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Atoms and the Law

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MICHIGAN LEGAL STUDIES

ATOMS AND THE LAW

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ATOMS AND THE LAW

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Preface

Early in 1951 a group of interested members of the faculty of The University of Michigan Law School conceived the idea of a research project, the purpose of which would be to investigate the principal unique legal problems being created and likely to be created in the future by peaceful uses of atomic energy. The group planned the preparation and publication of a series of manuscripts which might ultimately emerge as one or more printed volumes dealing with the legal problems affecting this new form of energy. Many phases of the subject were scrutinized, including the rule-making and licensing powers of the Atomic Energy Commission, the censoring of scientific information, liability for radiation injuries to persons and property, patent rights, state regulatory activities, and other areas of possible interest.

In July 1951 the Michigan Memorial-Phoenix Project, the University's major program of research in all phases of peaceful uses of the atom, made a substantial grant in support of the proposed study of legal problems. The law faculty group, consisting at the outset of Professors Samuel D. Estep, William J. Pierce, and the undersigned, organized and embarked upon the program. Later Professors Eric Stein and William W. Bishop were added. A small research staff was recruited and the studies were commenced, beginning with an intensive examination of the legislative history of the Atomic Energy Act of 1946.

In the summer of 1952, an Institute on Industrial and Legal Problems of Atomic Energy was organized and held in the Law Quadrangle in Ann Arbor. This proved to be one of the earliest of the many conferences held in this country resulting from the development of atomic enterprise, and it served to give very great stimulus to the research work being carried on within the staff of the Law School. The proceedings were published by the School and were widely distributed.

In 1956 a second summer conference was held, this time a "workshop," with a prepared agenda and working papers distributed in advance to the invited participants, who included not only lawyers but also engineers, A.E.C. staff members, scientists, health officials, and economists—a truly "inter-disciplinary" undertaking. The objective was to elicit concentrated thinking and interchange of ideas between knowledgeable people concerning atomic legal problems, and to precipitate these ideas in concrete form for the guidance of those responsible for current legal developments in the field. Again, proceedings were published and were widely distributed.

Throughout the years manuscripts on various phases of the subject have been prepared by the research staff or by the members of the faculty engaged in the project. Little by little the materials, which now emerge as this volume entitled *Atoms and the Law,* took shape in manuscript form. Principal interest finally centered on tort liability for radiation injuries, workmen's compensation for such injuries, federal statutory and administrative provisions regulating atomic activities, state regulation of atomic energy, and finally, in the later years, the international aspects of the subject. These became principal headings in the volume which is now being published.

As the project unfolded, those of us who were participating in it became increasingly impressed with the feeling that here was something unique in legal research, for we were engaging in a task that involved not only frontiers of the law but also one which was ever so closely interwoven with the science and technology of tomorrow. In carrying out the project, it became necessary for us to proceed as far as possible to master a new scientific field, one with a new vocabulary and a radically different set of concepts. This certainly enhanced interest in the task, not to mention increasing the difficulty of carrying it forward. In addition, it afforded us an even more fascinating prospect, namely, the possibility of creation of a center for legal studies related to the new technological world, with its great variety of new facets—automation, water resources problems, aviation, etc., thus to make our contribution in providing the legal framework to facilitate the adjustment of scientific advances to the social order of which we are a part.

The acknowledgements which we should make to those who have helped in the preparation of this volume are almost too numerous to mention. On the financial side we have already mentioned the Michigan Memorial-Phoenix Project, which made the initial grant-in-aid, and whose Director, Dean Ralph A. Sawyer, and Assistant Director, Professor Henry J. Gomberg, have been continuously helpful and encouraging. We have also received most generous support from the Detroit Edison Company, whose President, Walker L. Cisler, has led the way in the field of private atomic enterprise; from the William W. Cook Endowment Fund of the Law School; and from the Ford Foundation, whose grant-in-aid made in 1958 has not only helped with the completion of this volume but has made possible the continuation and broadening of the Law School's program of atomic legal research. Finally we must mention the most encouraging support of several of our loyal alumni who have been attracted by the project and have wished to contribute to it.

Acknowledgements must also be made to the many who have contributed to the research and preparation of the manuscript for the volume. Those of us who assume responsibility on the title page could never have completed the task without the participation of Professor Eric Stein and his one-time United States Department of State associate, Bernhard G. Bechhoefer, who wrote the chapter on the International Atomic Energy Agency; Courts Oulahan, now on the legal staff of the Atomic Energy Commission, who wrote on the Commission's administrative procedures; and Professor Horace W. Dewey, a graduate of the Law School, now in the Department of Slavic Languages of the University, who wrote the chapter on Soviet atomic developments. Then there has been the valued contribution of the several research assistants who have worked on the project—Rinaldo L. Bianchi, John W. Birchall, Mrs. Mimica Janez, Frederick Juenger, Lawrence P. King, Charles D. Olmsted, Ivor M. Richardson, Michael Scott, and Marvin O. Young. Finally, credit must be given for the skillful and diligent assistance of those who helped prepare the manuscript for the printer—Miss Alice J. Russell, Assistant Editor, Michigan Legal Publications; Miss Sharon Greene; and Mrs. Jean Hershenov. This has truly been a team project, and each member of the team has served faithfully and well.

One unique and worthy by-product of the Law School's Atomic Research Project is the extent to which those who have been engaged in it have been called upon to take active parts in outside activities related to the atomic age. We have participated in Congressional hearings on atomic matters; in activities of American Bar Association and State Bar committees; in the Power Reactor Development Company's Fermi Reactor, now under construction near Monroe, Michigan; in the drafting of state regulatory legislation on the subject; in the activities of the Fund for Peaceful Atomic Development; in the offering of a seminar as a part of the Law School curriculum; and in giving innumerable public addresses to all manner of groups, legal, lay, and technical. These by-product features have added interest and value to the task, and in a very real sense have, we believe, given us the opportunity to render some statesman-like service on one of the unique frontiers of the current scene.

A principal difficulty confronting us at all times has been the velocity with which changes have taken place during the period. New technical developments, new statutes, and even new concepts have followed one another in rapid succession—some of them even during the recent

weeks during which the manuscript has been in the printers' hands. This kaleidoscopic nature of the scene has made it impossible to keep the manuscript completely current with respect to all details, but it has seemed wiser to publish while the manuscript is reasonably timely than to lose the advantage of timeliness in the interest of technical perfection. Notwithstanding the difficulties, however, the task has been rewarding, and we hope the end result will make a worthwhile contribution to a fascinating new field.

E. BLYTHE STASON, DEAN
The University of Michigan Law School

Ann Arbor, Michigan
June 27, 1959.

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PART I

TORT LIABILITY AND RADIATION INJURIES

Chapter I

ORIGIN AND TYPES OF RADIATION INJURIES

A. Introduction

We are in the midst of a revolutionary technological development that may be as profound as the Industrial Revolution of the 19th century. Although peaceful employment of atomic energy has been comparatively meager to date, scientists, industrialists, economists, and many others have already recognized its potentiality. The failure of the 19th century legal profession to accommodate the law to the changes of the Industrial Revolution was a principal contributory cause for the creation of statutory workmen's compensation. The 20th century legal profession must move much more quickly to guide the adjustment of the law to this new revolutionary source of energy. The profession must be prepared to modify existing rules and to assist in the formulation of new doctrines to meet the unique problems which are certain to arise.[1]

The development of peacetime uses of atomic energy undoubtedly will have some of its greatest impacts on that portion of the law dealing with personal injury and property damage, usually denominated tort law. It is the purpose of this study to analyze the possible impact of this new technological revolution on this branch of the law.

Before the lawyer can consider the changes, major and minor, that will have to be made, he must acquaint himself with the basic scientific facts and theories of atomic energy. He must know something of the uniqueness of this source of energy if he is to understand its effect on the legal system. To handle the tort cases that will arise the lawyer will be required to master a new vocabulary, including such unfamiliar terms as neutrons, electrons, protons, positrons, isotopes, half-lives, and ionization, not to mention the anti-proton and the neutrino. Therefore, before analyzing the effect of atomic energy on the rules of law governing tort liability, we shall discuss some of the basic characteristics and technology of atomic energy and its potentiality for causing injuries to persons and property.

[1] Some have argued that traditional tort rules will adequately meet the challenge of atomic energy. Becker and Huard, "Tort Liability and the Atomic Energy Industry," 44 Geo. L. J. 58 (1955).

B. The Scientific Background

The theories of nuclear physics which are generally accepted today by scientists are nevertheless theories only. Like all other scientific theories we may find someday that they are somewhat inaccurate, or at least incomplete. Nevertheless, the atomic theory of matter does seem to explain many phenomena of nature with reasonable satisfaction, and it is possible to use the theory to develop truly startling practical techniques for industry, medicine, and research. Furthermore, accepted theories are certainly sufficiently useful to enable the lawyer to evaluate the possible effect of the new atomic techniques on the general principles of tort law.

1. Atomic Structure

According to present-day understanding, all matter is made up of infinitely small atoms which are, in turn, mostly empty space with a few subatomic particles of much smaller size. Each element has its own particular number of these particles. The principal components of atoms are neutrons, protons, and electrons. At the core or nucleus of an atom are found protons, which are positively charged particles, and neutrons, which are particles without electrical charge. Negatively charged electrons move around the nucleus in orbits with diameters about 10,000 times that of the nucleus. In stable atoms the number of electrons matches the number of protons of the nucleus. This numerical correspondence provides an electrical equilibrium since the protons and electrons neutralize each other. The neutrons are already electrically neutral and thus do not affect the equilibrium. There is, however, a limit to the number of particles which can be contained in the nucleus of an atom of a particular element. Overstuffing of the nucleus will produce instability, and the atom will discharge the surplus in the form of various types of radiation, all more or less harmful to human tissues.

The atoms of the various elements are identified in several ways. One is by reference to the combined number of protons and neutrons in the nucleus. This number is referred to as the *mass number* and is the *atomic weight* of this element. Atoms are also identified by the number of protons within the nucleus. This is the *atomic number* of the element. The *chemical* properties of an atom, on the other hand, depend upon the number of orbital electrons. However, as already indicated, the number of electrons in an atom is equal to the number of protons. Therefore, atoms with the same atomic number, as distinguished from mass number, always form the same chemical element

and react chemically in exactly the same way for all practical purposes. Frequently we find atoms with the same number of orbital electrons (also with the same number of protons or atomic number) but a different number of neutrons in the nucleus. We speak of these as different *isotopes* of the same chemical element. These terms can be understood best by reference to specific elements.

The simplest element of all is hydrogen which has one proton and one orbital electron. It is consequently the lightest of all elements and, in its most common form, has a weight, or mass, of approximately one. The heaviest naturally occurring element is uranium, with an atomic weight (mass number) of 238, derived from 92 protons (atomic number 92) and 146 neutrons in its nucleus. Between these two naturally occuring elements 90 others are found, varying in atomic weight according to a "periodic scale." In addition, science has thus far produced by artificial means certain other so-called transuranic elements which are even heavier than uranium. They are neptunium (93 Np 239),[2] plutonium (94 Pu 239), americium (95 Am 241), curium (96 Cur 242), berkelium (97 Bk 243), and californium (98 Cf 244), and recent newspaper articles report still two more in the ascending series. All of these artificial elements are unstable.

One orbital shell, housing one electron, is found around the nucleus of the hydrogen atom. Moving up one place in the periodic scale, we find helium, an atom which has two protons and consequently needs two electrons to attain a state of electrical equilibrium. According to atomic theory, two electrons will fill the capacity of the innermost electron shell. The saturation of the orbital shell causes helium atoms to enjoy a state of absolute repose, and thus helium is an inert gas.

The next atom on the scale (lithium) has three protons in the nucleus and thus requires three electrons for stability. One orbital shell being filled, a new shell must be used to house the new electron. The capacity of the second shell is eight electrons. Lithium, therefore, is an element with but one electron in a shell eager to harbor eight. Consequently, chemically speaking it tends to combine readily with atoms of other elements. Moreover, since orbital connections between lithium atoms are favored by their structure, lithium is a solid notwithstanding its low atomic weight.

After saturation of the second shell, a new one will be started, and so on until seven shells have been formed for the heaviest elements.

[2] The first number represents the atomic number and the second the atomic mass or weight.

The several shells are capable of absorbing different numbers of electrons. For example, the fourth outer shell builds up to eighteen electrons, the fifth up to thirty-two, the sixth up to eighteen, etc. As each orbital shell is filled to capacity, there is a recurrence of elements with similar characteristics in the form of inert gases. A single electron in a new shell will produce a recurrence of an alkali metal such as lithium.

When a shell hungry for new electrons cannot procure them by nuclear reactions, that is, by their reception jointly with the acquisition of new protons in the nucleus, an atom will eagerly resort to chemical reactions to fill its needs. Combinations will take place, forming molecules of various chemical compounds. For example, hydrogen atoms, with but one electron in an orbit capable of supporting two, will tend to link with any atom whose outer shell can accommodate another electron. Oxygen is such an atom and readily joins with hydrogen to form a molecule of water.

Neutrons, or electrically neutral particles, resulting from a combination of protons and electrons, can be present in various numbers in the nuclei of the atoms of the same elements. It is due largely to the activities of neutrons, under varied stresses as we shall see, that nuclear reactions take place and radiations are emitted.

2. Atomic Radiation

An unstable nucleus strives for stability in a number of ways, any one of which can be the source of injurious radiation. These include (1) alpha emission, (2) beta emission, (3) positron emission, and (4) K capture. Radiations also take the form of gamma rays. The reaction of neutrons on matter also results in radiation.

Alpha emission is the ejection of an alpha particle from the nucleus. An alpha particle consists of two protons and two neutrons bound together.[3] An atom subject to alpha emission loses four units of its weight number and two units of its positive electrical charge. This loss of two or more protons changes the atom to one of an element lower on the atomic scale. This method of radioactive decay is called alpha radiation and is confined almost exclusively to very heavy atoms found in nature, such as uranium, thorium, and radium.

Beta rays are really not rays but are particles and consist simply of electrons ejected from the atom at extremely high speeds. The ejection of an electron only does not alter the atomic mass number of the

[3] Helium nuclei are made up of 2 protons and 2 neutrons.

nucleus, but may involve a change in the atomic number. This latter is likely to happen when excess neutrons are present in the nucleus. An excess neutron tends to eject an electron and turn into a proton. This additional proton in the nucleus changes the atom to an element one higher on the atomic scale. Where two or more neutrons turn into protons, several transmutations may occur. This process is spoken of as beta decay. Beta radiation is the most common mode of decay of radioisotopes.

At this point it is interesting to note that beta decay often is initiated when the nucleus of a heavy atom (high on the atomic scale) undergoes alpha emission (*i.e.*, giving off particles consisting of two neutrons and two protons). The new nuclei thus formed are apt to have too many neutrons. The conversion of neutrons to protons, by emission of electrons (beta particles), will follow in the struggle for stability. This means that both alpha particles and beta rays may emanate from the same source.

Positron emission is another stabilization process which is encountered when protons are in excess in the nucleus. A positron has the same order of mass as an electron, but possesses a positive charge. It is formed when the proton, which has a far larger mass than the electron, attempts to bring electrical balance into the atom's structure by turning into a neutron, which is electrically neutral. If enough energy is present in the nucleus to allow this transformation, a positron is ejected without material alteration of the atomic mass and with the loss of a unit of positive charge. Where not enough energy is present, the nucleus reaches stabilization by the so-called "K capture" method.

K capture is essentially the capture of an electron by a surplus proton. The first electron shell is known as the K orbit, and the second one as the L orbit. The captured electron usually comes from the K orbit, but occasionally from the L. The acquired electron is absorbed by the excess proton and a neutron is formed. Stabilization through positron emission or K capture may be followed by emission of gamma radiation.

Gamma rays are not subatomic particles, but rather electromagnetic waves like heat, light, and X-rays. Gamma rays travel at the speed of light and have, in general, shorter wave lengths than X-rays. Because of this shorter length, they have considerably greater penetrating power. Gamma rays usually are the product of energy changes in the nucleus of the atom and often follow emission of beta particles, while X-rays are the product of energy changes in the inner electron shells

of the atom, usually as a result of bombardment by beams of electrons.

The *neutron* is another source of injurious radiation. If ejected from the nucleus of an atom, as, for example, in the operation of a nuclear reactor or in the detonation of an atomic bomb, neutrons become highly dangerous. They have great penetrating power and can make other substances radioactive.

Each of the foregoing types of radiation can be injurious to persons or property under certain circumstances. This study will be concerned with the legal aspects of damage from such radiations to both property and persons, but only insofar as such damage occurs in the course of peaceful uses of atomic energy. No consideration will be given to the damage caused by atomic bombs to either persons or property.

It should also be remembered that at present we are still talking about incompletely formulated and partly proven theories of atomic energy. The technology is continuously advancing. New discoveries are being made—new theories evolved. The lawyer will have to keep abreast of new developments for they may have an impact on such legal problems as causal relation, proof, damage, and the other matters with which the profession must deal.

C. Radiation Injuries

1. Historical Background

Several generations ago miners of pitchblende in Czechoslovakia died of pulmonary ailments at a rate thirty times greater than that of the general population. Modern medicine has since identified the ailment as lung cancer. It is believed that the inhalation of radioactive radon, a gas emanating from the disintegration of component substances of pitchblende, caused the cancerous growths and the consequent greater incidence of mortality among the miners.

But unawareness of the possible harmful effects of radiation persisted. When radium was discovered, the early workers with this element, out of ignorance, carried this source of radioactivity on their persons and as a result suffered injuries. The first manifestations of injury were usually erythema or reddening of the skin.

The use of X-rays in early stages of development claimed its share of victims and helped focus attention on the severe menace to human health inherent in radioactivity. Typical of the manner in which technicians and scientists discovered the damaging effects of X-rays is the case of a doctor who had frequently exposed his hands to X-rays in the

course of his experiments. The skin of his hands developed erythema aggravated by intense itching. Soon the skin became tough, pigmented, and glossy. Despite use of all medical remedies then available, an ulcerous area of his hand developed a malignancy. Even amputation failed to prevent death. Many other scientists and technicians have died of similarly induced cancers.

Possibly the best known of the early cases of injuries to employees caused by radioactivity are those of the radium dial painters of New Jersey (1917-24). Eighty women were employed to paint watch dials with luminous paint containing a small amount of radioactive material. The painters pointed the bristles of their brushes with their lips to keep them fine enough for their work. Each time they touched the bristles with their lips they ingested some of the radioactive substance used to make the paint permanently luminous. Many of these women developed anemia and bone tumors and died with symptoms of radium poisoning. Several years elapsed before it was discovered that radioactive material had been causing severe damage to blood-forming cells, thus precipitating the diseases. A sorrowful case stemming from the dial-painting episode was brought to court by a woman painter who began to experience symptoms of radium necrosis twelve years after she left the company's employment. She died shortly after bringing the action, but, in any event, the two-year statute of limitations had barred her claim.

The most spectacular cases of radiation injuries to date are those caused by the detonation of two atom bombs over Japan during World War II. The full extent of radiation injuries suffered in those two explosions is not known as yet. The whirling cloud of radioactivity released by the bombs must have contaminated a sizable area, but the most seriously contaminated victims, those in the proximity of ground zero, were killed by the blast or heat effects of the explosion, and thus the radiation effects could not be traced in all of their ramifications and ultimate consequences.

One of the most recent cases of radiation injuries, one having international repercussions, arose from the exposure of Japanese fishermen, following a hydrogen bomb test conducted by the United States in the Pacific. In this instance there was also property damage in the form of contamination of fish as well as the vessels of the fishermen.

In contrast with numerous cases of personal injury, about the only evidence we have of early appreciation of property damage arising from radiation is the effect of radiation on photographic film. Roentgen

apparently shielded his equipment, not to protect himself, but to prevent his film from fogging. This well may have saved him from the personal injuries that other early scientists experienced.

While we have learned much about the dangers of atomic radiation and how to guard against injuries to persons and property, as is clearly indicated by the almost phenomenal safety record of federal atomic energy operations, it seems perfectly certain that there will be many instances of injury to persons and property as a peacetime industry develops and widespread use of radiation sources becomes common.[4] It is necessary, therefore, that the lawyer who handles such cases have a thorough understanding of the mechanics of radiation injury.

2. Ionization

According to current theories, atomic radiations (chiefly alpha, beta, gamma, and neutron) cause damage to humans and to other living tissues and materials because of their so-called "ionizing" effect. Ions are atoms or molecules in an electrically excited state and are created when the electrical balance of an atom or molecule is upset by the gain or loss of an electron. If an atom loses one electron, it is left with a positive charge and becomes a positive ion. For example, a proton is a hydrogen atom with the single orbital electron removed, leaving a positive hydrogen ion with a single unit of charge. An alpha particle is an atom of helium whose two orbital electrons have been removed, leaving a positive helium ion wtih two units of charge. The resultant positive ion and the free electron are commonly referred to as an ion pair. However, it is possible to have a negative ion formed when in some manner an atom or molecule picks up an extra electron from another atom or molecule. The resultant negative and positive ions are also referred to as an ion pair. The injury potential of radiation is usually put in terms of the number of ion pairs it will create in passing through a given length of material, such as living tissue.

Alpha particles which carry positive electrical charges and beta particles which carry negative electrical charges cause ionization in substantially the same manner. Being electrically charged, when moving through matter they exert electrical forces which ionize a small fraction of the atoms or molecules along their paths. The kinetic energy originally possessed by the alpha or beta particle is transferred to the atom or molecule hit or particle ejected.

[4] For example, an explosion involving radiation hazards occurred in a New York City laboratory of the Sylvania Corporation in July 1956.

The maximum depth to which an alpha or beta particle can penetrate depends upon its energy and mass as well as the nature of the material through which it passes. The charged particle, as it passes through matter, loses a fairly uniform amount of energy each time it creates an ion pair.[5] A larger mass or a greater quantity of energy in a particle causes a greater amount of ionization. The depth of penetration of the particle into a particular material varies inversely with the density of that material. This can be illustrated by comparing the ionizing power of alpha and beta particles.

Because the mass of the alpha particle is more than 7,000 times that of the beta particle it has been found that, whereas an alpha particle will produce about 50,000 to 100,000 ion pairs per centimeter of air at atmospheric pressure, a beta particle *of the same energy* will create only about 30 to 300 ion pairs per centimeter. However, being much smaller and faster, the beta particle has a range of nearly a thousand times that of the alpha particle so that the total number of ion pairs created would be approximately the same.[6] This follows from the fact that it normally takes just about 32.5 electron volts of energy to create an ion pair, whether it comes from an alpha or beta particle or other source of energy.

From the standpoint of injury from radiation it is perhaps more important to think in terms of how much material it takes to completely absorb the ionization potential of alpha and beta particles, because this determines what shielding is required to prevent ionizing radiation or how deep the penetration will be into a given material, *e.g.,* animal tissue. In air an alpha particle will have a range of from one inch to three and one-half inches, while the ionization from a beta particle will be reduced to zero in from four *inches* to forty-three feet, in each case the exact penetration depending on the energy of the particular particle. In water or paper or animal tissue .004 inches (or four mils) will stop essentially *all* alpha particles and two mils will stop *most* alpha particles. Some beta particles will be stopped by such thicknesses and even the most powerful naturally occurring ones will be stopped by something like two inches of animal tissue. It should also be mentioned that positive beta particles, called positrons, act like negative beta particles but have an additional characteristic. They tend to combine very quickly with an electron on the outer orbit of some atom; and when they do so,

[5] 32.5 electron volts for every ion pair formed. Glasstone, Sourcebook on Atomic Energy 131 (1950).

[6] Glasstone, Principles of Nuclear Reactor Engineering §2.29, p. 65 (1955).

energy in the form of annihilation radiation (similar to gamma rays) is given off.

Gamma rays differ from alpha and beta particles in at least two important respects. In the first place, they are rays and not particles; they are like heat and light in this respect. (X-rays, bremsstrahlung, and annihilation radiation, though not coming from nuclear transitions, are so much like gamma rays, differing really only by reason of lower energies, that a description of gamma ray characteristics will suffice to cover them as well.) The second important distinction between gamma rays and alpha and beta particles is that the rays are not electrically charged. From the standpoint of injury to persons or property the most important consequence of these characteristics is that gamma rays are absorbed exponentially in passing through matter. This means it is theoretically impossible to shield against all gamma radiation. However, it is possible to reduce gamma radiations to the point where they are relatively unimportant.

The reactions of gamma rays upon absorbing material which produce ionization, directly or indirectly, are several in number and are too complex to be described adequately in this brief discussion. Sufficiently important to merit mention, however, are three factors. The first is the photoelectric effect (which is most important for low energy gamma rays interacting with material of high atomic mass). This consists of the transfer of the whole gamma ray photon energy to an electron which is ejected from the atom. This electron acts as a beta particle and has an energy equal to the excess energy of the gamma ray photon over that necessary to overcome the binding energy holding the electron to the atom. When the photoelectron is ejected, another electron from an outer orbit takes its place in the atom and this transition in turn gives off X-rays of low energy which in turn may cause the ejection of an outer orbit electron. In this way the whole energy of the gamma ray photon is absorbed.

The second method by which the gamma ray affects target material is the Compton effect, a process in which the gamma ray photon makes an elastic collision (bouncing, like two billiard balls colliding) with an outer electron of the absorbing material. Some of the photon's energy is retained and part is transmitted to the electron. The photon itself is scattered or deflected from its original path. The Compton effect is most significant in the case of gamma rays of the middle ranges of energy. There is no absorption of the gamma ray but only a decreasing of its energy.

As the energy of the gamma ray photon increases, the photoelectrical and Compton effects diminish, and the third method of interaction, pair production, occurs. When high energy photons pass near the nucleus of an atom, the photon is absorbed, and an electron-positron pair is created. These particles travel in a forward direction, and their absorption takes place in an exponential manner, theoretically never being 100% complete.

While the penetration range of gamma rays is much greater than alpha or beta particles and cannot be given definite limits because of the exponential absorption, it is possible to utilize a practical thickness of shielding which will reduce gamma radiation to apparently insignificant proportions. For example, in water alpha particles of 1-Mev [7] will penetrate .0004 centimeters, beta particles of 1-Mev will penetrate .39 centimeters, while 1-Mev gamma rays will go through 70 centimeters before the energy is reduced to one per cent of the original energy. In general, the higher the energy the greater the thickness of a given material needed to reduce the gamma rays to a given fraction of their original energy. Likewise, the greater the density of the absorbing material the less thick need it be to absorb a given fraction of the original energy.

Neutrons are like alpha and beta particles in that they have mass—they are particles. However, they are like gamma rays in that they are electrically neutral and have very high penetrating power. Apparently, the neutron does not cause ionization directly, but it can do so indirectly by causing alpha and beta particles and gamma rays to be emitted which in turn will cause ionization as already indicated.

Neutrons come from several sources. If a natural alpha emitting element, such as radium or polonium, is mixed with one of the light elements, such as beryllium, boron, or lithium, neutrons of varying but fairly high energies are emitted. Gamma rays of intermediate energies can cause the emission of neutrons of uniform energies when interacting with the nuclei of certain elements, particularly heavy hydrogen (deuterium) and beryllium. However, the principal source of neutrons is found in the chain reaction in a nuclear reactor in which atoms of uranium or other fissionable material are broken apart with a resultant emission of neutrons in large quantities.

Neutrons generally react with the nuclei of atoms in two ways: *absorption,* in which the neutron penetrates the nucleus and causes other particles to leave, and *scattering,* in which the neutron remains free

[7] Mev is the symbol for 1 million electron volts. *Id.* at §1.50, p. 13.

after collision with a nucleus but transfers to it some of its energy. The details of neutron reactions are too complex for statement here,[8] but some basic knowledge is fundamental for the lawyer who is to engage in the legal problems of atomic enterprise.

The absorption process takes place principally with so-called slow [9] or thermal neutrons and may result in at least four phenomena. An alpha particle or a proton may be ejected, though this occurs only rarely, happening only with a few isotopes of low mass number; gamma rays may be emitted; or fission may take place. Gamma ray emission is the most common of the four. In all four reactions it is believed that when the neutron is first captured by the nucleus of the target material a new isotope of the same element is formed, which is then in a highly excited state. Very shortly the new nucleus either expels a particle (alpha or proton), emits gamma rays, or fissions (breaks into two or more parts).

When a neutron is absorbed, the new isotope (same number of protons and electrons and therefore the same chemically but with a greater atomic weight or mass number) is quite often radioactive. The isotope may not only go through beta decay but also may give off gamma rays. This means that when material undergoes neutron bombardment damage can ensue as a result of the beta and gamma radiation. From the standpoint of injury to living tissue it should be noted that hydrogen which is so prevalent in such tissue readily absorbs neutrons. This absorption process makes neutron bombardment very dangerous to living persons and animals. It also means, however, that water with its high hydrogen content serves as an effective shield to protect personnel from neutron radiation damage.

Fast neutrons react with target material largely by way of scattering or fission, not so often by particle ejection or gamma ray emission. (A reaction of the latter sort takes place with oxygen, however, and is important since air and water are often used as coolants and both contain oxygen.) Scattering can be either elastic or inelastic. In inelastic scattering the neutron is absorbed, a neutron of lower energy is emitted, and the excess energy is emitted as gamma ray photons. This type of scattering is more likely to occur in the case of high energy neutrons. Parenthetically, it is also true that inelastic scattering in material of low mass number results from gamma radiation only if

[8] Even if it could be assumed that the writers fully understood what is now known.
[9] Even slow neutrons travel more than a mile per second.

the gamma ray energy is high. This means that light elements such as water or paraffin are the best moderators for slow neutrons.

Elastic scattering takes place when the neutron collides with the nucleus but is only slowed down, not absorbed, and some of the energy is transferred to the target nucleus. By this process the neutron is gradually reduced in velocity and finally becomes a slow or thermal neutron. The energy level at which it becomes a thermal neutron is dependent on the temperature of the target material, hence the name thermal.

The rate at which nuclear reactions from neutron bombardment takes place is dependent on the number of neutrons, their velocity, and the amount and kind of target nuclei. Only with certain amounts of a few elements do we have the proper combination of factors necessary to sustain a so-called fission chain reaction. Other elements, such as boron and cadmium, instead of fissioning absorb neutrons readily and can be used to control the fission process in reactors. Still others, such as deuterium, beryllium, and carbon (or graphite) are used as moderators because they slow down neutrons very effectively. The low neutron absorption characteristic of aluminium, zirconium, and stainless steel makes them particularly suitable structural materials for reactors.

The chain fission reaction is a special kind of fission in which there are enough excess neutrons from the fission process and enough target material to make possible a continuous series of fission reactions. When this right combination is present we have what is usually called a nuclear reactor. When a reactor is in operation—the chain fission process taking place—there are many radiation hazards immediately present. In addition to the neutrons and gamma rays already described as resulting directly from any fission reaction, there are also delayed neutrons and gamma rays. Both apparently are the result of decay of radioactive isotopes which are formed when fission takes place. One of the most important sources of possibly harmful radiation from nuclear reactors is found in these isotopes. For example, there are more than eighty different fission fragments created when thermal neutrons bombard uranium 235, and nearly all such fragments are radioactive. Each of these eighty lead, through a decay process, to the formation of other radioisotopes, so that more than 200 such isotopes are present shortly after fission takes place. Most of them emit gamma rays and beta particles, and the half-lives of these radioactive fragments range from a small part of a second to a million years.

The great variety of radiations resulting from fission makes the re-

actor shielding problem a very complex and difficult one to solve, especially if economy of construction is a factor, as it certainly will be in industrial applications. As a practical matter any shielding that will stop the neutrons, both fast and slow, and the gamma rays, will be enough to stop alpha and beta particles and even the protons that may be ejected. However, shielding is subject to many complications, involving much more than just the reactor core of fissionable material. The reactor coolant very well may become contaminated, and it must be carefully shielded. During chemical processing of spent radioactive fuels account must be taken of the highly radioactive character of the fission fragments, and adequate shielding must be provided. As neutrons and gamma radiations pass through the shielding material, they will react with and cause further nuclear reactions in the shield itself, just as in the core of the reactor. Such reactions caused by fast neutrons towards the outer edge of the shield are particularly dangerous. It should also be remembered that a material which will either capture slow neutrons or slow down fast ones or absorb gamma rays will not necessarily serve to shield against all three types. The determination of the proper combination of shielding materials for a given reactor is the task of the trained specialist.

All of these radiations either directly or indirectly cause ionization of the material through which the radiations pass. In respect to damage to human tissue, Glasstone has the following to say:

> 18.7. Little is yet known of the exact mechanism whereby ionizing radiations produce their effects, although several experimental researches are in progress with the hope of throwing light on this problem. The number of ions formed in the body, and presumably the number of molecules affected, by radiation may be quite small, yet the result can be fatal. It is known that the radiations affect the individual cells of which the body is composed, possibly by destroying the enzymes that determine their particular functions. In brief, all cells contain protoplasm, consisting of a central body, or nucleus, suspended in a viscous liquid medium, called the cytoplasm. The cell as a whole is surrounded by a membrane through which pass the salts, sugars and so on, required for its maintenance. Within the nucleus is the substance chromatin which, at the times of cell division, forms the chromosomes; the latter, whose number and shape are characteristic of each species, carry the hereditary factors.
>
> 18.8. There are reasons for believing that the proteins present in the chromosomes are particularly sensitive to the ionizing influence of radiations. . . . Even if the details are not un-

derstood, the over-all effects on the cell are well known; among the results observed have been the breaking of the chromosomes, swelling of the nucleus and of the entire cell, destruction of the cell, increase in viscosity of the protoplasm, and greater permeability of the cell membrane. The broken cells and other biological debris tend to clog the capillaries and so interfere with the circulation of the blood.

18.9. In connection with the behavior of individual cells it has been noted that the process of cell division, known to biologists as mitosis, is delayed by exposure to radiation. Frequently the new cells that are formed are unable to undergo mitosis, so that their number does not increase. It is possible that this effect, together with cell destruction referred to above, underlies the use of gamma radiation for inhibiting the proliferation of the cancerous cells in malignant tumors. . . . There is, however, a curious paradox in this connection, which emphasizes the difficulty in understanding the biological effects of radiation. While controlled treatment with gamma rays can stop cancerous growth, continued exposure to radiation in excess of certain limits may cause a cancer to be formed.

18.10. Unfortunately, the animal body has not developed an instinctive defense against radiation as it has against heat and, to some extent, against ultraviolet light. Consequently, there can be severe radiation damage without any realization at the time on the part of the subject. The nature and extent of the symptoms which develop later may vary with the individual. They depend on the type of radiation, on the depth to which the radiation has penetrated, on the extent of the body exposed, on the amount of radiation absorbed, and also upon whether the exposure was chronic, that is, repeated or prolonged so as to lead to a cumulative effect, or acute, that is, received in one large dose. All types of excessive exposure to radiation appear to have one factor in common; there is invariably a delay, which may be weeks, months or years, before the final, and worst, effects become apparent.[10]

The specific long-range effects of ionization in humans may encompass any one or more of the following: genetic damage, sterility, fetal damage, cancer, leukemia, leukopenia, cataracts, bone necrosis, epilation, shortened life span, and death. Erythema, or reddening of the skin, or "burn," varying in intensity with the amount of exposure, is a short-range effect. In severe cases, erythema is followed by blistering and formation of lesions.

With respect to property damage a distinction should be drawn

[10] Glasstone, Sourcebook on Atomic Energy 502 (1950).

between things that are living and inanimate materials. Vegetable and animal life, being made up of living reproducing cells and tissues, are apt to suffer various types of injuries from ionization in about the same fashion as humans. Materials, such as steel, which are not made up of living cells, can also be affected by ionization but the effect is almost always non-permanent. Nuclear scientists have found that the heavier particles, such as neutrons, protons, and alpha particles, may upset the molecular structure of such materials as a result of elastic collisions. These effects can usually be removed by raising the temperature of the material. In some cases changes in the molecular structure may even prove beneficial. As in the case of ionization, scientists do not yet agree on the explanations for these changes. In the case of non-metallic materials such as plastics the effects of radiation can be very harmful, as is the case with most organic materials. This fact raises special problems in utilizing lubricants and special materials for component parts of nuclear reactors. It should also be remembered that exposure of materials to a high neutron flux may create radioactive isotopes. This may be harmful but may also be very helpful under certain circumstances when a particular isotope is desired.

Certain radioactive substances, in addition to the harmful effects produced by the emission of alpha, beta, or gamma rays, cause damage because of their deleterious chemical effects. Plutonium, uranium, and isotopes of various other elements have poisonous effects on humans or animals, quite aside from their radioactive properties. Likewise, certain of the substances are very corrosive, particularly at high temperatures. But these qualities present lawyers with nothing uncommon or mysterious in tort litigation and need no special consideration.

3. Measurements of Radioactivity

Lawyers handling radiation cases must also familiarize themselves with the scientific concepts and terminology concerning the amounts and rates of radiation given off by radioactive isotopes of the various elements. An understanding of these is essential to an evaluation of the risks incurred and the existence of negligence, if any, in atomic energy activities. The most important terms are radioactive half-life, biological half-life, curie, and roentgen.

All of the radioactive isotopes, whether naturally existing (such as uranium 235 or 238, thorium 232, and radium) or artificially created (such as uranium 233 and plutonium 239), gradually change to some stable isotope or element by the discharge from the nucleus of either

an alpha particle (a helium nucleus) or a beta particle (an electron), or in the case of some artificial isotopes by emission of positive beta particles or positrons. This radioactive decay takes place at a given rate which is different for each radioactive isotope. This rate of decay is usually expressed in terms of the radioactive half-life, *i.e.*, the time it takes for one-half of the radiation activity to dissipate or decay. Isotopes are known to exist whose half-life is about a millionth of a second and also some whose half-life is billions of years. For example, thorium 232 has a half-life in the billions of years, while thorium 233 has a half-life of twenty-three minutes. It is also important to remember that radioactive decay takes place in an exponential fashion; *i.e.*, one-half of the radioactivity is emitted in the first half-life; then one-half of the remaining activity (or one-fourth of the initial activity) decays in the next equal half-life period; one-half of the remaining activity (or one-eight of the initial value) decays in the next half-life; etc. After seven half-lives 1/128 (less than 1%) of the initial activity remains. The radioactive half-life of a particular isotope is important in determining the amount of radiation received by tissue or other materials. The length of exposure multiplied by the rate of decay of the isotope (half-life) determines how much has been received in a particular case.

The radioactivity present in a particular material is usually measured in curies. One curie is the number of nuclei that disintegrate (decay) in one second in a gram of radium, *i.e.*, 37 billion per second. If a sample of some radioactive material disintegrates at this rate it is said to have an activity of one curie. A *millicurie* is 1/1,000 of a curie and a *microcurie* is 1/1,000,000 of a curie. The terms *kilocurie* (1,000 curies) and *megacurie* (1,000,000 curies) are used to indicate the activity in large amounts of radioactive material.

The relationship between radioactive half-life and the total radiation given off by any particular material is shown by the fact that it takes a larger quantity of a slowly decaying material to give off one curie of radiation in a given time than it does in the case of a fast decaying isotope.

In determining the permissible amounts of radiation (curies) to which persons or living tissue may be subjected, or the damaging effect of ionizing radiation received, use will be made of another term which lawyers must understand, the roentgen. The roentgen is the amount of X-ray or gamma ray radiation that will create in a given amount of dry air at standard temperature and pressure, ion pairs carrying a given quantity of electricity.

This dosage unit is really a compromise because the actual biological damage process is complex and little understood, but the roentgen is the dosage unit used in view of the prevailing opinion that biological damage to the living organisms is due mainly to ionization caused by radiation. The radiation dose represented by the roentgen indicates only the total amount of X or gamma radiation absorbed. The dosage *rate* is the amount of radiation (i.e., roentgens) absorbed in a given time, *e.g.*, a second or an hour. It should be mentioned that the absorption ability of air varies with the energy of the radiation so that the roentgens of energy received from a given source vary with the intensity of the source as well as with the amount of material in the source. The strength of such a source is usually expressed in *rhm, i.e.*, the quantity of a given source of gamma rays that gives off one roentgen per hour in air at a distance of one meter.

If the roentgen is translated into energy, it is found that each gram of dry air absorbs 83.8 ergs for each roentgen of radiation. In different materials the amount of energy absorbed per gram per roentgen, however, is different. For example, one gram of soft tissue absorbs 93 ergs and one gram of bone absorbs 150 ergs or more, as compared with 83.8 for air. But the dose in roentgens expresses a constant not dependent on the nature of the material exposed to radiation or the amount of energy which this material absorbs. It should also be noted that the ionizing effect of a given source of radiation falls off inversely with the square of the distance from the source, a fact which makes considerable separation from radioactive sources important in protection against radiation hazards. The actual determination of dosage and dose rates is a complex problem to be left to the scientists.

Since the roentgen is a measuring unit only for the ionizing effect of X and gamma rays, other terms are used to denote the effects of all types of radiation, including alpha and beta particles and neutrons. *Rep* (roentgen equivalent physical) is one such term and means the dose of any nuclear radiation that results in 83 ergs of energy being absorbed in one gram of tissue. Recently this has come to be used to indicate absorption of 93 ergs in tissue to make it equivalent to gamma absorption in tissue rather than air. Obviously, however, it does not hold for bone absorption (150 ergs).

A new dosage unit was adopted in 1953, the *rad*. It means the absorption of 100 ergs per gram of material imparted by ionizing radiation *at the point of interest*. It differs from the rep in that it does not describe the material absorbing the dose. (The rep is eighty-three

or ninety-three ergs absorbed by tissue.) In soft tissue, however, the rad is about equal to the rep.

Because neither the rep nor the rad (measures of amount absorbed) describe the *biological* effect of absorption in a particular material another term has been coined, *rem* (roentgen equivalent man). This expresses the amount of rads or reps received but in terms of the relative biological effect a given amount of ionizing radiation would have in *particular* tissue. The biological effect will differ greatly depending on the nature of the radiation. For example, those ionizing particles which cause more ionization per unit of travel along their path (such as alpha particles) generally have the greater biological effect. This effect is compared to the biological effect of X-rays of a certain energy, and the resultant quantity is called the relative biological effect or RBE. This RBE varies with the kind of tissue or organism receiving the radiation, the rate at which the particular amount of radiation is received, and the kind and amount of biological effect. For purposes of determining the amount of radiation protection needed these variables are in practice reduced to a single value of the RBE for different effects of a specific type of radiation, *i.e.*, the RBE which is the highest under the circumstances. Using these values for the RBE, roentgens or reps or rads can be converted to rems.

4. Personal Injuries

Although the manner in which radiation causes personal injuries, the types of injuries, and the doses required to cause specific injuries are not yet fully understood by scientists, some of the factual data that will be important to lawyers have been identified. As we shall see, some of this information leads to the conclusion that the task of the lawyer is going to be a difficult one when he attempts to prove that a specific injury was caused by a given exposure to ionizing radiation of all or part of the human body, or that it was even caused by radiation at all.

a. Radiosensitivity

One complicating factor in framing workable legal rules for peaceful uses of atomic energy is the difference in susceptibility to radiation injury not only among individuals, but also among age groups. Moreover, there are susceptibility differences between particular organs and tissues in the human body. It is estimated, for example, that a dose

of 400 roentgens is lethal for about one-half of the population.[11] Likewise, some of the tissues and organs of the body will endure extensive exposure before harmful results appear, whereas other parts are easily damaged by comparatively low amounts of radiation. Although the reasons for the differences in radiosensitivity are not known, it seems clear that certain tissues and organs such as lymphoid tissue and bone marrow where blood constituents are produced, the mucose membrane lining the stomach, and the reproductive organs are the most sensitive. On the other hand, nerve cells, muscle tissue, and fully grown bone are among the least sensitive. The skin, liver, and kidneys have an intermediate sensitivity.

b. Whole Body Exposure

Another variable in determining the effects of irradiation of the human body is that of whole as against partial body exposure. When only particular organs or parts of the body are exposed, a person or an animal can normally withstand many times the dosage of radiation that usually would be lethal if administered to the whole body. Indeed, this is fortunate, for it means that the destructive power of radioactivity can be localized and utilized to treat a variety of pathological conditions. In sufficient concentrations radiation may be used to destroy deseased tissue such as that found in malignant growths. As much as 5,000 roentgens may be used to treat a small skin cancer whereas exposure of the whole body to even one-tenth of this amount would kill most people.

When the entire body is exposed to radiation, a very complex problem arises of trying to determine the total effect. Since various parts of the body have differing degrees of radiosensitivity a certain dose of radiation over the whole body will probably affect some parts very seriously and others not to any discernible extent. Despite all of the complexities and uncertainties, scientists up to very recently have pretty generally agreed that a weekly whole body exposure of 0.3 roentgen or rem per week is a permissible upper limit for repeated exposure. It is true that recently certain geneticists have concluded that no dosage is too small to increase the likelihood of genetic damage and also to shorten the life span of the exposed person. In 1957 the National Committee on Radiation Protection recommended that for occupational conditions the maximum permissible accumulated dose, in rems, at any age equal five times the number of years beyond age eighteen, provided that no annual increment

[11] An average chest X-ray would probably administer a dose of about 1 roentgen.

exceed fifteen rems. For the entire population, the maximum permissible dose to the gonads from all sources of radiation, including medical and other man-made sources, and background radiation, is not to exceed 14 million rems per million of population over the period from conception up to age thirty and one-third of that amount in each decade thereafter.

These permissible dose figures take account of another characteristic of radiation exposure which seems to be true whether we are considering either whole body or only partial body exposure—namely, that, in general, a given amount of radiation will cause less damage if spread over a longer period of time. Overexposure occasioned by daily relatively low intensity radiation is called *chronic,* while overexposure by a relatively large dose received in a short time interval is called *acute* overexposure.

It seems clear that all types of radiation overexposure, whether chronic or acute, and whether of the whole or only part of the body, have at least two effects in common. In both cases there seems always to be a delay, whether of weeks, months, or years, before the final and the worst effects manifest themselves. Likewise it seems clear that in sufficient quantities overexposure can cause any of the specific types of damages discussed later in this chapter.

Aside from these specific injuries, however, there is a rather particular set of reactions of the human body to acute whole body overexposure. The reactions of the body to such exposure usually appear in four phases: (1) nausea, vomiting, and general lassitude, such as experienced by patients undergoing intensive radium or X-ray treatment (sometimes called "radiation sickness"); (2) a phase of relative well-being lasting from a few days to a few weeks depending on the severity of the radiation dose; (3) a period of intense reaction including prostration, loss of appetite, loss of weight, rapid heart action, fever, bleeding of the gums and loss of hair, lasting from days to weeks or until death occurs in severe cases; and (4) a period of gradual recovery lasting up to six months. Any acute overexposure is accompanied by the same significant changes in the blood cells found in cases of chronic overexposure.

c. Cumulative Effect

Another complicating factor in atomic radiation cases is the cumulative effect of overexposure. Such an effect is suggested by the preceding discussion and very definitely plays a part in the determination of the permissible or tolerance dose, presently set at 0.3 rem per week.

Many radiation effects are believed to be of a threshold character;

that is, unless the dose is more than a certain minimum, no injury will result. This is consistent with the fact that all life on the earth is continually bombarded by radiations from cosmic rays, from radioactive material always present in air and water, and from radioisotopes, such as carbon 14 and potassium 40, always present in the human body without any apparent or obvious resulting harm. The assumption is that exposure up to certain levels of intensity, at least for certain parts of the body, is offset by the powers of recovery of the body which are great enough to preclude cumulative damage.

It seems quite clear, however, that in certain cases there definitely is a cumulative effect such that damage that would not result from a single small dose will occur if that small dose is repeated often enough. For example, a recent report of the National Academy of Sciences on radiation injury makes the categorical statement that there is no dose too small to have a genetic effect or to shorten the life span. Our knowledge about such cumulative effects and under what circumstances they occur is quite incomplete at the present time, but the ramifications in radiation injury cases are obvious. For example, one exposure, which by itself falls within permissible limits, may make subsequent seemingly permissible exposures quite damaging. Accordingly, full knowledge and records of past exposures will be required in order to prevent really harmful exposures which otherwise appear to be perfectly within permissible limits. Again, once an individual has received the maximum permissible accumulation of radiation, essential X-ray exposure for medical purposes may be foreclosed because of the serious risk of total overexposure.

d. External and Internal Radiation Hazards

The harmfulness of radiation depends not only upon the radiosensitivity of the individual or the various tissues affected and the nature and dosage of exposure, but also upon the type of radiation and its immediate location in respect to human tissues. Some sources of radiation may create little hazard if located outside the body but may be highly dangerous if within the body. Therefore, lawyers who are to be involved in atomic affairs must understand the factors involved and methods of radiation protection that are available if they are properly to handle personal injury cases involving radiation.

(1) External Sources

As explained earlier, alpha and beta particles have only slight penetrating power. Consequently if the alpha or beta source is outside the

body, no observable harm results from the alpha radiation, and even from high energy beta radiation the damage will usually be limited to severe skin burn. However, it should be remembered that both alpha and beta activity is often accompanied by gamma ray emission.

Gamma rays from external sources are very dangerous, particularly if they are so-called hard gamma rays (*i.e.,* rays that have a very high energy). As pointed out above in the discussion of gamma rays, they, like X-rays, are absorbed in an exponential manner and thus theoretically can travel through any thickness of material, including body tissue. Not only do gamma rays create electrically excited nuclei which may upset the biological balance within body tissue, but also they cause the emission of electrons or beta particles inside the body which in turn cause ionization. Such beta particles released in close proximity to internal tissues can do great damage to radiosensitive organs and tissue that would never be endangered by such particles from an external source.

Neutrons, though they do not cause ionization directly, do cause considerable biological damage indirectly. If the neutrons are of the so-called slow type, most of this damage is caused by their capture by hydrogen and nitrogen nuclei which are plentiful in living tissue. Capture of neutrons in hydrogen nuclei produces gamma ray photons some of which will cause ionization in surrounding tissue and some of which escape from the body. Capture of neutrons by nitrogen nuclei also causes emission of protons which, like alpha particles, dissipate their energy in a short distance but the ionization is very substantial. The reaction of slow neutrons with other material in the body seems relatively insignificant.

If the neutrons are fast, *i.e.,* of high velocity, a somewhat different sequence of events takes place. Most of the energy from such neutrons is lost in elastic collisions with hydrogen, oxygen, carbon, and nitrogen atoms found in the body tissues. The target atom acquires kinetic energy which is then lost by elastic collisions with other atoms, by ionization, and by excitation. If fast neutrons hit nitrogen 14 atoms, protons may be ejected, as explained above, and carbon 14 may be formed which is itself a beta emitter. If the collision with nitrogen 14 is accompanied by sufficient energy, alpha particles will also be emitted. All of these reactions take place within a short distance from the nucleus hit by the fast neutron. Fast neutrons after a sufficient number of collisions lose energy and become slow neutrons.

In considering the biological damage caused by neutrons it is important to remember that the secondary effects will very likely take place

deep in the body, particularly if fast neutrons are involved, for neutrons, like gamma rays, lose their energy exponentially; they are not stopped by the skin as are alpha and beta particles. Neutrons are particularly harmful because hydrogen is such an important and abundant element in the body and is such an excellent absorber of neutrons. It is also important to remember that while most of the ionizing energy from slow neutrons comes from gamma rays emitted from neutron absorption by hydrogen, the greatest biological effect is probably caused by the nitrogen-proton reaction. This is because the whole energy of the proton is absorbed very close to the point of origin, while gamma rays are absorbed at considerable distances or may even escape the body without absorption. The RBE (relative biological effect) of protons may be ten times greater than the RBE of gamma radiation.

(2) Internal Radiation

As previously stated, so far as known, biological damage from radiation is caused by ionization and is the same whether the radiation is internal or external in origin. However, the effects from specific types and sources of radiation can vary greatly depending on whether the source is internal or external. This results from the fact that certain chemicals have a tendency to concentrate in certain body tissues. Account must also be taken of the fact that radiation from outside the body is reduced in strength to a greater or lesser degree as it passes through the body tissues.

Radioactive material may enter the body through the processes of breathing, eating, or drinking such materials or through cuts and abrasions. As is true with external sources, the quantity of material ingested is an important factor in determining the dose received. However, there are several factors relating to the dose actually received from an internal source which are not present when the source is external. Exposure to external sources can be terminated by simply removing either the source or the person to a safe distance. However, once a source is located within the body, exposure is continuous until the quantity of radiation is depleted either by radioactive decay in accordance with known rates (usually measured in radioactive half-lives) or by biological elimination (such as through urine, feces, or perspiration). The rate of elimination is measured by the *biological half-life,* which means the time required for natural processes to eliminate one-half the quantity taken into the body. By combining the radioactive and biological half-lives an *effective half-life* is determined, *i.e.,* the time required for the

initial amount of *radioactivity* to be reduced to one-half its initial value by both elimination and radioactive decay. For example, cesium has a radioactive half-life of thirty-seven years but is readily eliminated by the body, having a biological half-life of about fifteen days. Plutonium, on the other hand, has not only a very long radioactive half-life but also an extremely long biological half-life.

Another factor that determines how much of a radioactive material the body retains is the method of introduction into the body. As an example, iodine (including radioactive iodine 131 which is commonly used) entering the digestive tract has a retention rate of nearly 100%. Plutonium 239, on the other hand, if taken into the digestive tract is not absorbed nearly so readily as it is if it is drawn into the lungs. Strontium 90, however, has about as great a retention rate as plutonium 239 in air, but nearly twice the rate of plutonium 239 if taken into the digestive tract. Natural uranium is similar to plutonium 239, being retained only slightly if in water but much more so if in air.

As important as the retention rate in determining the biological damage that will be caused by an internal radiation source is the distribution of the source in terms of types of tissues or organs to which the source is attracted. The concentration of distribution is also significant. Taking examples again, iodine 131 localizes almost entirely in the thyroid gland. Because radio-iodine localizes in such a small part of the body, the permissible quantity that can be ingested before the level of overexposure is reached is very much less than in the case of radioactive sodium 24, which is distributed rather uniformly throughout the body. Another important factor is the location of any concentration in relation to vital tissues or organs. Uranium 233, plutonium 239, strontium 90, and calcium 45 (all radioactive isotopes) concentrate in the bones where they can radiate the very sensitive blood-forming marrow. Moreover, they are retained for very long periods, although there has been some success in the use of zirconium to speed the biological elimination of plutonium.

In comparing external and internal radiation the type of radiation involved must also be considered. As we have seen, alpha particles and even beta particles originating outside the body are not especially dangerous. They have very little if any internal effect because both are quickly absorbed by the skin. Gamma rays and neutrons, however, have great penetration powers. If alpha or beta sources are taken into the body, a very different effect is noted. In such cases the radiation is totally absorbed close to the source (alpha much closer than beta, of

course), and this may well be very close to, if not actually in, a vital, highly radiosensitive organ. Gamma rays from internal sources, however, may actually pass through the tissues without absorption, and in any event their harmful effects will be distributed much farther from the source and, therefore, more widely throughout the body than those resulting from internal alpha or beta radiation.

From the foregoing, it is obvious that safety procedures must take account of the great differences in possible biological damage caused by external as compared with internal radiation. Lawyers handling radiation injury cases must be familiar with the factors creating these differences in order to determine the existence of overexposure and evaluate the possibility and extent of damage suffered by the injured person. Moreover, the evolution of technology in this area will have to be examined continually by lawyers who are concerned in one capacity or another with radiation injuries.

e. Specific Personal Injuries

So far we have discussed generally the damaging effect of ionizing radiation and the nature of radiation hazards. Since the lawyers of the atomic age will be involved with fact situations in which specific injuries are alleged, the principal known types of injuries warrant mention. Once again, we wish to emphasize that little is currently known about the manner in which radiation causes injury, and undoubtedly future scientific experimentation and research will reveal many features of radiation damage that are either unknown or but little understood today.

(1) Genetic Damage

Today biologists generally agree that our inherited characteristics are determined by the genes which we inherit from our parents. These submicroscopic units singly and in combination are believed to control such physical characteristics as color of hair and eyes, baldness, size, mental ability, etc. Genes in turn are strung together in microscopically visible threads of material called chromosomes which exist in human body cells in forty-eight similar but not identical pairs. Twenty-four chromosomes come from each parent and roughly they match each other. The genes found in the reproductive organs of the parents seem to be the essential ones in determining hereditary characteristics in the offspring.

In general, the genes present in the fertilized egg do not change as the cells divide and as the mature human body develops. However, changes in the genes can take place as the result of exposure to heat, to some

chemicals (*e.g.*, mustard gas), and to radiation. If the change is permanent, it is called a mutation. If an ordinary body cell mutates, this change is passed along to other similar body cells by cell division, but it is not passed on to the children. If, however, the mutation occurs in a sperm or egg cell, the child resulting from the sperm or egg will inherit the mutated gene. Even the non-inherited mutation can have genetic effects such as reduced life span and reduced reproductive capacity, but the major genetic effect arises from inheritable mutations. It should also be mentioned that mutations can occur in the chromosomes.

Genes may be either dominant or recessive in the sense that if the two genes, one from each parent, that control some physical characteristic are not similar, then one, being more powerful, dominates the other, although such domination is not 100% complete. A recessive gene characteristic will manifest itself fully only if both genes are recessive. The fact that mutant genes are usually recessive in character is very significant in considering the genetic effects of radiation.

Being recessive, mutated genes do not ordinarily become apparent, particularly in early generations. This means that the genetic effect will be difficult, if not impossible, to prove in a legal sense, though scientists agree radiation does cause mutations. Since the recessive gene is not 100% dominated, however, it will manifest itself partially in every child of every generation carrying it. This manifestation may be in the form of shortened life span, reduction in fertility, or in any of the multitude of ordinary human ailments including susceptibility to disease. This means that the mutated gene will affect many more individuals than if it were dominant. If dominant and if involving a vital function or organ, it is likely to result in death or total inability to procreate. Genetically speaking, therefore, the recessive mutant gene has a very great impact indeed.

Scientists do not agree as to the exact mechanism by which ionizing radiation causes mutations,[12] but they are agreed (1) that radiation does increase the possibility of a mutation, (2) that mutations, including spontaneous mutations (naturally occuring from cosmic rays and natural radiation perhaps), are almost all harmful, (3) that any radiation increases the possibility of mutations no matter how small the dose, and (4) that mutation is a cumulative effect of radiation not dependent on a given dosage rate such as 0.3 rem per week. This last conclusion means that all radiation received by a particular person from the time

[12] One theory holds that radiation produces toxic substances affecting the gene; another says ionization breaks the chemical bond in the gene; and a third says radiation breaks the chromosomes into parts and an imperfect reunion is made.

of his conception until all of his children are born has possible genetic effects by increasing the probability of mutations which will be passed on to all of his descendants. In America, on the average, each child's parents have been living for thirty years at the time of birth so geneticists use thirty years to determine the impact of mutations on the population as a whole.

From natural background radiation, it is estimated that the *average* person receives 4.3 roentgens in thirty years. Medical X-rays add three more roentgens over a thirty-year period for the *average* person. Atomic weapons testing at present rates adds between .02 and .5 roentgens in thirty years.

Several responsible geneticists have concluded that from thirty to eighty roentgens of radiation per person would double the present rate of mutations. To make this somewhat more understandable in human terms, if doubling of the mutation rate occurred, some geneticists calculate that instead of 2,000,000 children having genetic defects in each generation (there are roughly 100,000,000 persons in each generation in this country), 4,000,000 children would have such defects. It is said that even a ten roentgen exposure of the whole population ultimately would create 500,000 more mutation defects per generation. Other geneticists say that a ten roentgen dose to the gonads of the whole population would cause a total of 5,000,000 mutants in our population. These are rough estimates, of course, but they indicate the potential danger.

From these calculations the Committee on Genetic Effects of Atomic Radiation of the National Academy of Sciences urges that our general population should not receive more than ten roentgens to the reproductive organs between conception and age thirty, this in addition to background radiation, but inclusive of radiation from medical X-rays. The committee also recommends that no one person receive more than fifty roentgens prior to age thirty and not more than an additional fifty roentgens from age thirty to age forty.

The problems posed for the legal profession in the area of genetic effects call for more than the mere application of familiar principles of tort law. Some imaginative thinking is indicated.

(2) Sterility

Radiation may produce sterility by causing degeneration of the cells in the layers of the epithelium in the testes from which spermatozoa develop. In females, although no gross changes in the ovaries seem to

occur, the ova will not develop normally after exposure, and the incidence of miscarriages and premature births increases.

The existence of damage in the form of sterility is ascertainable at an early date after overexposure. A case of sterility from radiation has already reached a court, but it was dismissed prior to trial when the claimant's wife happily developed pregnancy, a fact which served both to deprive the plaintiff of damages and to prevent any testing of familiar legal presumptions.

Overexposure can cause either temporary or permanent sterility, but the likelihood of the latter is slight. Generally, a dose large enough to cause permanent sterility would be lethal. Exposure resulting from the atom bomb explosions in Japan caused many cases of temporary sterility among the population, but the vast majority of the victims have returned to normalcy. The presence of other causes of sterility, such as malnutrition or disease, make accurate computations difficult.

(3) Fetal Damage

Another type of injury which may result from radiation overexposure, particularly in the use of radiation in medical therapy, is fetal damage. Recent experiments upon mice exposed to radiation have shown that various kinds of abnormalities result from exposing mouse embryos to X-rays. The type of abnormality is influenced by the size of the X-ray dose administered and the state of development of the embryo. Exposures as low as twenty-five to fifty roentgens have been shown to have an effect upon certain physical characteristics of the mice.[13] However, gross monstrosities in human beings are not considered too probable since a severe overexposure is more likely to result in fetal death or miscarriage. Certain experts believe, however, that radiation therapy of the pelvic area during pregnancy may cause microcephalic idiocy, and before any such therapy is administered, the condition of the woman should be ascertained and the risks appraised.[14] Fetal injury from chronic exposure to small amounts of radiation seems to be unlikely, although lack of sufficiently complete statistical information makes impossible the formulation of positive conclusions.

(4) Cancer

Cancer is another possible injury emanating from overexposure to radiation, although paradoxically radiation is also one of the brightest

[13] XI Bulletin of the Atomic Scientists 180 (June 1955).

[14] Behrens, "Cumulative Effects and Permissible Dosage Limits of Ionizing Radiations," Atomic Medicine 135 (New York: Thomas Nelson and Sons, 1949).

hopes for cancer cure today. The paradox stems from the fact that the ionizing radiation destroys both cancer cells and normal cells, and hence selective exposure may stop the cancerous growth.

Some of the earlier cases of radiation cancer involved severe hand burns from repeated exposure of X-ray technicians. The skin became dry and cracked, and the fingernails developed ridges and became brittle. Upon the cessation of radiation exposure, this condition disappeared, only to develop into cancer after the lapse of a long period of time marked by the absence of further symptoms. Much of the evidence of radiation-induced tumors has been derived from experiments upon mice and rabbits, the experiments showing an increased incidence of lung, ovarian, and breast tumors in animals exposed to radiation. The cause of cancer is still a mystery, yet the results of the experiments upon animals are considered worthy of extrapolation to man, with the conclusion that the irritation produced by overexposure can produce malignancy. Although the cause of cancer is not fully known, there is no question that such malignancy is one of the radiation injuries with which the law will have to contend.

(5) Leukemia

Leukemia is the presence of an excessive number of leucocyte or white cells in the blood, and it may be caused by radiation damage to the blood-forming organs. Because of the subtleness of its onset, leukemia is considered by many to be an even worse menace than cancer. Victims frequently are unaware of the presence of the malady until it has reached an advanced stage at which cure is impossible. Leukemia is a type of disease which is likely to result from chronic whole body irradiation over a long period. Available data shows an incidence of 0.53% leukemia mortality among physicians, as compared to 0.39% among the general population.[15] Other studies reveal the incidence among radiologists to be almost nine times that of other physicians.[16] From materials presently available, it would seem that the current state of knowledge concerning leukemia is comparable to that concerning malignant cancer. Thus, like cancer, leukemia is regarded as one of the likely results of excessive irradiation, although the exact manner in

[15] Henshaw and Hawkings, "Incidence of Leukemia in Physicians," 4 J. National Cancer Institute 339 (1944). See also Report of Committee on Pathological Effects of Atomic Radiation, National Academy of Sciences, p. 35.

[16] Ulrich, "The Incidence of Leukemia in Radiologists," New England J. Med. 234 (1946).

which it is brought about is unknown. All that can be said is that without the overexposure the victim might have developed the disease, but his overexposure also may have been the cause or a significant contributing factor. The chief basis for deducing that cancer and leukemia result from radioactive exposure lies in the fact that chronic irritations seem to be a factor in the incidence of such malignancies, and ionizing radiation is a powerful irritant.

(6) Leukopenia

Another disease with a high rate of incidence under conditions of overexposure to ionizing radiation is leukopenia, a deficiency of leucocyte [white] cells in the blood. This condition is more likely to appear immediately following extreme overexposure to radiation, although it can also be produced by chronic overexposure to smaller quantities of radiation. Its victims are highly susceptible to infection and are unable to throw off minor diseases.

Little statistical evidence is available relating to the incidence of leukopenia in occupations dealing with radiation as compared with other groups of the population. Animal experiments as well as instances in humans, however, seem to provide adequate evidence that radiation exposure can cause leukopenia.

(7) Damage to Bone Marrow

Severe damage to the bone marrow can also result from overexposure to radiation. Bone marrow damage usually results from total body irradiation but may also appear after local irradiation. Bone marrow is particularly radiosensitive and tends to become gelatinous after excessive radiation. Since most of the blood constituents are manufactured in the radiosensitive bone marrow, the effect of overexposure is quickly transmitted to the blood, and damage to the blood supply is followed by deleterious effects upon the body as a whole. In fact, hemological changes may prove to be one of the earliest and most effective symptoms for diagnostic study in detecting overexposure to radiation.[17] Mature blood cells, after leaving the marrow, and even if they are not damaged by radiation, have a limited life span and must be replaced. Red blood cells seem to have a life span of about 125 days; platelets and granulocytes reputedly have a life span of about three to five days; and lymphocytes usually live only for a few hours. Unless these cells are replaced

[17] BNA, Atomic Industry Reporter 457:941 (1956).

promptly, damage can be severe. Sufficient information is not yet available to explain the reasons for damage to the bone marrow, but it is certain that such damage occurs and that the production rate of blood cells by the marrow is affected. There is evidence to support the view that chronic exposure to even small amounts of radiation will cause damage to the bone marrow, but apparently little is known about the minimum dosage tending to cause damage. Individual differences in respect to radiosensitivity doubtless bring about variations in the dosage necessary to cause damage.

It should also be mentioned that radiation of bones seems to retard growth of epiphysis in immature bones. This may produce serious results in children subjected to radiation. Bone sarcoma may appear in even mature persons after chronic overexposure.

(8) Cataract

Cataract, an opaque condition of the lens of the eyes, is another injury caused by overexposure to ionizing radiation. Since the only cases on record are those of cyclotron workers and the atomic bomb victims in Japan, cataract is often regarded as the result of radiation damage caused by neutrons. However, X-rays and gamma rays will also produce cataract, although neutrons seem to be about forty times as effective. The development of a cataract does not necessarily result in permanent loss of vision, for the opaque lens may be surgically removed.[18] However, the damage is severe, and the victim is permanently handicapped. Findings in Japan have led to the conclusion that where radiation has induced the formation of the first stages of a cataract, the cessation of over-exposure will stop further progress of the disease and surgical removal may not be required. The exact manner in which cataracts are produced is not yet known, nor is there evidence of the exact effect of radiation upon the eye.

(9) Epilation

The loss of hair was a common consequence of radiation among the Japanese survivors of the atomic bomb. This loss occurred mainly on the head, probably because it was more exposed to the bomb burst and thus absorbed more radiation. About thirteen days after exposure, the hair fell out in large quantities. This continued for about two weeks. In

[18] Some of the cyclotron workers in California had cataracts removed. After surgery, reasonably effective vision was apparently restored.

a few months the hair began to return, and in no case was the epilation permanent.

(10) Other Injuries

On the basis of animal experiments, some scientists believe that ionizing radiation, as a result of accumulated effects over the years, is responsible for shortened life span. Professor G. Hoyt Whipple, pathologist of the University of Rochester, in a paper delivered at the Nuclear Engineering and Science Congress in December 1955, asserted, on the basis of animal experiments, that the exposure of a human being to 3/10 of a roentgen per week for a thirty-year period could reduce the life span as much as three years.

There is also the possibility of other injuries to organs of the body, such as the kidneys, the liver, the brain, etc., as the result of ionizing radiation, even without development of actual disease. Injuries to these organs in swine and cattle exposed to radiation during the atomic bomb test at Bikini, and in overexposed Japanese victims, bear out this possibility, although exact knowledge as to the physiology of such injuries is at present lacking. One very likely effect of general bodily radiation injury is a distinct reduction in the resistance to disease.

f. Conclusions

Continuous research is being conducted in the biological sciences on the types and causes of radiation injuries. Undoubtedly, new discoveries will be made that will increase man's knowledge of radiation hazards and the methods of treatment. However, this rather cursory examination of personal injuries from radiation indicates several unique hazards that are not encountered in typical industrial activities. Among the more significant features that lawyers must contend with in the atomic age are the following: (1) knowledge of the nature of injuries is still very limited; (2) there are differences in the radiosensitivity of individuals and of specific parts of the body; (3) the cumulative effect of radiation makes it difficult to place responsibility for an injury on any particular person or activity; (4) the differences in the effect of external and internal sources, as well as in the kind of ionizing radiation, raise difficult questions of proof; and (5) injuries may not be discovered until many years after exposure to radiation.

5. Property Damage

Not only may humans suffer severe injury from exposure to radiation, but also property may be damaged in a rather spectacular fashion. All living matter, including plant, aquatic, and animal life, can suffer many of the injuries already described in respect to personal injuries. Furthermore, some of these injuries may eventually result in injuries to persons. For example, if a cow eats radioactive material which is retained in the flesh and is then eaten by humans, the personal injuries previously described in conjunction with ingested radioactive material possibly may arise.

Property may be injured by the disposal of radioactive materials into sewer systems and streams, or by dumping them into the oceans of the world. The recent report of the Committee on Effects of Atomic Radiation on Oceanography and Fisheries of the National Academy of Sciences warns of the potential dangers to marine resources from such disposal techniques. Apparently all ocean water wherever located and at all depths eventually finds its way around to all of the ocean surfaces throughout the world. Conceivably, radioactive material can be assimilated by algae in the water, which may subsequently be eaten by fish which will retain the radioactive isotopes. It is not difficult to envisage the loss that would result if a downstream fishery caught and canned a large number of fish contaminated by radioactive materials, especially if the radioactive content were sufficiently high to necessitate removal from the market by public health althorities to preclude human ingestion. The fact that a particular radioactive element will be perpetuated regardless of chemical combinations through which it may pass raises special legal problems because of the remoteness, both in time and space from the original wrongful act, of injuries that may result.

Growing crops, irrigated with water contaminated by radioactive wastes, may also be damaged as a result of radioactive materials being absorbed and retained. They may even be rendered inedible or unmarketable. Crop damage can also result from the absorption of radioactive materials from the air. This might happen, for example, when an atomic reactor is air-cooled and the discharged coolant is unduly radioactive. In one instance a person living in an area near a plant making use of atomic energy was able to trace its location because the air was polluted with waste products which descended upon the plant life in the surrounding area, leaving small speckled marks on it. Because the spots always appeared on the same side of the plants, he was able to deduce the location of the atomic energy installation. If such radioactivity

descended regularly over an area where crops or flowers are grown, it is conceivable that their value might decrease even though the amount of transferred radioactivity might not be sufficient to affect the health of subsequent consumers.

Injuries to nonliving matter are of a different nature. Exposure to neutron radiation may cause a machine, for example, to become so radioactive that it cannot be used for its intended purpose without being a hazard to humans. In some cases, the half-life of the resulting radioisotopes may prevent use of the irradiated article for thousands of years.

Because of the frequency of its occurrence, damage to unexposed film by exposure to radiation warrants special mention. Gamma radiation will readily penetrate the packaging of unexposed film. It then transfers its energy to the film emulsion, thereby activating it as though by light. This kind of damage has occurred to film shipped in a railroad car or other conveyance together with a quantity of radium, the rays from which rendered the film unusable. Film damage has even been caused by the atomic bomb tests in Nevada. Radioactive materials "fell out" over a wide area, feeding a river, the water of which was used in the production of strawboard. It is reported that the strawboard was, in turn, consigned to the Eastman Kodak Company for use in packaging film and that the contaminated packaging exposed the film.

Another type of property damage which may occur as a result of accidental contamination of an area with radioactive materials is the rendering of the area unsafe for human habitation or cultivation, thereby reducing land values. Such contamination may result from various causes, such as the crash of a plane carrying radioactive materials,[19] an accident to a truck carrying radioactive materials, etc. The latter situation actually arose on one occasion in the southwest. The community petitioned Congress for sufficient funds to contruct a new highway by-pass around the area. More severe contamination could result from a "burn up" or "melt down" of a nuclear reactor although the safety precautions tend to minimize the possibility. While a burn up is not of the same explosive quality as an atomic bomb, it could nevertheless destroy the reactor plant and scatter radioactive materials over the surrounding area. No burn up of major proportions has occurred to date, and safety measures for the control of reactors are constantly being improved. Such a catastrophe must, however, be con-

[19] The Civil Aeronautics Board does, however, require packaging designed to withstand quite severe shocks.

sidered within the realm of possibility, since there have been accidents in reactor operations, even though short of a major burn up.

This very brief discussion of types of property damage caused by radiation is not intended to be exhaustive, but merely suggestive of the possibilities. However, it does illustrate that atomic energy presents several unique tort liability aspects since the creation of a radioactive material may initiate a series of continuing property and personal injuries that are almost beyond the range of present experience.

D. Sources of Radiation

We have hitherto discussed some of the basic scientific data concerning the structure of the atom, the types of radiation, and the hazards of radiation. It seems rather clear that the dangers of radiation cannot be separated from the processes which make nuclear energy so promising as an energy source and as an industrial and research tool for the welfare of mankind. Therefore, a summary discussion of the sources of natural and artificially created radiation seems appropriate.

1. Particle Accelerators

High energy particle accelerators, popularly known as "atom smashers," produce radiation while operating and may also make target materials radioactive. Primarily used in scientific research, cyclotrons, synchrotrons, betatrons, cosmotrons, bevatrons, etc., are used to accelerate subatomic particles to tremendous velocities. Only electrically charged particles, such as protons, alpha particles, beta particles, and deuterons (the latter being the hydrogen nucleus with a neutron added), can be employed by the machines. The charged particles are set in motion in a complex machine utilizing the simple principle of reversing the electric charges in two separate sources, between which the particles pass. The particles, alternately attracted and repelled, move circularly during their journey toward the target atoms. Reversing a charge millions of times per second causes these atomic projectiles to acquire speeds approaching that of light. The impact on target atoms, depending on the total energy of the projectiles, and on the type of particle utilized, produces changes which manifest themselves in the form of artificial by-product isotopes, some of which may be radioactive. In addition, excessive energy is dissipated in the form of gamma radiation, and additional radioactivity may be given off in the form of dislodged neutrons. However, particle accelerators are extremely expensive to build and operate,

and they produce relatively meager amounts of radioisotopes. Therefore, except to those in the immediate vicinity, they have not proved to be a hazardous source of radiation.

One practical application of the accelerating principle is in the artificial production of X-rays. The ordinary X-ray tube is used to produce electrons, to accelerate and direct them, and to cause the bombardment of a suitable metal target. Because an electron is a very light particle, it is readily deflected by orbital electrons surrounding the target nucleus. The consequent excitation of the electronic structure of the target atoms causes the emission of the X-rays.

2. The Fission Process

Although high energy accelerators made possible man-made radioisotopes, it was the demonstration of the fissionable nature of the uranium atom which really ushered in the atomic age. The fission process has made the mass production of more than 1,000 varieties of radioisotopes virtually a matter of routine.

In 1939 Otto Hahn and Fritz Strassman in Germany proved that barium was produced by bombarding uranium with neutrons. Other scientists immediately predicted that neutron bombardment of uranium caused the uranium nucleus to fission with the release of tremendous amounts of energy. Professor Enrico Fermi of Italy also suggested the possibility that in splitting the uranium nucleus, neutrons were emitted which would cause the fission of other uranium nuclei, thereby creating a chain reaction. During World War II the chain reaction theory was proved by the construction of the first nuclear reactor under the abandoned football stadium at the University of Chicago.

In a reactor utilizing fissionable uranium 235, an independent neutron source is employed to release the initial supply of neutrons. The impact of the neutrons causes the uranium 235 atoms to split into fragments, forming a number of other elements, releasing both heat and still more neutrons (since lighter elements can house fewer neutrons). Some of the free neutrons go forth to strike still other U 235 atoms, which also split with like consequences. This sequence of events repeats itself over and over again as long as there is fissionable material present in the reactor in so-called "critical mass" quantity, or until certain other control devices are used to slow down or to stop the reactions. Insertion in the reactor of neutron-absorbing substances, such as cadmium, will serve this purpose.

Fission has made the neutron a very common nuclear projectile. Neutrons are produced in great quantities as a byproduct of the fission process, and they come forth with tremendous energies. "Fast" neutrons can be utilized in the production in atomic reactors of great quantities and varieties of radioisotopes at reasonable cost. During the fission process a vast amount of radiation is released, and shielding must therefore, be provided to create a barrier between the reactor core and operating personnel.

The atoms of various elements resulting from the breaking up of fissionable uranium are called fission "byproducts"; they are the "ashes" of the atomic furnace and are mostly radioisotopes of lighter elements. But, in addition, radioisotopes of an especially selected element can be produced in a reactor by placing a sample of such element within the core to become a target for the neutrons liberated during fission. When a neutron strikes a nucleus, it may be absorbed, thus forming a heavier isotope of the same element. Thereafter, the nucleus may have surplus energy, in which case it will emit gamma rays until it becomes stable. If the new nucleus is incapable of retaining the additional neutron as such, it may undergo beta decay. Further stages of transmutation occur, several in number and characterized by different types of radiation, before the decaying process terminates with the formation of a stable isotope or element.

This ability of nuclear reactors to cause transmutation of elements is utilized to turn U 238 into highly fissionable plutonium which is also capable of sustaining a chain reaction. This process has greatly enhanced the reserves of nuclear fuel available to mankind because U 238 is 140 times as plentiful in nature as is U 235. The transmutation is accomplished by using properly moderated "spare" neutrons coming from the fissioned U 235 atoms to strike and add their weight to a quantity of U 238 placed in the reactor core for the purpose. The addition of a neutron to U 238 causes it to become U 239 which, being highly radioactive, will quickly emit an electron and then, having an excess proton, become neptunium, an element of atomic number 93 and atomic weight 239. Neptunium is similarly highly radioactive; it will eject an electron and become plutonium because of the excess proton. Plutonium is a man-made element with ninety-four protons and 145 neutrons. It is highly fissionable and has a long half-life. Furthermore, it is possible to produce a quantity of fissionable plutonium 239 which exceeds the quantity of U 235 consumed.

Recently it has been demonstrated that another fissionable isotope

of uranium (U 233) can be created from thorium by similar means. As a result of its experiments, the Atomic Energy Commission has announced that a thorium reactor can breed more fuel than it burns. This announcement has been characterized by Dr. Alvin M. Weinberg, Director of the Oak Ridge National Laboratory, as the most important announcement of the Commission in connection with its five year reactor development program.[20] This conclusion is based upon the fact that thermal neutrons can be employed to convert thorium into U 233 whereas fast neutrons are essential to produce plutonium from U 238. A fast-neutron breeder reactor is extremely difficult to control and cool, but a thermal reactor does not present the same engineering difficulties. Therefore, thorium presents very attractive possibilities in the development of breeder reactors which can increase substantially the quantity of fissionable material available for atomic power.

3. The Fusion Process

Another process which may eventually be employed to create radiation is the fusion, or thermonuclear, process. Instead of splitting a heavy nucleus as in the fission process, the fusion process involves the merger of two light nuclei to form a heavier nucleus. This process also is accompanied by the release of large amounts of energy including heat and radiation. Although the process has been used in the so-called hydrogen bomb, techniques for controlling the process in reactors have not yet been devised.

In January 1958 the Atomic Energy Commission and the United Kingdom Atomic Energy Authority announced significant progress in the research program aimed at controlling the hydrogen fusion reaction. The reaction itself may involve the merger of two atoms of deuterium, hydrogen with a mass of twice light hydrogen, to form a triton. Triton is the nucleus of a triple-heavy hydrogen atom called tritium. The reaction may also involve the merger of deuterium and tritium to form helium. In either process a small proportion of the mass is converted into energy. Deuterium is available in enormous amounts in the oceans of the world, but tritium must be man-produced from lithium. There are two major obstacles to producing power by fusing either the nuclei of deuterium or a deuterium-tritium mixture. First, a tremendous temperature is required to cause the reaction, and secondly, there are serious difficulties in creating a container that will hold the hydrogen

[20] Weinberg, "Power Reactors," Editors of Scientific American, Atomic Power 36 (1955).

gas after it has reached the required temperatures. It is estimated that a self-sustaining deuterium fire requires a temperature of 370,000,000 degrees centigrade which is twelve to eighteen times the temperature of the sun's interior. A deuterium-tritium fire would probably require a temperature of 50,000,000 degrees centigrade, but tritium can only be produced from the supplies of lithium available in nature. The recent announcement has evidenced success in containing the reaction by the use of a magnetic field and temperature as high as 6,000,000 degrees have been reported, but only for infinitesimal periods of time. The magnetic field creates what is known as the "pinch effect," the gas being pinched into a narrow column within a container so that the hot gas is prevented from touching the walls of the container and losing its energy. Although no major breakthrough has occurred in the thermonuclear research projects, a significant beginning has been made and further progress can be expected.

The fusion process promises to have several advantages over the fission process. Recoverable uranium and thorium supplies are limited, but deuterium supplies seem inexhaustible. In addition, thermonuclear processes offer the possibility of producing electricity directly without the intervention of the costly process of producing electricity from heat through a heat-exchange system. Finally, in contrast to reactors using the fission process, thermonuclear reactors give promise of being extremely safe. The possibility of serious accidents because of failure of parts or mistakes by the operator are considered negligible. Moreover, there are no waste products which may be spread about in the burn up of a fission reactor and which create handling and disposal hazards. However, a fusion reactor may produce intense neutron radiation necessitating adequate shielding. The neutrons probably could be used to produce radioisotopes for commercial and research usage.

4. Natural Radiation

A complicating factor, growing in importance with the increase of scientific information about cosmic and natural forces, is the natural or background radiation which may also be a contributing source of radiation injuries. Man is continuously exposed to the natural radiation coming from the nuclear decay of elements composing the earth's surface and from outer space. To some extent the ground we walk on is radioactive; the food we eat and drink is radioactive; the air we breathe is radioactive. The AEC has reported that:

> As scientists learn to detect and measure nuclear radiation, they learn that we are constantly being exposed to radiation

from a variety of sources in the air, water and the earth. A number of radioactive substances occur naturally, and they are widely distributed in the earth's crust. It is estimated that a layer of soil one foot thick and one square mile in area will contain on the average, more than one gram of radium, 3 tons of uranium, and 6 tons of thorium. In addition, cosmic rays constantly bombard the earth. Cosmic rays and the nuclear radiation from uranium, thorium, radium and other radioactive materials in the earth's crust and in the air constitute what is called background radiation.

Background radiation varies in intensity depending upon time of day, altitude, and the geology of the area, and to a minor extent, latitude. For example, at sea level in the Northeastern part of the United States, about 6.5 cosmic-ray particles per minute cross a horizontal surface one square inch in area. At 15,000 feet above sea level, about 5 times that number will be observed, and at 55,000 feet elevation the rate is about 75 times that at sea level.

Rainfall also may increase background radiation. The exact mechanism causing this increase is unknown, but it is believed that either the falling rain droplets absorb the minute radioactive particles naturally occurring in the air or the downward air flow accompanying rainfall blows these particles toward the earth's surface. Background radiation may increase as much as 10 fold as a result of rain or snow.

Alpha, beta, gamma and cosmic radiations are included in "background" but because of the penetrating properties of the latter two, they are the principal components to be considered.

Human beings receive between 80 and 800 milliroentgens (0.08 to 0.8 r) per year from natural background sources.

Since radioactive materials are widely distributed in the earth, air and water, it is not surprising that they occur naturally in the tissues of human beings, animals and plants. Radioactive isotopes of such essential elements as carbon and potassium are incorporated into body tissue along with common stable forms. Water from many natural sources contains traces of radium, which accumulates in the skeleton once it is taken into the body. The radioactivity normally present in tissues is minute and not harmful to health, but it may be measured in the laboratory.[21]

As in the case of man-made radiation, the impact of natural radiation on individual cells which compose the body is definitely harmful, but whether the damage is repaired or not is, as yet, uncertain. However, the fact that natural radiation may cause damage further complicates problems of proving radiation injuries.

[21] AEC, Thirteenth Semi-Annual Report 94-95 (1953).

E. Conclusion

This very brief sketch of nuclear processes and of the nature and effect of radioactivity has been set forth in the belief that it constitutes essential technical background for a proper understanding of the unique legal problems confronting the lawyer in the atomic age. Once again we repeat our original brief *caveat:* the technology in this new field is not yet fully understood in many particulars, and the continually increasing knowledge of the atom will make more definite and certain the exact nature of radiation damage. Therefore, the lawyer must keep abreast of the expanding body of pertinent knowledge regarding atomic energy.

Chapter II

THE GENERAL IMPACT OF ATOMIC ENERGY ON TORT LAW

The purposes of this chapter are: (1) to acquaint the reader with the importance of atomic energy to society by describing some of the more important of its peaceful applications; (2) to describe how peaceful uses of atomic energy may result in injuries to persons and property; and (3) to suggest the legal problems that lawyers must deal with when advising clients of liability problems or trying tort liability cases in the atomic age. Analysis of the legal problems and possible solutions will be included in subsequent chapters.

A. Peaceful Uses of Atomic Energy

Any account of the peaceful applications of atomic energy is bound to become out-of-date rapidly because of the new discoveries that are being made almost daily. However, the potentialities of atomic energy in industrial, medical, agricultural, and research pursuits already are sufficiently well known to make it clear that atomic energy will play an ever-increasing role in society. The peaceful uses presently employed can be classified roughly into three major categories: (1) the use of the fission chain reaction process in reactors for the production of heat energy and radioactive isotopes;[1] (2) the use of sources of radioactivity where the radioactivity itself is employed for specific purposes; and (3) the use of radioisotopes as a tool or a research instrumentality. Each of these uses, as we shall see, involves certain hazards that may cause injuries to persons and property.

1. Reactors and Their Hazards

The discovery of methods of harnessing the atom has revolutionized thinking on the problem of supplying the energy needs of modern society. It has been estimated whereas one pound of coal can produce about 1.4 kilowatt hours of electricity, one pound of uranium could, if fully consumed, release enough heat to produce 3,700,000 kilowatt hours

[1] The fusion process apparently has tremendous possibilities as a heat energy and neutron source, but since the technologic aspects apparently have not been solved, the fusion process will not be discussed.

of electricity and is equivalent in heat energy to about 1,320 tons of coal. In the United States, which is extremely wealthy in conventional fossil fuel resources, including coal, oil, and gas, the availability of nuclear energy derived in the fission process means that we can measure our energy resources in terms of centuries rather than a few generations. For portions of the world less well endowed with fossil fuel resources, the fission process makes possible the attainment of a standard of living previously thought impossible. The discovery of a means of using the fusion process to produce peacetime power would increase the magnitude of available energy sources to an even more astonishing degree. Clearly we can expect an ever-increasing utilization of nuclear energy as a power source throughout the world even in the United States where an abundance of comparatively cheap fossil fuels will make it difficult for nuclear power plants to compete economically, especially during the research and development stages. In fact, the Atomic Energy Commission has recently issued licenses for the construction of privately financed atomic energy power installations in the New York, Detroit, and Chicago areas.

To date, the truly dramatic potentialities of the controlled chain reaction in reactors designed to produce electricity have overshadowed many other possible practicable uses. Reactors may be employed to space heat buildings and residences, to propel ships, locomotives, and airplanes, to supply heat in many industrial pursuits such as the manufacture of cement and brick, to produce radioactive and other chemicals, to test materials, to act as blast furnaces in the reduction of ores, to treat diseases, and undoubtedly to accomplish many other tasks that are yet to be envisaged. The imposing array of methods of commercial exploitation of the fission process puts the legal profession on notice that it will within the next decade be required to handle innumerable legal problems involving atomic energy.

Assuming, as we must, that nuclear reactors are destined to become commonplace, lawyers must become acquainted with the technological processes involved to ascertain whether or not existing rules of tort law can be applied in cases of civil liability arising from reactor situations, or whether reactors will necessitate revision of the conventional rules of law. Without doubt, so far as the law is concerned, the unique feature of reactors is that they present a continuous threat to persons and property unless the utmost precautionary measures are taken.[2] The fission

[2] The fusion process, if it can be controlled, apparently would not present as great hazards as encountered in the fission process.

chain reaction process involves the release of large quantities of all types of ionizing radiation which, as described in Chapter I, can have extremely deleterious effects on all forms of life and property. Therefore, one of the most important technological problems in reactor construction and operation has been that of providing essential safety for employees and the surrounding community. Moreover, the fission process creates a sizable number of radioactive waste materials that create secondary hazards and even perhaps greater danger in the long run.

Although all reactors have in common the purpose of utilizing a controlled fission process, they vary substantially in design depending upon the manner in which they are to be utilized. Furthermore, several possible techniques may be employed for the same utilization. For power purposes alone, several different designs have been constructed or are in the process of construction and still others are yet in the planning stage. Reactor technology is still in its infancy, and it is not to be expected that in the years immediately ahead any single design will have proved its superiority over others. Reactor designs can be classified in many ways: (1) by the types of fissionable material used; (2) by the speeds of the neutrons, either thermal (slow) or fast; (3) by the types of moderators (materials used to reduce the speed of the neutrons); (4) by the coolants used to maintain heat levels; (5) by the structure of the reactor cores (heterogeneous if the fissionable material is placed in the reactor core in units separated by moderators and coolants and homogeneous if the fissionable material is uniformly mixed with the moderator in the reactor core with the coolant surrounding the core); (6) by the chemical and heat reactions that occur in the reactor cores; and (7) by the ability of the reactor to produce fissionable material in the process of consuming fuel (breeder reactor). A single reactor design may incorporate several of these features. Obviously, a most important consideration for commercial reactors is the cost of the various types.

Up to the present time water and sodium-cooled reactors have played the predominant roles in American power reactor development. Actual experience is largely confined to thermal (slow neutron) water-cooled types. With Atomic Energy Commission financial assistance, Westinghouse has constructed a pressurized-water reactor for the Duquesne Light Company at Shippingport, Pennsylvania. Another type of water-cooled reactor, but one in which steam generation is permitted to occur in the reactor core (experimental boiling water reactor), has been developed by Argonne National Laboratory, and it has recently been re-

ported that the reactor operated at more than twice design capacity. Another type of water-cooled device is the homogeneous reactor being developed by the Oak Ridge National Laboratory. An experimental sodium-cooled graphite-moderated reactor, built by North American Aviation, Inc., became critical in 1957. General Electric Company and Pacific Gas & Electric Company have cooperated in the development of a boiling water reactor at Pleasanton, California which also became operative in 1957. The Atomic Energy Commission has already constructed one fast neutron experimental breeder reactor and is in the process of constructing a sodium-cooled experimental breeder reactor at the National Reactor Testing Station in Idaho. And, finally, the Commission has issued construction permits for three large power reactors.[3] Other reactor concepts for which experimental work is being completed are an organic-moderated reactor and a liquid metal-fuel reactor. In addition, several low energy research reactors which are air- or gas-cooled have been developed.

Among the important factors to be considered in selection of a particular reactor for power purposes are: (1) safety in operation and in changing fuel elements; (2) economy in cost of fuel elements; (3) economy in cost of fuel reprocessing necessitated by efficiency-reducing contamination during the fission process; (4) reliability for continuous operation; (5) reliability of essential materials in withstanding nuclear forces; and (6) heat-producing potentialities. Each of the major reactor types has specific advantages and disadvantages for the production of power on the basis of current experience. Therefore, in view of technological problems involved, selection becomes a question of judgment. During the present initial development stages, the choices must be made largely in the absence of conclusive technological data. The lawyer advising clients engaged in atomic power reactor projects must evaluate the possible legal consequences of any particular selection.

The pressurized-water reactor seems to be the most highly developed technologically, but a considerable amount of information regarding specific features of the reactor remains classified. Nonetheless, on the basis of published data it would appear that pressurized-water reactors present several serious hazards, many of which are also inherent in other reactor designs.

[3]A boiling water reactor (180,000 electric KW) is now under construction by the Commonwealth Edison group near Joliet, Illinois; Consolidated Edison Co. of N.Y. is building a pressurized water reactor (275,000 electric KW) at Indian Point, N.Y.; Power Reactor Development Co. is constructing a fast breeder reactor (100,000 electric KW) at Monroe, Michigan. For the more complete details of the reactor program see AEC Semi-Annual Reports.

Since the pressurized-water reactor has been successfully operated in the submarine *U. S. S. Nautilus* and is being used in the first large size central-station nuclear power plant in the United States at Shippingport, Pennsylvania, it may be of assistance to sketch the principal technological problems and hazards involved. The Shippingport reactor employs fifteen to twenty tons of uranium, slightly enriched in the uranium isotope 235. The reactor core contains closely spaced, zirconium-clad fuel elements arranged in a cylindrical shape six feet in diameter and seven and one-half feet high. The core and the water which acts as the moderator-coolant are housed in a pressure vessel, thirty-three feet high, twelve feet in diameter, with the plate of the vessel being eight and one-half inches thick with a one-quarter inch cladding of stainless steel. Pressure in the vessel will be about 2,000 pounds per square inch which means that the water can reach a temperature of nearly 640° F before boiling. Therefore, the fuel elements cannot have a surface heat temperature in excess of 600° F. Three different heat exchange systems (steam generators) will be operated at once, with a fourth to be constructed as a standby. In each system water will have to be pumped at the rate of 16,000 gallons a minute to remove the heat. The reactor vessel and the heat exchangers are enclosed in strong gas-tight containers, located underground in concrete and steel vaults. The containers act as shields against radiation hazards and minimize the possibility of radioactivity escaping in the event an accident occurs.

Although it would appear that excess neutrons created in the fission process could be used to create new fissionable material from the non-fissionable fertile uranium 238 so that the fuel elements could be used almost indefinitely, this is not the case. During the fission process, the new atoms which are the "ashes" or "waste products" of the nuclear furnace accumulate, and they tend to absorb the neutrons so that the chain reaction cannot be sustained. Also, radiation causes the fuel elements to undergo changes both in size and in structure. Therefore, when approximately one per cent of the fertile material has been consumed, it will become necessary to change the fuel elements and remove the waste products. The Shippingport reactor will be a major test of a system of removing fuel elements while maintaining the entire reactor under pressure. If in removing the elements, pressure falls, so that the water reaches its saturation (boiling) point at a lower temperature, serious disrupture of the reactor core may result in its disintegration with a possible release of radioactivity within the plant. In addition, if the underground chambers are breached, radioactive products may be

released in the atmosphere or into the subsoil, thereby endangering the surrounding community. In such delicate operations, it is not difficult to envisage the possibility that an accident may result in several persons being subjected to damage suits, including the reactor designer, the manufacturer of the mechanical apparatus for removing fuel elements, and the contractor who built the underground chambers, as well as the owner-operator of the facility.

Nearly all of the "ashes" of a nuclear furnace are radioactive, emitting both beta and gamma radiation. About eighty different radioisotopes are created in the fission process, and in the decay process the number increases to about 200 in a relatively short period of time. The half-lives of these radioisotopes vary from a few seconds to several years. Therefore, methods must be devised to protect personnel when spent fuel elements are removed and during the reprocessing of the fuel elements. Remote controls are therefore essential to the handling of the fuel elements. After removal, the fuel elements are stored under water for as long as 100 days. During the "cooling" period, short-lived isotopes decay sufficiently to make them an insignificant hazard in the separation process. Those isotopes with very long half-lives are insignificant because of their slow rate of decay. Despite the "cooling" period, however, the fuel elements, because of the isotopes of intermediate half-lives, remain highly radioactive. Therefore, in separating the fission products from the fuel, utmost safety precautions must be taken. If the reactor power installation does not have its own processing facilities, spent fuel elements must be transported in sealed and shielded containers to other establishments. If, in transport, a container is broken and persons are exposed to the radiation, thereby causing injury, a question arises as to who is liable—the carrier, the reactor owner-operator, the contractor hired to handle packaging, the manufacturer of the container, or all of them. By contracting out this function, can the reactor owner-operator absolve himself from part or all of the liability?

Because of the serious health hazard, waste fission products cannot be disposed of in the same manner as wastes from other industries. The wastes may be in liquid, gas, or solid form and, depending on the processing, may have different levels of radioactivity. Liquid wastes, which constitute the bulk of the material, are usually stored in underground tanks. As reactors become more commonplace, suitable storage sites will diminish in number, and accordingly this method of disposal is not considered very satisfactory. "The volumes of stored waste accumulated by 1980 are estimated at 20×10^7 gallons, by 1990 at 60×10^7

gallons and by 2000 at 240 x 10^7 gallons." [4] Furthermore, the radiation may create high temperatures in the liquid wastes and thereby cause them to become so corrosive as to cause breaches in the containers. Moreover, there is the problem of tankage leakage occurring because of deterioration of the material of the tank or as a result of geological changes resulting, for example, from an earthquake. If there is leakage, it may seep into rivers that supply water to communities or into individual wells. Therefore, extreme caution must be taken on a purely geological basis in selecting sites. Again, problems of marshaling proof to impose liability in the event of injury may become difficult. The problems are complicated by the fact that injury may not occur until years after the waste products were originally stored. If some of the waste products can be converted to useful purposes, a desired end that seems a reasonable possibility, some of the waste disposal problems may be eliminated or at least minimized.

Gaseous wastes are generally discharged into the atmosphere through high stacks. No significant hazard [5] is created if the spent fuel has "cooled" for a considerable period, and if meteorological conditions are satisfactory for the dilution of the radioactive gases in the atmosphere. If meteorological conditions are adverse, however, dangerous quantities of gaseous wastes may endanger persons and property in the vicinity. Another hazard is found in the possibility of the air in a processing facility becoming contaminated by absorbing small particles of liquid or solid radioactive wastes. Since this can present a serious problem, all air expelled from the plant is filtered. To reduce this hazard, the processing vessels are usually maintained under air pressure less than atmospheric in order to minimize the escape of radioactive material into the air.

Solid wastes consist of substances that have been contaminated in a reactor or fuel processing facility, including those that have settled from liquid wastes. Some radioactive components and equipment can be satisfactorily decontaminated, but in other cases it is not possible or desirable to do so, and therefore it is usually buried in the ground. This creates some of the same dangers as underground storage of liquid wastes. On the Atlantic and Pacific coasts, some solid wastes are being buried at sea.

[4] National Academy of Sciences, National Research Council, "The Biological Effects of Atomic Radiation," p. 104 (1956).

[5] Maximum permissible concentration levels in the atmosphere should be established in the light of future discharge rate possibilities according to the Committee on Meteorological Aspects of the Effects of Atomic Radiation, National Academy of Sciences, National Research Council, "The Biological Effects of Atomic Radiation," p. 61 (1956).

However, for inland facilities, the cost of transporting solid wastes may be prohibitive. Thus, the reasonableness of the various methods of disposal may vary in accordance with plant location.

Throughout the entire fuel reprocessing operation two hazards are present. One is caused by the highly radioactive nature of the materials and the other arises out of the fact that the amount of fissionable material at a given point may become critical so that a fission chain reaction occurs. To protect personnel, adequate shielding against radiation must be provided. All process vessels, equipment, pipelines, valves, etc., must be leakproof and shielded. The equipment particularly must be properly designed and manufactured with excellent workmanship to reduce repair and maintenance problems. If maintenance is required, it can be handled only by those using remote control devices or entering the area after the equipment has been sufficiently decontaminated to avoid serious hazard. To avoid a chain reaction, which would cause serious damage within and possibly outside the plant, concentration of materials in any single vessel must be limited and separate vessels must be kept apart by an adequate distance. Since most of the operations in a fuel reprocessing plant are inaccessible to humans, remote control instrumentation is essential to handle the operation and to sample the materials at the various processing stages. A failure to install proper instrumentation or perhaps a failure in the instrumentation itself may result in the escape of highly radioactive materials into the atmosphere or in a concentration of fissionable materials which would cause a chain reaction.

In addition to fuel reprocessing problems, reactor technology also encounters a series of difficulties in connection with the fabrication and cladding of the fuel elements, the type of moderator used, the materials used in the reactor structure, and the type of coolant.

Uranium, other fissionable materials, and fertile source metals (such as thorium) react rapidly with oxygen; and also at high temperature water has a particularly corrosive effect on these materials. Since fine chips or lathe turnings are a serious fire hazard if exposed to the air, fabrication of uranium metals must be carried on in a vacuum or in an atmosphere of inert gas. Moreover, the fuel element in the reactor must be clad with a corrosion resistant material to prevent attack by air or by a water coolant and to prevent the escape of fission products and plutonium produced in the fission process. The cladding must possess nuclear properties that will not interfere appreciably with the fission process. Aluminum has been widely used as a cladding material in research reactors since it readily retains fission products. However, aluminum is

violently attacked by water at high temperatures. Therefore, it is not very suitable for power reactors since higher temperatures are more efficient in steam generation. It is for this reason that the Shippingport reactor fuel elements will be clad with zirconium which has suitable nuclear properties as well as a high resistance to corrosion. Even for zirconium the maximum safe surface temperature in water is only approximately 660° F, so that a maximum operating water temperature of only about 560° F is possible. Nevertheless, this compares favorably with the maximum permissible surface temperature with aluminum of 400° F. Neither aluminum nor zirconium is satisfactory for a sodium-cooled reactor which is to operate at very high temperatures. Stainless steel seems to be about the only present possibility for this purpose even though it captures neutrons at a higher rate than either aluminum or zirconium.

Another problem in respect to cladding is its removal when reprocessing the fuel. Aluminum dissolves easily, but stainless steel and zirconium are fairly difficult to remove. It may be possible that more effective mechanical methods can be devised for the purpose; but because of high-level radioactivity, this will have to be done by remote control. Because of the importance of the cladding, it can readily be seen that an error in the thickness or in the purity of the cladding material can cause damage of very serious proportions. Erroneously using aluminum cladding in fuel elements to be operated at too high a temperature for the metal could result in the disintegration of all or part of the reactor core, with a resulting release of large quantities of highly dangerous radioactive gases and particles. Similarly, running a reactor at high temperature levels approaching levels where the cladding disintegrates in an attempt to reach the maximum steam generation capabilities could result in an accident of catastrophic proportions. On the other hand, stainless steel jackets erroneously made thicker than necessary for the purpose may seriously impair the efficiency of the reactor because of excess absorption of neutrons. Careful engineering design is essential; and errors of judgment may, in the event of accident, give rise to legal liability.

Other materials employed in reactors must also be chosen carefully. As noted in Chapter I, radiation can cause ionization of materials which may lead to chemical changes (particularly when they are interactive with water or organic materials) so that materials also suffer "radiation damage." Changes in the moderator, such as graphite, may affect the operation of the reactor; but relatively little is known about the nature

of the injuries to such materials or how they can be prevented. To add to knowledge in this area, the Atomic Energy Commission has constructed a materials testing reactor at Arco, Idaho. Non-metals also are affected by radiation, so lubricants and non-metallic parts of electrical equipment, control rods, containers, and seals, etc., may be adversely affected. Therefore, metals, as well as solid lubricants, such as graphite or molybdenum, must be used wherever possible. Where organic materials such as oil must be used, exposure to radiation should be minimized.

Apparently the only substances which may be used as moderators are ordinary water, heavy water, beryllium, and graphite. Ordinary water must be absolutely pure since impurities capture neutrons and may become radioactive, endangering the cooling system of the reactor as well as causing corrosion of metals. However, water has a relatively low boiling point so that pressures must be kept high if the generation of steam is to be prevented. As we noticed, in the Shippingport reactor pressures of approximately 2,000 pounds per square inch will be necessary. This is a substantial figure, about equivalent to the pressure at nine-tenths of a mile under the ocean, so difficulties are involved in fabricating and constructing the reactor vessel. Heavy water is much more expensive than is ordinary water, but it has better nuclear properties. However, it, too, boils at a relatively low point; so high pressures are essential for power production purposes. Both ordinary and heavy water suffer decomposition when exposed to radiation, and hydrogen and oxygen gases are released. Since these are explosive, they have to be removed and recombined. In the homogeneous reactor there is even greater decomposition because fission products are formed within the uranium-water solution. Beryllium has excellent nuclear properties but has been reported as susceptible to corrosion in water. There is evidence that, if the metal can be more highly purified, this may increase corrosion resistance. However, beryllium itself is a poison and constitutes a serious health hazard, so extraordinary precaution must be taken to prevent inhalation or ingestion. Graphite has been widely used as a moderator, but it is affected by nuclear radiation and reacts with oxygen at high temperatures. Therefore, in respect to moderators a difficult choice must be made, with all three factors of engineering suitability, safety, and expense being involved.

For power production, reactors have as a primary function the production of heat energy. Theoretically, extremely high temperatures, which provide the greatest efficiency in steam generation, are available in

the fission process. Modern conventional steam boilers, for example, operate at steam temperatures of about 1050° F. At high temperatures, however, uranium metal changes in size and shape to an extent that would seriously disrupt the reactor. Therefore, the temperatures sustained within the reactor must be carefully controlled to prevent distortion of the elements and to guard against the reactor's getting out of control.

To use the heat produced in the reactor and to maintain proper heat levels, a coolant must be circulated through the reactor and through a heat exchanger in which steam is produced. The coolant should have adequate heat-transfer capabilities, not be susceptible to radiation damage, and not seriously interfere with the neutrons during the fission process. The coolant must be pumped continuously to prevent heat levels in the reactor core high enough to cause the reactor to "burn up" with the resulting release of radiation. An undue temperature rise in even a small portion of the reactor may be disastrous, so the reactor must be equipped with automatic safety devices which can shut down the chain reaction when necessary. However, some heat fluctuation is inevitable, and therefore the design of the controls presents difficult problems.[6] A failure in the safety devices could have tragic consequences. Similarly, all the pumps, heat exchangers, valves, etc., must be absolutely leakproof and undergo rigid testing so that chances of a failure are reduced to the very minimum.

As a coolant, air does not have good heat-transfer properties, and at high temperatures oxygen may cause damage to moderator, cladding, and structural materials. However, in research reactors, or reactors used to produce plutonium, where high temperatures are not essential, air can serve as a satisfactory coolant. Such air must be discharged through high stacks because of the contained radiation, but under unsatisfactory meteorological conditions hazards may develop. Hydrogen has good heat-transfer properties but constitutes a serious hazard because of its explosive qualities. Helium also has good coolant characteristics, but because of its high cost and lighter-than-air quality it must be kept within leakproof vessels.

Ordinary water seems particularly well-suited as a coolant because of its low cost and because of its suitability as a moderator. However, the water must be extremely pure, and it presents certain difficult problems because of its corrosive effect particularly at and above its boiling point,

[6] A recent report from the Argonne National Laboratory indicates that the fast breeder reactor may be very difficult to control.

which is relatively low. Therefore, high pressures must be used. Heavy water is even better as a coolant because of its nuclear properties, but it is extremely costly. Liquid metals, such as sodium, may also be used because of their good heat-transfer qualities. However, sodium is very difficult to handle because of its explosive quality if it comes in contact with air or water. Moreover, sodium becomes highly radioactive when subjected to neutron bombardment, a fact which increases the shielding problem. Furthermore, sodium may solidify in the cooling system when the reactor is shut down and this necessitates auxiliary heating equipment. In the second submarine-type reactor, sodium was to be used as a coolant; but it was to flow through mercury, which in turn would flow through the heat exchanger to produce steam. In this way, the hazard that would be created (if a leak should occur and the sodium should contact the water with a resultant explosion) was to be minimized. However, because of leaks in the system the reactor was not accepted, and a Nautilus-type reactor was installed in the submarine. As in other instances in nuclear reactor design, compromises must be made and undoubtedly economic considerations will play a major role in commercial reactor ventures.

Reactors, like many other types of furnaces or engines, must have control mechanisms. In the case of reactors, however, largely because of the nature of the fuel, several difficult problems are encountered in devising methods of starting the fission process, increasing power to the desired level, maintaining the desired level, and shutting down the reactor. At least the critical amount of fissionable material necessary to sustain a chain reaction must be present. This critical mass depends upon the fuel, reactor design, leakage, etc. Moreover, since heat and fission products cut down the number of available neutrons, the amount of fuel placed in the reactor must actually exceed the critical size. Since a chain reaction builds up very rapidly and a too rapid increase in power can be dangerous, the obvious answer is to control the rate of the chain reaction process. The different methods that might be employed to control the chain reaction involve either the diminution or removal of fuel, or the moderator, or the reflector (a blanket of material which scatters neutrons back into the reactor core), or the addition of a neutron absorber. Boron and cadmium capture neutrons very effectively. Accordingly, control rods made of these materials may be inserted and withdrawn from either the reactor core or the reflector to control the chain reaction. Absorber rods, however, cause a high loss of neutrons. For some purposes natural uranium might be used as an absorber and at the

same time to produce plutonium, or materials might be used that would create marketable isotopes.

Not only are there different control mechanisms, but several different types of controls are needed in a reactor. To start the reactor, control rods called "shim-rods" are usually removed from the reactor core. Since the growth of the chain reaction must be closely regulated, shim-rods should be designed so that they cannot move at high speed. Once the reactor has reached the proper power level, "regulating rods" are necessary to control rapid, variable changes. These should be capable of rapid movement but over small distances so that dangerous increases in the neutron flux are not possible. The design should be such that complete withdrawal due to an operator's error or failure of any automatic controls would not permit an upsurge in power levels and a possible "burn up." As fuel is depleted and as fission products accumulate, regulating rods may be completely withdrawn. Further depletion or poisoning necessitates withdrawal of a shim-rod to maintain power levels, but a regulating rod must then be reinserted to the extent that a shim-rod is removed. Therefore it may be necessary to have a system of interlocking the two types of rods. Another type of control is provided by "safety rods" which are used to shut down the reactor quickly in the event of an emergency. They must move very rapidly. By using different drive devices, shim-rods may also be used as safety rods. Finally, "back-up" safety devices are necessary for extreme conditions, such as an earthquake, when the safety rods may not move. In some reactors, back-up safety is supplied by boron shot or liquid absorbers which can be quickly placed in holes in the reactor. In homogeneous reactors, "dump" valves can be used to pour the liquid off into vessels having subcritical size. All of the various controls can be designed to operate automatically as well as upon push-button control by the operator. Where the human factor is involved a failure of the operator to notice changes in the reaction as shown by the instruments may result in a serious accident. Recently an operator of one of the experimental reactors at Arco, Idaho, failed to understand oral instructions and started control devices in operation which were not adequate to prevent an accident. Apparently once the inadequate control mechanisms had started their movement, it was impossible to change to other methods. Where the controls are automatic, a failure of the measuring devices which start automatic control, or a failure in the automatic control mechanism itself, could result in a rapid upsurge in heat which would melt the reactor core and cause the release of dangerous quantities of radiation.

Because of the magnitude of the radiation hazard in the operation of reactors, extreme precautions must be taken to protect both employees and the general public. As a safeguard for the general public, reactors are usually located in exclusion areas. The AEC Advisory Committee on Reactor Safeguards has recommended that the exclusion area for a reactor capable of producing 250,000 kilowatts of heat power should have a radius of approximately five miles. This may be modified depending on the inherent safety features of the reactor and special construction features. For example, the Shippingport reactor will be housed in an underground chamber, and the experimental submarine reactor was located in a gas-tight steel sphere. In selecting reactor locations, the population density, geological conditions for disposal of wastes, and meteorological conditions must all be considered.

Some of the most serious problems of radiation safety are encountered in respect to the operating personnel. As indicated in Chapter I, the biological effects of radiation are not as yet fully understood, but it is known that radiation can cause several types of personal injury. The National Committee on Radiation Protection has established maximum exposure limits for humans, maximum radiation levels in air and water, and maximum limits of radioisotopes that may be accumulated within the body. To assure that the maximums are not exceeded continuous radiation monitoring is essential. Personnel should have individual monitoring devices so that if any employee receives unusual doses of radiation, measures can be taken to avoid further exposure in excess of the maximum. In certain cases radioactivity in the thyroid gland, where radioiodine accumulates, should be measured. In some cases analysis of the urine and feces should be made to determine if radioisotopes are being ingested. All areas around the reactor should be monitored to determine the amounts of radioactivity on surfaces and within the air. If radioactivity is high, protective clothing and masks should be worn or remote control systems should be introduced. Outside the plant, there should be continuous monitoring of the air and plant life to determine whether or not hazards are being created. There are several types of monitoring instruments that can be employed. A failure of these instruments to record properly could result in the continuance of operating procedures that endanger both personnel and the community by allowing radiation to exceed the permissible levels.

To protect personnel and also to permit the satisfactory operation of the reactor control instruments, it is essential that the reactor be shielded. However, as we noticed in Chapter I, neutron and gamma radiation

cannot be reduced to zero because neutrons and gamma rays are exponential in nature. Therefore, the problem is one of reducing these rays to safe levels. For mobile reactors, such as in aircraft, shielding because of its bulk presents a major problem. Accordingly, in aircraft design other technical considerations may take precedence over the lowest possible radiation levels.

Shielding should be capable of slowing down fast neutrons and absorbing gamma radiation (for which heavy elements are best suited), moderating *slow* neutrons (hydrogenous substances perform well), and capturing neutrons without producing high-energy gamma radiation (for which boron appears to have exceptional qualities). The same material may perform all three tasks. Iron has been extensively used as a suitable heavy element. Lead is particularly capable of absorbing gamma radiation and slowing down neutrons, but it has not been widely used as reactor shielding because of its low melting point and its softness, making it unsuitable as a structural material. Ordinary concrete is very effective for moderating slow neutrons, but it is not satisfactory as a shield because of the absence of heavy elements. However, heavy elements, such as iron turnings or mineral *barytes* (largely barium sulfate) may be used in the concrete instead of sand and gravel, making an effective shield. To reduce the size of concrete shielding, the incorporation of boral, a combination of boron and aluminum, seems to be promising. At the present time, a shield of concrete and heavy elements appears attractive because of its low cost, but experimentation with air-water, lead-water, or ceramic shields may prove fruitful.

In the shielding process, other difficulties are encountered where instruments, controls, and beam holes for inserting materials for producing radioisotopes must penetrate the shield. The various instruments and pipes may require further shielding to reduce the amount of radiation to which personnel are exposed. When experiments are being conducted, or fuel elements are being handled, mechanical or human reactor controls must be carefully coordinated. Possibilities of leakage must be checked continually, and personnel must be carefully trained to avoid contact with radiation beams.

Although we have explored only superficially the technological problems of reactor design and operation, it seems clear that the slightest human or mechanical errors may create conditions that endanger personnel and the surrounding community. The magnitude of possible injuries is astounding. A release of large quantities of radiation may result in all the types of personal radiation injuries discussed in Chap-

ter I. A whole city may have to be evacuated and decontamination processes used. In some cases, decontamination would not be satisfactory, and therefore the contaminated articles would have to be removed or that particular location may become uninhabitable until radiation naturally diminishes to safe levels. The accidental contamination of a community's water supply alone could cause untold personal injuries and disrupt the entire economic life of the community. There can be no doubt that a major reactor accident could cause damages measured in the millions and hundreds of millions of dollars. This magnitude of potential damage litigation is apparently not encountered in other industrial pursuits.

2. Radiation Sources and Their Hazards

The development of the nuclear reactor brought with it a very important byproduct—radioisotopes. For the first time a neutron source of sufficient power was available to produce radioisotopes of many different elements in abundance and at low cost. The physical phenomena of radiation, even that derived from relatively rare and enormously expensive radium, was early recognized as being extremely important in industry, medicine, agriculture, and other pursuits. When, after World War II, the government permitted purchase of radioisotopes produced in its reactors, a whole new technology was immediately stimulated, and innumerable practical uses of radiation have been developed. In fact, it is principally in the uses of sources of radiation to accomplish specific purposes that commercial exploitation of atomic energy has occurred in the United States, although reactors planned or in construction will soon change this. The estimated savings through process and quality controls in industry alone have been estimated as being at a rate of $400 million annually. Moreover, new radiation devices which have considerable promise are being rapidly developed, and the number of industrial users (now approximately 1,600) can be expected to increase in the years to come with resulting major contributions to the economy. First we will discuss some of the current and potential uses of radiation sources, and then we will proceed to review the nature of some of the hazards to persons and property arising therefrom.

Thickness and Density Measuring Devices. By measuring the change in intensity of a beam of radiation it is possible to determine variations in the thickness or density of material through which the radiation beam passes. Typically, in gages employing radioactivity, the radiation source is stationary and is placed on one side of the material. On the other side

is placed a geiger counter, ionization chamber, or other device which can measure the changes in the radiation. These gages have been particularly useful in industries producing sheet materials, such as steel, aluminum, copper, brass, plastics, paper, film, and tape. Radioactive thickness gages have advantages over mechanical gages. Because no mechanical contact is required, it is not necessary to stop or cut rolling sheet material to insert the gage. If the material to be measured is too hot, too soft, or easily marred by handling, radioactive gages have a further advantage. Moreover, radioactive gages are more sensitive and give higher precision than mechanical gages. In addition, they are easily adapted to automatic controls which can even be used to adjust the rollers thus permitting automatic correction of the defect.

Because radioactive thickness gages require no interruption of production, permit narrower tolerances to be maintained (thereby saving material), and can be used with automatic control devices to correct errors, their use means substantial savings in many industries. For example, the amount of rubber needed to make a safe tire reaches a limit beyond which quality is not improved by additional material. Surplus rubber was formerly used as a safeguard but with radioactive gages exact amounts can be readily measured and savings have ensued without sacrifice of quality. Radioactive thickness gages may also be used to measure the thickness of plating or of abrasives, such as sandpaper, with similar advantages and consequent savings. Further possibilities exist in the measuring of the density of solids and liquids, such as oil, chemicals, soap chips, etc.

The radioactive material which is incorporated into the gage is usually placed in a sealed metal container which has at least one area which is so designed that the radiation can pass through at the desired level of intensity. Necessarily, the container must be inspected regularly to see that no radioactive materials have escaped to contaminate surrounding equipment. In practice, the gages are sometimes sold outright by the manufacturers, but in many instances the radiation source is rented so that the supplier retains title. The supplier of rented radiation sources also undertakes the responsibility of inspecting. The manufacturers have in some instances sold the radiation source without such service where the user has the necessary equipment and experience to handle the health and safety problems connected with the gages.

Similarly, liquid level gages can be used in many industries to locate substances in containers that are closed and hence inaccessible. The location of the level depends upon recording the intensity of a beam of

radiation. When the liquid, the height of which is being measured, comes between the source and the detector, there is a sharp decrease in the detector's radiation. Or in the alternative, radioactive floats are introduced into the liquid, and their radioactivity is detected from outside the wall. The point of radioactivity reveals the level of the liquid.

Radiography. Radiographic testing which is used to inspect the internal structure of metal castings, welds, etc., is not a new technique. X-ray machines and radium sources were previously used, but the availability of large quantities of high energy radiation sources such as cobalt 60 has made it economically feasible to undertake more extensive radiographic testing. The testing process consists of placing a radioactive source on one side of the specimen to be tested and a photographic film on the other. The film when developed reveals any flaws or cracks in the specimen since more radiation will penetrate the areas of defect and cause greater exposure on the film. Radiocobalt is approximately one-fiftieth as expensive as radium and it has a greater gamma ray generating capacity for its weight. Cobalt sources can be machined to any shape before they are made radioactive by exposure to neutrons within a reactor. However, radiocobalt must be clad prior to usage because it tends to flake after exposure to neutron bombardment.

Medical Uses. Radioisotopes and radiation sources have considerable promise for therapeutic uses by the medical profession. X-ray machines and radium have, of course, been employed for a number of years. Radioactive iodine and phosphorus have also been available as specialized therapy tools in very limited quantities for the few scientists having access to particle accelerators. Today, however, over 800 varieties of radioisotopes are available in substantial quantities for medical use. Availability is no longer a problem.

One therapy technique makes use of the destructive qualities of radiation. The radiation is directed at diseased tissue to destroy the undesirable cells. However, healthy tissues located near the diseased tissues are also in danger of destruction, so the process must be cautiously handled. The radiation may be supplied from a source external to the body, it may be placed within the body near the diseased tissue, or a radioisotope may be injected in the body when the particular isotope has a tendency to concentrate chemically in the particular diseased organ. If reliance is placed on the selectivity of a particular isotope for certain body tissues, the half-life of the radioisotope is important. Too long a half-life may result in the continuation of radiation which damages healthy tissue long after the diseased tissue has been destroyed. Like-

wise, the biological half-life or rate of elimination from the body is important in such use of radioisotopes, as was explained in Chapter I. Considerable research is still needed before the therapeutic techniques now used experimentally can become standardized.

As an external source, cobalt 60, a very powerful gamma emitter, is replacing radium because of its low cost and less hazardous nature. The radioisotopes currently used most extensively internally are radioiodine 131, a gamma emitter, and phosphorus 32, a beta emitter. Because iodine is naturally attracted to and retained by the thyroid gland, radioiodine can be used for some of that gland's disorders. Hyperthyroidism, or excessive hormone secretion of the thyroid with disabling symptoms, has been checked, if not cured, by radioiodine. Cancerous growths in the thyroid can be treated by the radiation from radioiodine. Angina pectoris has been relieved by radioiodine, apparently because it eases the load on a diseased heart by slowing down the activity of the thyroid. Radiophosphorus, which has an affinity for bone marrow, will radiate the blood-forming tissues and decelerate the production of blood cells. Administration of radiophosphorus has provided relief to patients afflicted with an oversupply of red cells (polycythemia subra vera) and has controlled, though not cured, the oversupply of white cells (leukemia).

Sterilization of Food and Drugs. Radiation sources can also be used to sterilize foods and drugs. Microorganisms present in pharmaceutical products and items intended for human consumption can, if desired, be completely exterminated, but the quantity of radiation needed for the purpose increases greatly as lower forms of life are attacked. Absolute sterilization may require a dosage as high as approximately two million roentgens. The danger inherent in using this amount of radioactivity in foods and drugs is apparent when we consider that approximately 400 roentgens constitutes a lethal dose for at least half of the human population. Apprehension has been expressed about the possibility of inducing subtle changes in the irradiated food or drug materials which could not be detected by ordinary chemical and physical means. The hazards in this respect do not arise from radioactivity as such, but from its side effects, such as the creation of pathogenic conditions or toxicity.

However, short of sterilization, pasteurization of foods and drugs by means of ionizing radiation can be accomplished by much smaller doses of radioactivity. In pasteurizing a product most of the pathogenic bacteria are killed, but not all. Intensive experiments are being carried on to achieve practical results in this area. It has been reported that in

England irradiated onions and potatoes have already been supplied to the submarine crews of the Royal Navy. The United States Army is carrying on a $5,000,000 research program along this line.

The advantage of either sterilizing or pasteurizing by the use of radiation consists of accomplishing these goals without significant increases in temperature. Consequently there is the possibility of treating products that are heat-sensitive, protecting them from deleterious changes produced by heat sterilization, or from change of taste or other quality that might result therefrom. Packaged meats, canned milk, dried eggs, ice cream, and other mixes may be cited as examples. The sterilizing or pasteurizing operation is normally applied after packaging, thus eliminating the possibility of contamination after radiation, a very important advantage.

Cold sterilization of penicillin or other antibiotics, medical supplies, and sanitary products, bandages, sutures, etc., can also be effectuated; plasma and other blood components are made to last longer and the likelihood of transmitting contagious disease is reduced. Beneficial effects can be produced by sterilization of hormones, vitamins, antibodies, and other products. Fruits, vegetables, and beverages can also be treated to increase appreciably their shelf-life.

Static Eliminators. The hazards of static electricity, which is produced by friction, can be eliminated by the use of ionizing radiation. Static charges occur in manufacturing operations of sheet plastic, paper, motion picture film, in coffee plants, in leather fabrication, in flour milling, and in many fine grinding operations. Automatic processes may be reduced in efficiency or even impeded by static electricity. The cutting of filmy materials, or the carding and warping of textile fibers are examples. Even more serious is the possibility of building up large electrostatic fields sufficient to give off sparks and thus create fire hazards in explosive atmosphere, such as that formed in industrial works using inflammable fluids or explosives, or that of a hospital operating room.

Radioactive sources can be used to ionize the air surrounding the point of origin of a static charge. The ions in the air are attracted to surfaces of opposite signs, and the charge is neutralized.

Exploration for Oil. The oil industry has found in the use of radioactive sources a more efficient means of exploring the bowels of the earth. A portable neutron source, usually a mixture of radium, polonium, and beryllium is lowered into the bore-hole of the well, along with a detecting device. To prevent the detector from being directly activated by neutrons from the source a shield is interposed. The operation con-

sists of making readings of radioactivity reflected from the surrounding matter the nature of which is to be determined. Dry strata absorb the neutrons, but when neutrons encounter hydrogen atoms, many of them are "scattered back" and are revealed by the detector. A counter measures the activity, and electronic devices relay the information to the surface. The presence of either water or oil is shown by the hydrogen content thus revealed, and electrical conductivity tests are used to complete the identification. The use of radiation has revealed the existence of large reserves in many fields long believed exhausted.

Agricultural Uses. The ability of radiation to induce changes in the hereditary features of plants and animals has been turned to advantageous use by science. Neutron irradiation of chromosomes and genes produces mutations that are frequently harmful, but occasionally beneficial changes are induced. This fact has already led to the production of rust-resistant oats and better barley, wheat, and corn. A variety of peanuts has been produced which is leaf-spot resistant and yields about thirty per cent more quantity per acre. A radiation-caused mutation in penicillin mold has made possible a much greater producing type. The radiation doses needed to bring about mutations are much larger than amounts lethal to humans and animals. In the process a minute portion of the total number of specimens show good mutation. The others are discarded as useless. It is for this reason that plant and seed irradiation is more practical than animal activation. Amounts of radioactivity large enough to produce mutations would have to be administered to large numbers of animals, and a considerable number of them would have to be sacrificed to obtain the favorable mutations in some of them. Nevertheless, radiation is currently being used on poultry to increase egg production.

Again, atomic energy offers at least partial relief from this country's three billion dollar yearly loss of agricultural yield due to insects. Low energy radiation renders various species of insects sterile, thus facilitating their eradication. Similarly radiation may be employed in the control of weevils and other insects in stored produce, in the elimination of insect contamination in consumer packages of grain products, and for coating underground cables to inhibit mold and fungus growth. It has recently been suggested that railroad cars equipped with radiation sources be moved about the country during critical crop stages to reduce crop damage due to insects and spoilage.

Miscellaneous Uses. Brief mention should also be made of certain other uses of radioactivity which indicate the important role that it will

play in the everyday life of the future. The use of cobalt 60 gamma rays to vulcanize rubber by radioactivity, instead of heat, shows promise of improving resistance of rubber compounds to oil impregnation and increasing their serviceability under high or low temperature conditions. Radioactive devices for the scientifically correct measurement of time are expected to be used in navigation, communication, and related research, such as the study of variations in the rate of rotation of the earth. Conversion of sea water to fresh water may someday be brought to pass by use of radiation. Large-scale catalysis of chemical reactions is envisioned. Radioisotopes have been found to have useful applications in ventilation and air conditioning where they can minimize or eliminate hazards from explosions in ducts conveying finely ground materials. Better means of processing plastics, increasing their temperature resistance, and adding to their strength can be achieved by the use of atomic energy.

Phosphorescent or fluorescent materials, activated by radioisotopes, make excellent luminous compounds, and the stock pile of fission products increases the availability of colors, of degrees of brightness, and of longer-lived materials. They can be used on instrument dials, road signs, advertising structures, and as safety markings for buildings and mines. For example, when disruption of electrical power interrupts normal service, luminous signs might be used to guide personnel to safety.

Ionization of the air-fuel mixture may be used to improve the performance of internal combustion engines, for flame propagation is believed to depend in part on the agitation of the gas molecules. Because ions are agitated atoms or molecules and can be created by radiation, a long half-life isotope in a combustion engine may well improve the efficiency of low octane fuel and prevent knocking.

Another probably common future use of radiation sources, based on the same principle as that employed in logging oil wells, is the determination of the density of the soil upon which structures or highways are to be built, and the amount of moisture in it. Simplification of construction procedures and improvement of quality and safety features in the building of highways, airport runways, or earth dams can be achieved by this means. Neutron sources and detectors will be used but will function on the surface instead of at considerable depths as in the case of oil wells. The tests will be conducted at intervals along the path to be used.

Paul Weidlinger, a consulting engineer of the American Society of Chemical Engineering, suggests that powerful radiation could be used to rearrange the molecules in wood so that the result would be a stronger

and more durable product. Better plywood could thus be provided for houses, boats, and industry. The structural members of the material would be much thinner and lighter, and yet they would be stronger and more elastic. Fire resistance could be increased to the extent of eliminating the necessity of fireproofing and the cumbersome, expensive accessories that come with it. Exploiting the ability of hard radiation to cross-link molecules, the plywood industry might be enabled to forego the use of glues. According to Mr. Weidlinger, enormous pressures may be used to cross-layer thin veneers, and heat action may cause the extrusion of natural lignin, while the application of hard gamma rays may cause the molecules to join without raising the temperature. This process would permit the processing of building materials into various shapes and would truly be like taking the substance apart and completely reassembling it.

Innumerable other possibilities for the use of radiation, such as in batteries or for space heating of homes, have been suggested and are being investigated. Undoubtedly many other uses will be developed that will make the total contribution of radiation to the economy of possibly startling proportions. Therefore, we can expect radiation sources to become even more commonplace in the relatively near future.

It must always be remembered, however, that utilization of radioactive sources creates hazards to persons and property because of the damaging effect of ionizing radiation. Recently, as pointed out in Chapter I, a group of prominent scientists has concluded that any radiation, no matter how small, is damaging to the living and perhaps more importantly to the descendants of the living. Therefore, users of radiation must exert all efforts to reduce radiation hazards.

The number of ways in which the use of radiation may result in damage is almost unending, but some deserve particular mention. The transportation of radioactive materials from their point of origination to refiners and suppliers and eventually to consumers involves unusual hazards. Not only must carrier personnel be protected by shielding, but also protection must be afforded persons who are near the transportation vehicles, such as passengers or the casual passersby or persons working in buildings near railroad sidings where boxcars transporting radioactive materials happen to be resting temporarily. A train or airplane accident may cause rescuers to be subjected to damaging radiation if the container has been broken by the impact of the wreck. Persons so exposed will not know of their injury until possible corrective measures may be too late. Therefore, radioactive materials should be transported

in the most secure fashion and notices of a possible hazard should be conspicuous.

Radiation sources are, of course, a hazard to personnel in the immediate vicinity. Areas of high radiation levels must be blocked off or personnel unwittingly will be absorbing harmful radiation. Location within buildings but close to public passageways may cause harmful exposure to children playing outside the factory. The uninformed petty thief may carry home an extremely dangerous radioactive source unless the materials are carefully guarded and inventoried. A plant explosion or fire may break the container, scattering the radioactive material. Police and firemen who come to assist in putting out the conflagration may be exposed.[7] Plant visitors or even trespassers, such as children, must be excluded from access to the source so that the radiation beam will not be directed at themselves or others in the vicinity. This very incomplete list of possibilities suggests the desirability of free use of exclusion areas with an abundance of warning devices and notices.

Radiation injuries may also occur because of the cumulative effect of radiation, although the particular exposure is below safe maximums, as is also pointed out in Chapter I. For example, an employee may have undergone radiation during therapy and then received additional radiation at work because of the impossibility of perfect shielding against gamma radiation. Or a patient may have been given radiation treatments by one doctor and then given further radiation for possibly another ailment by a second doctor. In both cases the amount of radiation at any one exposure would have been considered safe, but a cumulative radiation injury may occur. This suggests that monitoring of personnel should be continuous and perhaps every individual in the community should have a complete accurate record of exposures so that cumulative radiation can be estimated and damage avoided. Registration on a national basis was actually recommended by the Committee on Genetic Effects of Atomic Radiation of the National Academy of Sciences.[8]

The erroneous shipment of a gamma source when the consumer has requested a beta source could lead to innumerable injuries because of the vast differences in required shielding. Radiation injuries to persons and property may result from leakage in containers. Radioactive materials may be accidentally shipped to consumers of articles produced in the factory using radiation sources. Radioisotopes may be accidentally thrown into sewers which empty into streams from which water is taken

[7] *E.g.*, the explosion in the Sylvania Laboratory in New York City.

[8] National Academy of Sciences, National Research Council, "The Biological Effects of Atomic Radiation," p. 28 (1956).

for drinking or industrial uses. If a film processing plant used water containing radioactive materials, the film would be damaged. Disposing of radioactive materials in dumps that may later be the site of buildings may eventually result in injury to the occupants. When the radiation level is no longer sufficient for the particular use but is still harmful to human life, adequate methods of disposal must be found or the same hazards may develop as in the case of disposal of the waste products created in the fission process. The possibilities for injuries seem interminable, and unusual hazards are encountered because of the unique nature of radiation whereby injuries are suffered without the immediate interposition of the human sense perception.

In conjunction with use of radiation sources, it should be noted that, although potential hazards are created by their use, failure to use radiation techniques may similarly create hazards that may result in legal liability. For example, a crucial casting for a mechanical device that has not been tested by radiography may break causing injuries to persons and property. Similarly, drugs or blood plasma not sterilized by radiation may seriously infect patients. Furthermore, it is entirely possible that radiation usages may become so standardized in certain industries that a failure to take advantage of them may be evidence of negligence in any litigation based upon injuries caused by the product.

In judging what radiation hazards are unacceptable, the hazard must always be weighed against the great benefits which can come from the use of atomic energy mechanisms.

3. Radioactive Tracers and Their Hazards

Radioisotopes have already been used in large quantities in tracing experiments and techniques in biology, industry, medicine, and agriculture. Since the beginning of the United States Atomic Energy Commission's post-World War II program thousands of shipments have been made to thousands of institutions in this country and abroad. Moreover, the federal government is financing an extensive research program with laboratories at Brookhaven, Argonne, Los Alamos, Oak Ridge, Rochester, Arco, and other places.

Because of the radiation they emit, inconceivably minute quantities of radioisotopes can be detected by very sensitive instruments. A so-called "labeled" or "tagged" atom, *i.e.*, a radioactive isotope of a given chemical element, as explained in Chapter I, is identical in its chemical behavior with its non-radioactive sister atoms. It can be "traced" through a series of chemical or physical reactions even in the presence of

great quantities of non-radioactive atoms of the same substance or of different substances. Complex and mysterious biological and industrial processes can be better understood by the use of proper radioisotopic tracer materials. Isotope labeling establishments are currently supplying numerous tagged compounds, such as sugars, organic acids, amino acids, pigments, alkaloids, proteins, and others. Medicinal plants are being grown in an atmosphere of radioactivity to produce labeled drugs.

There are, of course, limitations upon the practical use of tracers, and often a radioisotope of suitable degree of activity or half-life is not available. For example, no usable radioisotope of oxygen, nitrogen, or aluminum has been produced, or the amount of an isotope needed for a certain tracer application may be too large to be safe. Moreover, the process of synthesizing the radioisotope into a compound possessing physical and chemical properties identical with the material under study is sometimes impossible or impractical. Despite these difficulties, however, tracer techniques are widely used and highly successful. The equipment needed for utilization of tracers is not expensive; the cost of the radioisotopes themselves is low, and important additions to knowledge may be made by their utilization. Their possible usefulness for known processes and for many not yet envisaged has caused authoritative sources to hail them as one of the most significant contributions to the welfare of man so far derived from atomic energy, perhaps the most useful discovery since the microscope.

A brief account of some of the more important current applications of tracer techniques will reveal the importance of radioactive tracers to society.

Tracers in the Oil Industry. The oil industry has found profitable uses for radiotracers. After a period of use the walls of a pipeline may become encrusted with wax. Special scrapers, with a number of blades, are driven through a pipe by compressed air to remove obstacles and accumulations. If a scraper sticks in a pipe instead of emerging at the other end, its location is difficult to determine. To facilitate identification of the spot, a source of cobalt 60 in an aluminum container is attached to the scraper. A geiger counter outside the pipe registers a response to the gamma rays emitted by the cobalt even through several feet of earth, and thus locates the scraper.

Gasoline, diesel oil, stove oil, or oils of different qualities may be shipped successively through the same pipeline, and it is necessary to spot with accuracy the interfaces between any two substances as shipped. If a small quantity of radioactive material is injected into the line at the

interface, geiger counters placed at the desired cut off points indicate the arival of a new substance by signaling the radioactivity. Operators can then turn valves to direct the new shipment to its proper tanks. The advantage of the tracer technique is that it accurately locates the interface and measures the extent to which the adjacent materials have intermingled in the pipeline. The amounts of radiation needed for this and similar strictly tracing functions are not particularly hazardous provided proper care is exercised in handling the radioactive materials themselves.

Again, tracers have contributed to making oil well drilling safer and simpler. The use of acids in wells to render limestone or sandstone formations permeable is often necessary, but it has been a hazardous and time-consuming operation for the reason that thousands of feet of tubing had to be removed and disjointed to install accessory equipment for acidizing purposes. Radioiodine now reveals the level of the acid, which, by applying pressure according to instructions received from readings, can be kept at the bottom of the well without danger of corroding tubings or the casings of the well.

Metal Wear Testing. A process has been developed for measuring the wear of engine parts and comparing the performance of different lubricants and fuels. It is based on a weight loss system and is a quick and effective procedure. Under previous practices, an engine would be run for a long time, even months; then it would be dismantled and the weight of the parts being tested would be compared with their weight before the test. Using the "tagged atoms" procedure, piston rings or other parts can be irradiated in a reactor, placed in the engine, and the engine started. At any desired time interval, the oil may be drained off, and a geiger counter used to determine the amount of radioactive metal worn off in the operation. Accurate testing is possible without the expensive and time-consuming dismantling otherwise required. It is asserted that better engine oils have been produced as a by-product of this speedy and precise method of testing.

The same technique can be applied to tools of many kinds to appraise their resistance and predict the duration of their life. Cutting tools may be made radioactive in a reactor. During their use microscopic fragments of metal are worn off and intermingled with the metal chips of machined pieces. The radioactivity of the wastes determines instantly the wear of the tool. Previous methods required extended wearing of the tool to test it effectively.

Foods and Food Processing. By means of radiotracers simpler and more reliable methods of toxicological evaluation of ingredients are

open to the food industry. Food additives, whether for flavor, color, and texture, or as a preservative, must be harmless. Radioactivation of such additives, or proper labeling with a radioisotope, allows the research staff of the industry to follow the absorption, distribution, storage, and excretion of ingested foodstuffs. Any abnormalities in the metabolic process such as excessive accumulation or distribution may reveal nutritional hazards and call for discontinuance of a practice or the substitution of a safer chemical.

Again, it often happens that food processors are interested in knowing the rate of water penetration into food products. Experimental samples are processed with radioactive water, and radiographic tests are made which indicate the water distribution at different stages. This technique has assisted the manufacture of better products.

Even the much debated effects of smoking may be investigated by the use of radioactive tracers. A tobacco company has reported that it is conducting experiments to determine the disposition of the several ingredients of tobacco that are inhaled. Different constituents of tobacco are tagged and followed in the pathways inside the body. The distribution and rate of elimination thus observed may reveal important facts about the pathogenic effect of certain tobaccos or some of their constituents.

The contributions of tracing techniques to the improvement of many agricultural processes and to the expansion of knowledge concerning agricultural practices have been outstanding and are undergoing constant expansion. It truly can be stated that imagination and ingenuity can extend the use of radioactive tracers to cover most areas of human activity.

The efficiency of conversion of feed into meat by animals can be determined by tracing. The effect of adding certain elements may lead to better feed products. The utilization and elimination rate of feed components may reveal the cause of a diet deficiency and suggest ways of restoring pastures to a high nutritional value or of rendering valuable an area of supposedly little worth. Experiments with tracers reveal whether inadequate growth in animals is due to low dietary intake or to the intake of adverse food elements.

The use of tracers has revealed to science the processes of synthesis of foods and the degradative reactions that occur rapidly within the body. Earlier beliefs are being replaced by more adequate understanding. Advances in dietetics have been made possible by nutritional studies based on tracing techniques.

The mineral components of certain feed supplements have been followed in their paths through an animal system. To satisfy animal needs for small amounts of iodine, iron, copper, cobalt, zinc, etc., such substances are placed in "salt blocks" scattered around pastures. The use of radioisotopes reveals that certain minerals are being leached out without reaching the animal. This discovery has led to the manufacture of blocks containing water insoluble compounds. The effects of fluorine on calcium metabolism in animals has been studied with the use of tracer isotopes to measure the rate of bone growth and to determine the amount of fluorine, if any, to be used in water. Experiments have shown that the growth in the bone structure of animals supplied with a high fluorine content in their diet is only half that of the growth registered by animals that are fed a normal or low amount of fluorine. This discovery even has implications for use of fluorine to retard tooth decay in humans.

Again, a substance called thiouracil shows great growth promoting possibilities and can be fed to pigs, poultry, and other farm animals to improve the efficiency of feed utilization. A drawback consists of the fact that thiouracil depresses the function of the thyroid gland and may even be deleterious to humans feeding on animals fattened on a thiouracil diet. Experiments have shown that if the substance is withheld from the diet of animals for two or three days before they are slaughtered for human consumption, no significant amount is retained by the time they reach the market. This knowledge was gained by the use of radioactive iodine as a tracer studying its uptake by the thyroid gland when mixed with thiouracil. As a result of these demonstrations, the Food and Drug Administration has approved thiouracil as a satisfactory diet ingredient.

Agricultural Uses. Radioactive tracers have disclosed much valuable information on the rate of plant uptake of commercial fertilizers. Tracers reveal under what conditions and at what stage of a growing cycle fertilizers should be applied for best results. Phosphates, tagged with radiophosphorus, permit discovery of the portions of phosphorus derived from the soil and the portions coming to the plant from fertilizers. Thus it has been found that corn takes up phosphorus from applied fertilizers in its early stages, but that later the uptake is principally from natural phosphorus deeper in the soil. Tobacco growers have introduced savings as a result of the knowledge that phosphates spread at the surface have little value for their crops.

Radiotracers can also be used to evaluate the natural fertility of the soil. The inhibiting effects of certain mineral components of the soil can

be assessed. It has been learned that a fertilizer may be good for a certain year, but that it will be harmful to a future type of crop in the system of rotation. This has furnished valuable guidance for growers in the selection of their rotating crops. Dr. Walter F. Libby, a member of the United States Atomic Energy Commission, has estimated that proper utilization of radiation sources and radioisotope tracers in agriculture could save upwards of $200,000,000 per year by reason of improved methods and materials.

Photosynthesis, the process by which plants store sunlight and turn it into chemical energy, is the basis of all life on earth, and it is slowly unfolding its mystery through the aid of radioactive tracers. The hoped-for dream of researchers is the artificial reproduction of the photosynthesis cycle which would make possible the production of organic foodstuffs from inorganic materials—from water, carbon dioxide, and solar energy. This would even tend to obviate the necessity of complete reliance upon soil and plant life as the source of food supply as we know it now.

Tracers in Medicine. Great strides have been made in medicine with the use of radioisotopes as tracers. Radioiodine and radiophosphorus have proved most useful. When radioiodine is administered to a patient in a solution of water—the so-called "atomic cocktail"—it will quickly tend to concentrate in the thyroid gland. If the iodine taken up by the thyroid is less than the normal amount, cancer of the gland may be suspected; if too much concentration is registered, the gland may be overactive and need treatment. A detecting instrument placed over the gland signals the amount of radioactivity and tells the skilled technician much that the doctor needs to know.

A new method of cancer diagnosis which utilizes tracing techniques has been inaugurated. It has been found that certain substances tend to concentrate in areas of overactive metabolism such as cancerous tissues. This fact has been exploited by injecting radioisotopes into the system and detecting the point or points of higher concentration of radioactivity. This technique helps to pinpoint the location of the tumor and may reveal the malignant nature of many kinds of growth.

Radiocarbon and radioiron have yielded useful information about anemia and diabetes. The reason for overproduction of white cells in leukemia sufferers is better understood as a result of the use of tracers. For example, tracers have revealed that the white cells in leukemia patients are deficient in zinc.

Radioisotopes disclose the distribution of drugs in the body. They

also facilitate studies of blood flow by taking advantage of the fact that the time employed by the blood to circulate between two given points can be determined by injecting radiomaterial at one point and determining the time of its arrival at the other.

During a surgical operation it is often vital to know the amount of blood lost by the patient. An accurate method is afforded by the intravenous injection of radioiodine. The dilution of the radioisotope in a sample of blood extracted after sufficient time for mixing has elapsed, reveals the present blood volume. Blood preservation studies have been aided by the use of radiochromium tagged red cells. The life processes of red cells are studied in this manner.

The hazards connected with the utilization of radioactive tracers are substantially similar to those involved when using radiation sources. However, in tracer techniques only small amounts of low energy materials are needed, and consequently the degree of hazard is not as great. Moreover, tracer techniques are usually employed by highly experienced personnel who are fully knowledgeful of the dangers. In industrial applications of radiation sources untrained employees are more likely to be utilized.

Once again, as with radiation sources, a *failure* to use radioisotopes as tracers may create hazards. If a fertilizer or drug is tested with the new tracer techniques, injuries may be avoided. A failure to determine possible dangers in a product by using the tracer technique may be evidence of negligence in some instances. Therefore, although injuries may result from employing radioisotopic tracers, other injuries may occur by not taking advantage of their value as a research and testing instrument.

B. General Tort Liability Problems

In reading the foregoing discussion of the scientific aspects of atomic energy, its peacetime uses, and the potential hazards, lawyers without doubt have reviewed in their minds the legal principles applicable to litigation in the tort liability field. We shall now briefly describe some of the legal problems that we feel may be arising in the future with considerable frequency, and in the succeeding chapters we shall analyze the more important rules of law currently applied in the tort and workmen's compensation fields and discuss possible solutions for specific problems unique in connection with peaceful uses of atomic energy.

It should be especially emphasized that there will be an important interrelationship between the law and atomic energy. In other words, the

law will affect atomic energy operations, for the lawyer will be obliged to advise his clients to pursue certain courses of action to avoid certain legal consequences. At the same time atomic energy will affect the law by stimulating the development of new legal principles to the new technology, either by the courts or legislatures, or both.

Perhaps the most crucial question is what general rules of tort liability will or should be applied to atomic energy activities. Should the ordinary rules of negligence apply? Or should rules enforcing strict liability as in the case of an "ultrahazardous" enterprise be applicable? Should the same rules, negligence or strict liability, be applied to reactor operation as to the use of radiation sources or radioisotopes? As we mentioned earlier, the failure of the common law to adapt itself to industrial injury problems led to the enactment of statutory workmen's compensation. If common law rules are not again to be superseded, this time by statutory rules in the area of atomic energy enterprise, careful consideration must be given to the evolution of judge-made common law. Or perhaps it may be found that, in some aspects at least, only statutory solutions will serve adequately to adjust atomic energy to the law. If, in judicial proceedings to impose civil liability, negligence must be found before the one who causes the damage is obliged to respond in damages, individual members or, indeed, the whole of society will bear a greater direct risk and burden. If strict liability rules are applied, a restricted part of society, *i.e.*, atomic energy enterprise, must bear a greater direct economic burden, either through payment of claims or through increased costs of insurance. These economic burdens may, of course, be passed on to the general public in the form of increased prices for the product of such enterprise. In many instances, however, the potential economic burden may deter entrepreneurs from undertaking atomic energy activities. The nature of the general rules of law to be made applicable will also have its effect on the safety measures to be used in atomic energy operations. If strict liability is imposed, entrepreneurs will doubtless take the utmost precautionary measures which, of course, will increase the economic costs of utilizing atomic energy, undoubtedly retarding its development to some extent.

We have already seen that reactor operation, radiation sources, and the storage and disposal of radioactive wastes all involve unusual hazards that might be characterized as ultrahazardous in nature. We must ask ourselves many questions. What effect, if any, should be given to governmental approval of the operation as set forth in the form of atomic energy licenses? Should or does such approval preclude the

courts from applying strict liability rules, particularly when the operation has been carefully inspected from the standpoint of health and safety by federal or state authorities? What is the effect of federal approval on state authority? Should liability be imposed for injuries to trespassers in view of the unique hazards? Should visitors and licensees be required to assume radiation risks? Should liability be imposed where an "Act of God," such as an earthquake or tornado, has caused injuries by spreading radioactivity throughout a community? Do workers "assume risks" such as possible genetic damage?

The scope of potential liability based upon the applicable principles of tort law will have an effect on the type of business organization that may be used in atomic energy pursuits. If strict liability is imposed, it may encourage the establishment of separate corporations to handle atomic energy, legal entities divorced from business organizations already established in industry. Should use of a corporate device with limited assets be permitted in so hazardous a field? Should minimum insurance coverage be required by law? Lawyers in the atomic energy era will be called upon to assess all legal possibilities and undoubtedly will be asked to give advice that will protect investors to the greatest possible degree against possible tort claims. At the same time cognizance must be taken of the legitimate claims of individuals and groups who may be injured by atomic energy activities.

In addition to the problem of the general rules of law to be applied to atomic energy, there are a number of specific problems that may arise. In determining the location of an atomic energy facility, consideration must be given to the potential hazards and to the desirable exclusion area. Even before a plant is constructed, nearby inhabitants and landowners may seek to prevent the construction by seeking injunctions on the theory that the plant will be a nuisance. Some may seek to enjoin the construction while others may seek damages on the theory that the plant destroys property values. What will be their measure of success? What will be the effect of zoning ordinances in trying such cases? What will be the effect of licensing by the Atomic Energy Commission? Will use of underground chambers or gas-tight steel spheres reduce the success of what is by some called "nuisance" litigation? Lawyers must analyze these questions in the light of local rules of law as well as federal laws and regulations, not to mention international legal principles, to advise properly when plant locations are being selected.

A number of individuals and industrial organizations are currently engaged in designing nuclear reactors and atomic energy devices and in

supplying consulting services in the atomic energy field. In the current stage of technological development, the alternatives have yet to be tested conclusively, so designs must be selected in the absence of conclusive data. What liability may be imposed on designers and consultants if the installation causes injuries? Once one type of installation or process is proved to be safe, what effect will this have on the area of choice if negligence claims are to be avoided? Can consultants and designers immunize themselves from liability? Should they be allowed to do so? For what kinds of injuries should they be liable? Should they be liable only to those in the immediate vicinity of a nuclear accident, or should they be liable to the film manufacturer who happens to purchase cardboard to package film that was made with water into which radioactive materials had leaked? When are the injuries so remote that liability should not be imposed?

The construction firms and manufacturers of equipment used in atomic energy facilities also face possible tort litigation. Should or will the building contractor be held liable to persons injured due to slight defects in construction that permit leakage of radioactive materials? Should negligence rules be applied or strict liability rules? Should or will the manufacturer of equipment used in reactor or radiation devices be liable for injuries resulting from defects in the product? Does it make a difference if the manufacturer did not know his product was to be used in a reactor and the defect would have caused only minor damage, or perhaps none at all, if the equipment had been used in a conventional industrial operation? For what kinds of injuries should contractors and manufacturers of equipment be held liable? If a radiation source is rented, what should be the liability of the owner for injuries resulting from accidents? What is the effect of assuming an obligation to inspect radiation sources on the liability of the user and of the inspecting firm? Can liability be avoided by contract terms or by disclaiming any warranties in respect to products?

What should be the liability, if any, of the owner-operator of a reactor who sells radioisotopes to others who negligently or accidentally cause injuries to persons and property? Because of the dangerous nature of the product must the seller investigate and ascertain the capacity of the purchaser to use the product safely? What is the effect of the securing of a license to use radioactive materials from the Atomic Energy Commission? Would the seller be liable if he sold radioisotopes to a person not having a license? Can possible liabilities be avoided by any legal techniques? If reactor-owners are liable for immediate injuries caused by products sold to others, are they equally liable for remote injuries

where there has been a chain of intervening events with the possible lapse of a number of years?

Not only are there problems regarding specific rules of liability to be followed but also there are a number of problems arising out of the peculiar nature of radiation injuries. Since the plaintiff is required to sustain the burden of proof in litigation, he must first prove that his condition resulted from radiation, and thereafter he may find it very difficult to prove that his injury was caused by radiation from a particular source. Many of the same injuries occur even in the absence of radiation, and thus there is the problem of the multiple cause or cumulative effect of radiation. Should the burden rest on the atomic energy user to prove that radiation did not cause the injury? If the burden of proof is placed on the atomic energy user, can he ever avoid liability even under negligence rules? If the burden of proof is made minimal for injured persons, will this create a convenient vehicle for nuisance litigation by any person having any complaint in an area where there has been the slightest rise in radiation levels? Should new rules governing the burden of proof be developed for atomic energy tort cases? What kinds of monitoring records should be kept to defend possible future injury claims? How can injured persons receive damages when classified data is involved which cannot be introduced as evidence? Should special courts capable of receiving security information be established? Or should the government assume liability when it prevents the introduction of the evidence necessary to prove an injured person's case?

What claims can be made by a person who has received radiation damage only because of its cumulative nature when all of his exposures were below safe levels? Can he recover from only the person who caused the exposure to go above the maximum permitted before cumulative effects begin? Or are all who contributed to the cumulative effect liable? Should every person be required to keep his own personal exposure record so that employers and doctors can rely on the record in subjecting an employee or patient to radiation? Can victims of degressive genetic damage seek damages from those who exposed their ancestors to harmful radiation? Should society bear the risk of genetic injuries? What advice should the lawyer give the atomic energy entrepreneur?

In addition to the problems of proving injury, its cause, and the role of the defendant in causing the injury, other problems arise in respect to the procedural aspects of trying atomic energy tort cases. One problem is that of the adequacy of the typical statutes of limitations. When does the cause of action arise so as to start the statutory period—when the radiation accident occurs or when a person discovers his injury? If the

former, what protection, if any, should be given persons who discover injuries perhaps years later after the statutory period has run? Should a person who knows he has caused harmful exposures of radiation be required to notify possibly affected persons? If the statutory period does not commence until injuries are discovered, users of atomic energy will be called upon to defend against claims years later when witnesses are dead and evidentiary materials are no longer available. Should users of atomic energy, because of the peculiar nature of atomic injuries, be required to assume the risks of stale claims?

Other problems arise out of the possible progressive nature of atomic energy injuries. A person may receive an exposure which caused temporary sterility as its first noticeable effect. Years later malignancy may develop requiring amputation of limbs and perhaps death will ensue still later. If the person sues at the time he discovers sterility, can he attempt to prove possible future consequences? If he recovers only for the sterility, can he sue again at a later date when he discovers a malignancy? If legal rules prevent him from suing twice, should he be advised to delay damage actions until the latest permissible moment within the statute of limitations? Should any new rules be developed to handle possible progressive injuries?

Another problem in atomic energy tort litigation arises out of the complex nature of the subject matter. Are juries equipped to handle highly technical data or will the technicalities so overwhelm them that they will be unable to assess the evidence? Will inability to handle the subject matter lead to verdicts for persons claiming injury or, on the other hand, for the defending users of atomic energy? Will the judges be able to give proper instructions dealing with scientific data? What should lawyers advise clients when faced with determining whether tort litigation should be tried by the judge or jury? Can hindsight be kept out of the deliberations in determining negligence and causation issues?

Still other legal problems may arise because of the fact that a release of radioactive materials does not respect state or national boundaries. Which law should be applied in determining liability of an owner-operator when radiation has transcended state or national boundaries? What law should be applied if injuries occur on planes and trains traveling across state and national lines? The answers are crucial, of course, if one state follows ordinary negligence rules and the other invokes strict liability. Can legal devices be used to avoid liability under the law of other states or nations? Should there be an attempt to obtain uniform legislation covering atomic energy tort law so that the conflicts problems will be minimized?

Many of these problems also will be present in the workmen's compensation field. The same problems of proof, of the statutory time limitations, and of the peculiar nature of atomic energy injuries will be in evidence. In addition, workmen's compensation statutes will have to be evaluated to determine if they provide satisfactory coverage for atomic energy industries. If the state has lists of compensable injuries, radiation injuries must be included. If general categories are set forth in the statute, they will have to be examined to ascertain if the coverage is as broad as necessary. Moreover, the scale of benefit payments may have to be revised to allow compensation for injuries that may not cause a diminution in wage earnings, such as sterility.

These are among the many problems concerned with the tort liability aspects of atomic energy that have occurred to us. Undoubtedly others will occur to the reader and still further problems will arise in the future. Nonetheless, this listing serves to illustrate the problems that must be evaluated to determine what legal principles will be applied on the basis of common law concepts. Once these are evaluated, consideration should be given to changes in the law that should be made, either by the courts or legislatures, for the satisfactory accommodation of atomic energy in our society. In the succeeding chapters, we shall discuss the current rules of law as applied to atomic energy problems, and we shall suggest possible developments for the future.

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Chapter III *

NEGLIGENCE

A. Introduction

1. Limitations of Discussion

It is not the purpose of this study to cover in detail all of the tort liability problems that will face those operating in the atomic energy field. Many, if not the great majority, of the cases in this area will present typical tort law problems susceptible to solution in the ordinary way according to the usual rules. Established legal scholars have explored and analyzed existing tort rules and have attempted to define and suggest future developments in the law of torts generally. Our purpose in writing this volume is not to second-guess these writers. Rather, we seek to identify for the lawyer and business man those particularly troublesome or unique legal problems that will arise out of atomic energy. In discussing these selected problems it usually will be necessary to work not from direct precedent but from the most nearly analogous cases, including some on the frontiers of tort law. Where established legal rules would seem to provide inadequate or incorrect answers, alternative solutions or courses of action, legislative or judicial, will be suggested.

Not all of the difficult legal problems will be in the areas of negligence, product liability, and strict liability, but the atomic energy entrepreneur and the lawyer advising him will find that these problems will be the most unusual and the hardest to answer. In a real sense negligence, strict liability, and product liability cases cannot be separated into mutually exclusive categories. Nevertheless, it is convenient to analyze the problems under these separate headings. Questions peculiar to the workmen's compensation area will be treated separately, even though many of the problems arising in the area of negligence will be present in workmen's compensation cases as well.

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There is a serious question as to whether ordinary negligence rules or strict liability concepts will or should be applied to atomic energy activities. A discussion of this question will be more meaningful if there is an understanding of the results that might be reached under ordinary negligence rules, because the limitations and possible inadequacies of ordinary rules then will stand out in sharper focus. It is for this reason that negligence rules will be discussed first and the question of whether those rules or strict liability concepts should govern the atomic energy area is postponed.

2. Typical Negligence Analysis

Whether the injury be to persons or property, courts and legal scholars generally view negligence actions as involving four elements. To recover damages every plaintiff must establish: (1) a duty of the defendant to use reasonable care, under the circumstances, in his relations with the plaintiff; (2) a breach of this duty by the defendant; (3) causation, both in fact and "proximately"; and (4) a legally recognized loss or damage to persons or property.

Of the four, the problems in causation and damages are the most peculiar and troublesome when considering atomic energy activities. Most of the duty problems will not be unique but there are several troublesome ones to be considered. In analyzing the application of tort principles as to each of these four elements, the peculiar characteristics of atomic energy must be kept in mind.

3. Legally Significant Peculiarities of Atomic Energy Activities

Seldom, if ever, has such a significant scientific development come so rapidly. The existence of the neutron was not generally thought proved until 1932; the first reactor did not "go critical" until 1942. Yet nuclear energy has the potential to cause tremendous changes in our industrial society, if not throughout the world. There is a vast new science and technology with which the general public is quite unfamiliar and for which there are relatively few trained specialists. Even the specialists admit their science is so new that there are many very important concepts which they understand but vaguely or are not aware of at all. A man cannot knowingly be negligent in failing to utilize a principle or concept which he does not know exists. This might lead to the conclusion that, since he did not know of a technique that might have prevented the accident, he was not at fault; lacking fault, in the ordinary

sense, generally there can be no recovery in a negligence action. On the other hand, it is also true that when an activity is known to be dangerous it may be negligent to act in that area unless one is extremely well informed. It is important, from the standpoint of both domestic development and our position of world leadership, that atomic science be developed as rapidly as possible. The rules of law should not impede this progress unduly. Experimentation and boldness, which are necessary for progress, must not be limited by the timidity that almost inevitably follows imposition of too strict duty concepts or too strict a standard of negligence.

Additional legal difficulties may well arise from the fact that the government has surrounded a not insignificant portion of the information and knowledge about nuclear principles with the shroud of secrecy and the red tape of access permits. The person who wishes to avoid this time-consuming and expensive procedure may risk an accident that could have been avoided if all the information known to those persons working for the government or those having access permits had been known to him. This secrecy creates the further possibility that some injury situations may not be susceptible to trial in the ordinary manner because secret government information may be needed to determine facts in a particular accident. This has already been a troublesome problem in some instances.

As pointed out in the technology chapter, the ordinary human senses are not capable of detecting radiation in most situations. Since a person may be seriously overexposed to radiation and be unaware of it for weeks, months, or even many years,[1] the lawyer is going to face some difficult problems in radiation cases, especially with respect to the matter of proof. This fact is going to present some extremely difficult proof problems.

The general public views nuclear science as mysterious and frightening. This is not surprising when it is remembered that the science is so new and that it was first revealed to the public by the A and H-bombs. The veil of government-imposed secrecy and the fact that radiation cannot be detected by human senses adds to this fear. The consequence is very likely to be a great increase of cases in the area of mental disturbance, psychosomatic illness, and nuisance litigation aimed at preventing operation of atomic energy facilities.

[1] N.Y. Times, May 27, 1958, p. 21, col. 4, carries a report of the development of bone cancer 35 years after exposure to radium poisoning. The 42nd dial worker died in 1958 at the age of 57, 40 years after exposure. N.Y. Times, Oct. 3, 1958, p. 31, col. 7.

Another singular characteristic of radiation is that it is cumulative in nature. What may be a perfectly permissible exposure may contribute to overexposure when added to other radiation, itself either permissible or wrongful. This characteristic will present some difficult proof and damage problems, not to mention duty questions of a type relatively unknown to tort law. It will also have an impact on multiple causation and joint tortfeasor cases. Difficult problems concerning the statute of limitations and conflict of laws doctrines also will arise as a result of this cumulative effect.

Yet another characteristic of radiation is that many of the injuries caused by it can also be caused by other forces, known or unknown. Often it will be impossible to determine the specific causal factor for such conditions as cancer, cataract, and leukemia. In addition, there are many sources of radiation, such as natural background emissions, radioactive debris from bomb tests, radioactive wastes from government operations, and radiation treatment in the course of medical therapy. The effects on the human body and on property are indistinguishable from those arising from industrial use of radiation. This characteristic of lack of identification with the particular source will present some new problems for the lawyer.

It should be noted also that the causal connection between radiation and injury both as to amount and type often is speculative in nature. While scientists in general agree that certain injuries can occur as a result of overexposure to radiation, and in fact that some types of damage are caused by even quite small amounts, they cannot as yet state categorically that a certain amount of radiation in all cases will cause a certain kind of injury to all persons or even to most persons. For the most part, the impact of overexposure to radiation might be described as statistical in nature. The overexposure in most cases increases the incidence of such damage among a large number of persons and, therefore, increases merely the chance of injury to a particular individual.

Another characteristic of radioactive materials is its great flexibility. As pointed out in Chapter I, there are several types of radiation with differing characteristics and injury potential depending often upon the particular way in which the person is exposed to the radioactive material. Likewise there are many different kinds of radioactive isotopes of various elements whose length of radioactivity varies greatly. Perhaps as important legally as any characteristic is the fact that radioactive isotopes of various elements chemically are identical with stable isotopes of the same element and remain radioactive through all kinds

of chemical reactions. Radioactive material, therefore, may remain a potential hazard for great lengths of time while it is processed through numerous extremely complicated chemical changes. Probably no other dangerous material is so insidious in character.

4. Typical Atomic Energy Operations and Tort Liability

Many of the activities in which atomic energy will play a part cannot even be foreseen. There are several types of operations now in use, however, as described in Chapter II. Although there may be legally significant differences between some of these operations, particularly as to duty and breach questions, the most interesting and most difficult tort liability problems are common to most or all of the presently known uses.

Reactor Operations. The question most nearly peculiar to reactor operations is that of whether strict liability will or should be imposed upon the licensee. Application of manufacturer's liability rules, such as when a defective fuel element is supplied,[2] also presents some difficulties. These will be discussed later in the chapters on strict liability and manufacturer's liability respectively. Assuming application of negligence doctrines, the use of foreseeability or proximate cause to determine the extent of the duty owed by the operator will need to be analyzed. To evaluate the extent of the duty the lawyer must consider not only the foreseeability that particular persons or property will be damaged if there is a reactor accident but also the foreseeability that specific types of damage will ensue. The cases concerning off-site liability of a landowner when there are intervening agents, and those dealing with remoteness in time and space as they relate to the duty concept will be helpful in answering these questions.

Little guidance is given by the cases to assist the operator in determining what specific procedures, if followed, will preclude a finding that there has been a breach of the duty to use due care. Suggestions can be made, however, as to some general cautions that should be observed; *e.g.*, an obligation to keep abreast of technological development, a duty to reduce the hazard by giving warning and possibly providing rescue or treatment services,[3] and a duty to make use of new techniques

[2] N.Y. Times, Nov. 30, 1957, p. 37, col. 1, reported worker was accused of deliberate damage to uranium slugs manufactured for the government which might have caused serious harm.

[3] For example the AEC has announced a new service to deal with emergencies. AEC Info. Rel. No. A-127, June 10, 1958, "Atomic Energy Commission To Acquaint State and Local Officials with Services Available in Event of Radiation Incident."

made available through radiation. The effect of compliance or noncompliance with government safety standards is of considerable concern to the nuclear industry in determining whether or not the standard of conduct required of the reasonably prudent man has been breached. Also important is the scope of the duty to use due care as it applies to other persons such as firemen and policemen who are on the premises in an official capacity but not pursuant to an invitation of the owner. Equally significant to the entrepreneur will be the question of whether or not he will be vicariously liable for the negligence of third persons both on and off the reactor premises. This includes both transportation and disposal of waste products. The cases dealing with these questions will be treated in considerable detail.

Fuel Fabrication and Reprocessing Operations. The legal problems arising from fuel fabrication and reprocessing operations again involve manufacturer's liability and strict liability concepts discussed later. The questions concerning the use of foreseeability to determine duty and those concerning the determination of the existence of a breach of the duty to use due care in reactor operations are equally applicable here. Potential liability arising out of transportation and disposal of radioactive materials will also be of concern.

Waste Disposal. Many factors must be taken into account in providing for the disposal of radioactive wastes, whether from reactor operations or from industrial, medical, or research use of radioactive sources. Geological, perhaps meteorological, and even oceanographic calculations must be considered along with the physical characteristics of the waste material. Is it in a gaseous, solid, or liquid form? Is it soluble in water? Does it undergo chemical reaction with surrounding materials? Is it a long or short half-life isotope? What type of radiation is involved? Is the radioactive material likely to concentrate if taken up by plants, or ingested by animals or human beings? Mistakes as to any of these calculations might cause serious injury to property or persons. The answer to these questions as they affect duty and breach problems will not require any different analysis than for reactor and fuel operations.

Aside from strict liability, the most interesting and difficult question is: What should be the legal effect of hiring an independent contractor or the federal government to dispose of the waste material which later causes damage? In determining liability of the one creating the waste material, should a distinction be drawn between using the federal government and a private concern? Should licensing of the disposal con-

tractor by the AEC immunize the producer of the waste material from liability for the former's negligence? What should be the effect on the liability of the producer of the material and of the private concern which carries out the disposal operation if the AEC rules are followed? If they are not followed? These questions need careful consideration.

Transportation of Radioactive Materials. Again laying aside the question of absolute liability, normal tort rules surely will provide answers to many of the questions in transportation cases; *e.g.,* should the standard of conduct imposed on the transportation company be greater or less depending on the method of shipment (air, rail, truck, water), the route chosen (heavily populated areas, etc.), or the type of material (long or short half-life, high or low intensity of radiation, type of radiation such as alpha, beta, or gamma)? Also susceptible to standard treatment are such questions as: Will the doctrine of foreseeability (or proximate cause) protect the shipper or transportation company from remote consequences of a release of radioactive materials; to whom is the duty to use due care owed—persons shipping other goods, the crews or passengers of the transportation company, the general public who congregate around an accident, the rescuers, both official and gratuitous, who come to the scene of an accident; and what must the carrier do by way of checking the character and crating of "hot" shipments to avoid a charge of negligence?

Not so easily answered is the question of what steps the transporting company must take to give warning of the dangerous character of the material while en route. The significance of compliance with government regulations will be of concern to the carrier, just as for the reactor operator and processor. The liability standard to be applied when carrying material somewhat more dangerous than many others is important also. These questions and the most nearly analogous cases are discussed extensively, since little has been written about them.

Industrial, Medical, and Research Use of Radioisotopes. In most cases the tort liability problems arising from such uses as that of cobalt 60 for radiography, strontium 90 for thickness gauges, and iodine 131 for medical diagnosis or therapy either can be dealt with under normal tort principles or are similar to those suggested before in discussing reactor and processor operations or transportation and disposal activities. Most of the duty and breach questions fit into the former, while the effect of government safety regulations and the application of vicarious liability concepts to disposal operations come within the latter category.

The discharge of small quantities of waste material into the air, a sewer system, or a river will present some situations for which existing tort principles do not provide very clear or satisfactory answers. This is true of reactor and reprocessing operations as well as those involving use of radioisoptopes. These problems will be treated rather fully in the discussion of multiple causation cases.

B. The Application of Negligence Principles to Atomic Energy Cases

With a few exceptions, such as the Price-Anderson Bill creating a government indemnity program and a few other examples of state statutes discussed in Part III in connection with state regulations, there have been no legislative attempts to solve the tort liability problems involved in atomic energy cases. In the absence of statutory provisions one must turn to analysis of tort cases in other areas of analogous activity, keeping in mind (1) that too-strict application of tort liability may unduly discourage use of these new materials which promise great benefits and (2) that the hazards are considerable, almost unique, and of a kind that often give no warning. As mentioned before, this analysis typically involves a four-fold categorization of the problems, the first of which is duty, including foreseeability and proximate cause.

1. Duty—Foreseeability and Proximate Cause

A complete treatment of the duty question, of necessity, would involve a long, detailed analysis of the relationship between duty concepts, foreseeability, and proximate cause, since today most agree that the latter two terms actually are merely different verbalizations of the same basic duty concepts. Undoubtedly, the discussion would start with an analysis of the famous case of *Palsgraf* v. *Long Island R. R. Co.*[4] In this case a railroad employee was negligent in assisting a passenger to board the train, causing the passenger to drop a package to the platform. The package contained fireworks which, when the package fell, discharged and shook the platform. This caused a large scale some distance away to drop on Mrs. Palsgraf, who had purchased a ticket for another train. She sued the railroad, claiming that the negligence of the employee caused her injuries and that the railroad, therefore, was liable. The opinions of the majority and dissenting justices exemplify the differences that exist among courts and legal scholars today concerning the scope of duty and to whom it is owed in negligence cases.

[4] 248 N.Y. 339, 162 N.E. 99 (1928).

As one writer in the field concludes, "The present state of the law is, then, one of troubled waters, in which anyone may fish." [5] Professors Harper and James in their recent treatise indicate that courts and writers have from time to time taken the position that if defendants should anticipate that certain conduct is fraught with unreasonable probability of some harm to somebody, then the duty to refrain from that conduct is owed to anyone who may in fact be harmed by it.[6] These writers then add, however, that the view currently prevailing in this country does limit the duty to do or to refrain from doing a given act to (1) those persons or interests that are likely to be endangered by the act or omission, and (2) harm (to such person or interest) from a risk the likelihood of which may be by act or omission negligent.[7] Because these treatises and the writings of other scholars in legal journals have discussed so exhaustively the relationship between duty, foreseeability, and proximate cause, nothing is to be gained by another treatment here. All seem to agree that, in determining whether defendant owes a duty to protect persons somewhat removed (as to space, time, or other relationship) against injuries not ordinarily to be expected, the policy determination is the same, regardless of whether "duty," "foreseeability," or "proximate cause" terminology is used. It is made by balancing the desirability of compensating injured parties on one hand against the deterrent effect such recoveries will have on normal human activity and especially on development in new areas. The question often boils down to whether the plaintiff should assume such risks and provide for compensation through his own life, health, property, or income insurance or the defendants should provide compensation through a public liability policy.

In discussing the legal problems of atomic energy it seems best to avoid the confusion involved in distinguishing between these three terms. Regardless of which term is used, courts typically do not insist that the defendant be legally liable for every single consequence caused in fact by his negligent act. This is true even when strict liability is applied, apparently because, as discussed later, certain classes of persons and injuries may not be allowed compensation. In analyzing the legal problems created by a new area of activity which presents a danger of serious harm to any person, the first question is to what extent will liability be imposed for *all* of the harm resulting from this action. It

[5] Prosser, Torts 171 (West Pub. Co., 2d ed. 1955) [hereinafter cited as Prosser].

[6] 2 Harper and James, The Law of Torts 1018 (1956) [hereinafter cited as Harper & James].

[7] *Id.* at 1018, 1019.

is toward the solution of this problem as it relates to atomic energy operations that attention will be directed here. Recognizing that the trend is toward a system of strict liability, and what Harper and James describe as a social insurance philosophy of tort liability, it seems perfectly clear that this question will still have to be answered: Just how far will the responsibility for negligent action be imposed on the wrongdoer when a reasonably prudent man would think that the person injured or the injury (as to kind or amount) was quite remote or indirect?

The great mass of legal writing on this subject apparently can be reduced to nine or ten printed pages, if we accept the work of the authors of the two leading treatises in the area.[8] While Harper and James point out differences between their interpretation and that given by Dean Prosser to the *Palsgraf* type of case, one cannot help but be struck by the remarkable similarity of their conclusions. We see nothing in the atomic energy area which would call for a different analysis of the scope of duty from that reached in these two treatises. The representative cases discussed in detail in each of these treatises indicate how far courts will go in extending the scope of duty owed by the person using radioactive materials.

Perhaps it is attempting to reduce the irreducible, but it seems fair to say, at least for analyzing atomic energy problems, that there are just two basic questions: (1) is the wrongdoing defendant liable only for those kinds of injury which would be reasonably foreseeable; and (2) is the defendant liable only to those plaintiffs injured by his wrongdoing whom he reasonably could have foreseen might be injured? The authors of both treatises conclude that there are differences among the courts on both of these questions.

As to whether the defendant is liable for unexpected types of injuries to a plaintiff who reasonably might have been foreseen to be injured in some way, Prosser states that "most courts agree that there may be liability for unforeseen consequences, beyond the original risk, to those within the zone of apparent danger."[9] Harper and James feel that the matter is left in some doubt when one considers all of the decided cases, but in general they agree with the broad statement made by Prosser.[10]

Among the many cases cited to support this broad proposition is *Rasmussen* v. *Benson*.[11] There the court permitted recovery for all

[8] Prosser 165-73; Harper & James 1018-27.
[9] Prosser 171.
[10] Harper & James 1021 ff.
[11] 135 Neb. 232, 280 N.W. 890 (1938).

damages claimed even though one item was the sickness and death of the plaintiff resulting from worry over the loss of live stock caused by the poisoned feed carelessly furnished by the defendant. Another example is the famous *Polemis* case,[12] where the court found liability since it was foreseeable that the negligent dropping of a plank into the hold of a ship might do some damage to the ship even if it was not foreseeable that it would cause a spark which would then start a fire which would destroy the ship. There are limits, however, to how far we can carry this idea. Even Harper and James point out that while it is negligent to allow a child to have a loaded pistol, liability will not be imposed for all of the harm which follows. Liability may follow even though it is not possible to foresee the particular persons that may be injured, because it is possible to foresee that injuries may occur if the child discharges the pistol.[13] On the other hand they point out that, while it is foreseeable that the child may drop the gun on somebody's toe or throw it through a window, the gun would be no more dangerous in this respect than any other object of a similar size and weight. They concluded that, while we could anticipate injury to some person from discharge of a firearm and that this would be an unreasonable risk, we could not foresee any unreasonable risk from dropping or throwing the gun. It is therefore possible that only certain types of injuries, even to plaintiffs foreseeably within the zone of danger, will be covered by scope of duty concepts.

The question of foreseeability becomes much more significant when considering the second question: to what injured parties must the plaintiff respond? While the dissenting judges in the *Palsgraf* case (and the decisions in a few other cases) seem to take the position that once the defendant has been guilty of a breach of duty toward some one person he thereafter is liable for all damages to all parties injured as a result of that negligence, generally it is agreed that foreseeability, sometimes phrased in terms of proximate cause, is the criterion by which the courts determine whether the injury to the particular plaintiff is compensable.[14] It seems somewhat illogical to use foreseeability to determine which plaintiffs can recover but not to limit the kind of injury for which a foreseeable plaintiff can recover.[15] In any event it is clear

[12] *In re* Polemis & Furness, Withy & Co., [1921] 3 K.B. 560.

[13] Harper & James 1022.

[14] Prosser 170, 171 suggests that the majority view in Palsgraf may not be followed in most cases. *Cf.* Harper & James' explanation at 1024-26.

[15] Prosser 171, "There appears to be an essential inconsistency in holding that one who can foresee harm to A is liable for unforeseen consequences to A, and refusing to hold him for unforeseen harm to B."

that at least in many jurisdictions some limitation will be placed by the court upon the types of injuries and the plaintiffs who will be allowed to recover. This determination will be made on the basis of what reasonably could be foreseen. The lawyer dealing with atomic energy cases certainly must keep this limitation in mind, but he also must note the trend toward a greater willingness to hold wrongdoers liable for more and more of the consequences of their wrongdoing. A few of these frontier cases will indicate the scope of this trend.

The Tennessee court in 1940[16] allowed the jury to decide the question of whether it was reasonably foreseeable that when a customer fell on a defective mat in defendant's store another customer would be hurt in the rush to come to the first customer's aid. Although the question was left to the jury, the test still was whether the result was foreseeable. Two Wisconsin cases show how variable this concept of foreseeability can be in determining the scope of duty. In 1933 in *E. L. Chester Co.* v. *Wisconsin Power & Light Co.*,[17] the Wisconsin court submitted to the jury the question of whether the particular injury which resulted from defendant's negligence in allowing gas to escape from a broken valve in a gas main should have been anticipated by the defendant. The gas from the broken main seeped through twenty feet of earth and exploded under plaintiff's store building, demolishing it. The court submitted the question to the jury although it recognized that in general all that needed to be anticipated was some injury to the plaintiff. Again in 1952 in *Pfeifer* v. *Standard Gateway Theater*,[18] the Wisconsin court was faced with a case brought against the operator of the motion picture theater for injury suffered by a plaintiff customer who was struck in the eye by a spitball shot from an unknown source. The alleged negligence was failure to control a group of rowdy hoodlums in the theater. The court decided that the jury should be left free to determine whether or not allowing such rowdyism to continue was negligent because it might result in spitballs being projected with injury to persons such as the plaintiff. The supreme court then went ahead to say that if the jury found the negligence was a "substantial factor" it would then be a matter of law for the court to decide whether or not public policy required that there be liability. In doing so the court overruled the *Chester* case to the extent that it allowed the jury to limit liability if it finds the injury too remote to be reasonably foreseeable.

[16] Jackson v. B. Lowenstein & Bros., 175 Tenn. 535, 136 S.W.2d 495 (1940).
[17] 211 Wis. 158, 247 N.W. 861 (1933).
[18] 262 Wis. 229, 55 N.W.2d 29 (1952).

An English case involving a major submarine disaster is a good example of the use of foreseeability to limit the scope of duty of a negligent defendant. In *Woods* v. *Duncan*[19] the shipbuilder and its subcontractor were guilty of negligence in painting over some test holes in torpedo tubes which were designed to show whether or not they were filled with water. In actions brought by widows of civilians who were riding the submarine during the test dive the House of Lords held that the companies were not liable for the deaths that ensued because of the sinking of the submarine when it filled with water. There were questions of whether the submarine officers who were handling the controls were intervening agents, and if the doctrine of *res ipsa loquitur* could be used to prove causation, but the point upon which most of the Lords agreed was that it was not reasonably foreseeable that painting over a test hole in the torpedo tubes would result in the flooding of the submarine to the point where it would sink. The majority felt that the causal relation between the negligence of the defendant and the deaths was too remote to hold them liable for the disaster, although it was a contributing cause-in-fact. They felt that the extraordinary loss of life was outside the scope of reasonable foreseeability and therefore outside the scope of duty owed by the defendant.

In *Mize* v. *Rocky Mountain Bell Telephone Co.*,[20] however, the Montana court felt that the defendants should have anticipated that their high tension wire might come into contact with an uninsulated telephone wire which was otherwise harmless. The consequent electrocution occurred at a point many miles distant from the place at which the high tension wire touched a guy wire running from one of the telephone poles to the ground.

Somewhat more closely analogous to the situation that may possibly arise in connection with atomic energy operations are the fire and stream pollution cases. In an early case the Missouri court held the defendant railroad liable on the ground that it should have reasonably anticipated the injury that resulted and that there was no independent intervening agency which would excuse the defendant.[21] In this case grass on the right of way of the railroad was negligently set on fire. The fire burned the grass for a distance of three miles and then apparently died out. A hard wind revived the dying fire the next day, however, and it finally destroyed the plaintiff's house some five miles

[19] [1946] A.C. 401.

[20] 38 Mont. 521, 100 Pac. 971 (1909).

[21] Poeppers v. Missouri, Kansas & Texas Ry., 67 Mo. 715, 29 Am. Rep. 518 (1878).

away. The court held the defendant liable, noting that high winds were not infrequent in the area and should have been anticipated.

In a much more recent case the New Hampshire court made an interesting distinction that may be applicable to atomic energy situations. In *Beard* v. *Boston and Maine Railroad*[22] the court drew a line between the plaintiffs whose homes abutted the railroad property and those that were located four to six miles distant from the point where the fire was started by the negligence of the railroad. The cause of action arose under a statute imposing strict liability, but on the question of what plaintiffs were to be protected the court seemed to be using the foreseeability test. The court said:

> . . . [The statute] was not intended to apply to all damages . . . regardless of the intervening factors of time, distance, manner of communication and other circumstances which may vary from fire to fire.[23]

Two cases involving stream pollution show the conflict in approach one finds among the various courts. In *Hoag* v. *Lake Shore & Michigan Southern Railroad Co.*[24] a train loaded with crude oil was involved in a wreck caused by the negligence of the engineer who failed to notice a landslide on the tracks. The cars burst and the oil caught fire and ran into a nearby creek. The plaintiff's house, located several hundred feet downstream was damaged. The court held that it would be unreasonable to conclude that the engineer should have anticipated the burning of the plaintiff's property as a consequence of his negligent failure to keep a sharp lookout. The court mentioned among other things that applying liability to the defendant in this case "would be a severe rule to apply, and might have made the defendants responsible for the destruction of property for miles down Oil Creek." [25] The court felt that the flowing stream was an intervening independent agency, making the cause too remote and hence the imposition of liability unjustified. Three years later a New Jersey court came to the opposite conclusion [26] on somewhat similar facts. In this case there was a negligently-caused train collision. One of the trains included twenty-five cars loaded with oil. The oil tanks burst and the contents ignited when they came into contact with the fire of the locomotive; the oil ran into a small creek and thence into a larger river and from there to the

[22] 99 N.H. 469, 115 A.2d 314 (1955).
[23] *Id.* at 471, 472.
[24] 85 Pa. 293, 27 Am. Rep. 653 (1877).
[25] *Id.* at 299.
[26] Kuhn v. Jewett, 32 N.J. Eq. 647 (1880).

plaintiff's building on the bank of the river. Criticizing the *Hoag* decision, the court used the following language:

> . . . [W]here a fire originates in the negligence of a defendant, and is carried directly by a material force, whether it be the wind, the law of gravitation, combustible matter existing in a state of nature, or other means, to the plaintiff's property and destroys it, and it appears that no object intervened between the point where the fire started and the injury, which would have prevented the injury, if due care had been taken, the defendant is legally answerable for the loss.[27]

The so-called rescuer cases have brought forth some of the most extreme extensions of the foreseeable risk test in determining duty. Certainly similar situations will arise in the atomic energy area. One of the classic cases is *Hines* v. *Morrow*.[28] There the defendant was negligent in allowing a mud hole to remain in the highway. The plaintiff rescuer broke his wooden leg in attempting to tow a stalled car out of the hole. The wooden leg became stuck in the mud and a loop in the tow rope caught on the leg causing it to break. The court said this was foreseeable. Again in *Lynch* v. *Fisher*[29] we find another extension of the foreseeability doctrine. The defendant left a truck on the highway at night without lighting flares. Another car crashed into the unlighted truck and caught fire. The plaintiff, in the role of rescuer of the occupants of the car, returned to the car for a floor mat on which to put one of the victims. The husband of the victim for whom the mat was being procured was temporarily deranged by the accident and shot the plaintiff in the leg with a pistol. The court held the truck owner liable because it was foreseeable that a car might crash into it and that somebody might come to the rescue, even though the particular consequences resulting in injury to the plaintiff could not be foreseen. The court said this was immaterial.

If this kind of injury is within the scope of duty owed by a negligent defendant, it is not difficult to conclude that a rescuer of victims in transportation accidents where radioactive material is being transported would be allowed to recover for any radiation injuries he received in attempting to rescue crew or passengers. The courts now seem to hold that rescuers at least are foreseeable plaintiffs in such situations.[30]

An interesting duty concept somewhat related to the rescue cases is

[27] *Id.* at 651.
[28] 236 S.W. 183 (Tex. Civ. App. 1921).
[29] 34 S.2d 513 (La.2d Cir. C.A. 1947).
[30] Prosser 173.

found in *L. S. Ayres & Co.* v. *Hicks*,[31] where a boy's finger was caught in an escalator in the defendant store. The court held that the defendant was liable although there was no negligence in the construction of the escalator. The defendant was held liable because it was slow in coming to the assistance of the boy and stopping the machinery so that he could be released. The court said there was a duty to come to the assistance of a person who had been injured by an instrumentality under the defendant's control. This case raises a question as to the extent of the duty resting on a person controlling a radiation source who in a non-negligent, and therefore non-liable, manner exposes another to radiation. Perhaps there is a duty not only to stop the exposure as soon as possible, but also to see that the victim is at least warned of the need for specialized medical care. This latter suggestion, of course, is an extension of the facts in the *Hicks* case, but even treatment may be required if it should prove necessary to give immediate and specialized care to minimize the radiation injury.

The reasoning of the Arkansas court in a case decided ten years ago[32] certainly would seem to be applicable to situations that can be anticipated in the atomic industry. In this case the defendant, a chemical company, had sold a weedkilling spray to be used in dusting crops with an airplane. The spray traveled downwind a considerable distance and damaged the crop on the plaintiff's farm. As will be discussed later,[33] the main concern of the court was as to whether or not the defendant was negligent in not having conducted research to determine how far wind could carry its spray. The case, however, also stands for the proposition that distance and the intervention of natural forces do not prevent the imposition upon a defendant of a duty of due care to a remote plaintiff.

Harper and James emphasize the similarity of the inquiry when determining what action is so unreasonably dangerous as to constitute a lack of care and what is the scope of the duty owed. They then point out:

> Neither inquiry stops with what might be called the physical range of foreseeable harm, or with mere proximity in time or space. In both we look to see what natural forces and what human conduct should have appeared likely to come upon the scene, and we weigh the dangerous consequences likely to flow from the challenged conduct in the light of these interven-

[31] 220 Ind. 86, 40 N.E.2d 334 (1942).

[32] Chapman Chemical Co. v. Taylor, 215 Ark. 630, 222 S.W.2d 820 (1949).

[33] See text *infra* at note 54.

> tions. And in this inquiry foreseeability is not to be measured by what is more probable than not, but includes whatever is likely enough in the setting of modern life that a reasonably thoughtful man would take account of in guiding practical conduct. Just as this broadening of the quest adds to the risks which may make conduct unreasonably dangerous, just so does it add to the range of duty. Dynamite caps carelessly left accessible to children may be long hidden or taken many miles before there is an explosion. An automobile made defectively in Detroit may be sold in Seattle or Miami before it brings harm. The victim of the explosion or the defect is none-the-less within the class to which the duty is owed.[84]

For each example they cite two cases upholding their conclusions.

The application of this kind of reasoning to atomic energy cases seems very likely. This means that the peculiarities of atomic energy, which will cause long delayed injuries, at great distances from the negligent act and possibly occurring after many chemical transmutations, will not prevent imposition of a duty to use due care toward all those parties who reasonably could have been foreseen as likely to come in contact with the radioactive material.

It is the conclusion of the present writers that in those cases where strict or absolute liability is not applied, atomic energy cases, insofar as the scope of duty is concerned, will be decided in accordance with the normal rules, although the fact situations will call for application of those rules in somewhat different situations than have been known heretofore. It seems rather clear that the courts will not impose a duty on defendants as to all persons that may possibly be injured by radioactive substances negligently released. Whether stated in terms of scope of duty, foreseeability, or proximate cause, some such limitation seems very likely. It is even possible that a court, as a matter of social policy, will place such a limit on possible plaintiffs so as not to impede unduly the development of a new industry. It seems equally clear, however, that the range of plaintiffs to whom the atomic energy entrepreneur will be liable is extremely broad, and that time, space, and transformation characteristics of radiation sources will not place any very serious limitations on the rights of injured persons to recover.

2. Breach of the Duty to Use Due Care

In establishing his right to recover from a particular defendant the plaintiff must show not only that the defendant owed a duty to protect

[84] Harper & James 1019-20.

plaintiff against the type of injury sustained, but he also must show that the defendant's actions were negligent in the sense that they did not meet the standard of conduct legally required *in such circumstances.*

Frequently in analyzing the breach question courts will use the word "duty." They may say there is a "duty to use due care," or there is an affirmative "duty to warn" or to take advantage of new techniques. In these cases, however, courts are using it to state that the reasonably prudent man in the circumstances, either would not do certain things or would do others, and if defendant fails to meet this duty it constitutes a breach of the required standard of conduct. It is not enough, of course, merely to state that there is such a duty; the standard of conduct must be defined and this is a fact to be found by the jury or the court if there is no jury. At the appellate level this means that the inquiry is whether or not there is sufficient evidence to support the finding below.

a. General Principles Concerning the Standard of Conduct

There have been many attempts to define what is meant by negligence. One of the earliest definitions by a legal scholar states that it is "conduct which involves an unreasonably great risk of causing damage." [35] The Restatement calls it conduct "which falls below the standard established by law for the protection of others against unreasonable risk of harm." [36] Harper and James summarize it as failure to do "what the reasonably prudent person would do under the circumstances." [37] Prosser, after quoting the above, along with many other statements by courts and legal scholars, emphasizes the need for taking particular circumstances into account when he says, "The conduct of the reasonable man will vary with the situation with which he is confronted. The jury must therefore be instructed to take the circumstances into account; negligence is a failure to do what the reasonable man would do 'under the same or similar circumstances.'" [38]

Much has been written [39] about what the reasonable man is and what constitutes a standard of conduct sufficient to avoid the charge of negligence. Very little of the literature is of any value to the lawyer advis-

[35] Terry, "Negligence," 29 Harv. L. Rev. 40 (1915).

[36] Restatement, Torts §282 (1934).

[37] Harper & James 902.

[38] Prosser 125.

[39] Prosser uses 50 pages beginning at Prosser 124. Harper and James use 120 pages, beginning at Harper & James 896. See also dozens of law review articles on all phases cited in each treatise on various phases of the concept of the reasonable man.

ing clients in the atomic energy business. The questions of whether defendant or his agents are blind, insane, drunk, of tender years, or have normal intelligence, memory, and perceptive abilities are not likely to be involved in radiation cases. In any event it is difficult to believe that a jury pays much attention to these distinctions lawyers have concocted to describe that hypothetical person, the reasonably prudent man, that "ideal-normal" being (if there can be such a combination).[40]

(1) Specific Standard Not to Be Found in the Cases

It would be helpful to the atomic energy lawyer if one could distill from the cases some specific standard of conduct expected of persons using dangerous material, compliance with which would give immunity from tort liability. Such analysis would be of great help to the nuclear entrepreneur in establishing operating procedures. Unfortunately, after searching literally hundreds of cases, the writers have found nothing of any real significance establishing what is the standard expected of the reasonably prudent man. Certain general cautions will be suggested which have significance in establishing safety procedures, but it is impossible to state what constitutes due care in general—it always must be related to the specific facts of each individual situation. The authors have come to the conclusion, although with disappointment, that the treatise writers are correct when they state that the proper rule, and the one that almost always is followed by the courts is that the standard of conduct legally required "depends upon the circumstances." Prosser states it as follows: "Although the language used by the courts sometimes seems to indicate that a special standard is being applied, it would appear that none of these cases should logically call for any departure from the usual formula. What is required is merely the conduct of the reasonable man of ordinary prudence under the circumstances, and the greater danger, or the greater responsibility, is merely one of the circumstances, demanding a greater amount of care."[41] He then con-

[40] In Herbert, Misleading Cases in the Common Law (2d ed. 1927), cited in Prosser 125, the author characterizes the reasonably prudent man as "this excellent but odious character [who] stands like a monument in our Courts of Justice vainly appealing to his fellow-citizens to order their lives after his own example."

[41] Prosser 147-48. For cases using language about the high degree of care, see, *e.g.*, Read v. Lyons & Co., [1946] 2 All E. R. 471 (munitions factory—dictum); Rakowski v. Raybestos-Manhattan Inc., 5 N.J. Super. 203, 68 A.2d 641 (1949) (discussed *infra* note 175); Merlo v. Public Service Co., 381 Ill. 300, 45 N.E.2d 665 (1942); and Chase v. Washington Water Power Co., 62 Idaho 298, 111 P.2d 872 (1941), both dealing with electric utility power lines, discussed *infra* Chapter IV. See also language in Chapman Chemical Co. v. Taylor, *supra* note 32.

cludes that while some courts talk in terms of degrees of care, really all they are saying is that the circumstances require somewhat greater precautions on the part of the defendant, but that it is still the same standard; *i.e.*, what the reasonably prudent man would do under the circumstances. Harper and James put the concept in somewhat different terms, but essentially it amounts to the same thing. They conclude that it is impossible to state in general what will be considered negligent or not negligent. Instead they say there are three factors which must be weighed in each case in determining whether or not the standard of non-negligent conduct was met by the particular defendant in the particular circumstances. These three factors are: (1) the likelihood of harm; (2) the seriousness of the potential injury; and (3) the value of the interest to be sacrificed.[42] They conclude that the amount of caution required tends to increase with the likelihood that the conduct will cause damage to others. They also conclude that the amount of care demanded will increase with the seriousness of the injury that will result if an accident happens.

The first two factors must be balanced, though, against the third, that is, what is sacrificed if we are to avoid the risk created by the danger. Their conclusions are consistent with those drawn by Prosser and are aptly summarized by them in a quotation from an old Nebraska opinion. The case involved injury to children from playing on a railroad turntable, and the court said:

> The business of life is better carried forward by the use of dangerous machinery; hence the public good demands its use, although occasionally such use results in the loss of life or limb. It does so because the danger is insignificant, when weighed against the benefits resulting from the use of such machinery, and for the same reason demands its reasonable, most effective and unrestricted use, up to the point where the benefits resulting from such use no longer outweigh the danger to be anticipated from it. At that point the public good demands restrictions. For example, a turntable is a dangerous contrivance, which facilitates railroading; the general benefits resulting from its use outweigh the occasional injuries inflicted by it; hence the public good demands its use. We may conceive of means by which it might be rendered absolutely safe, but such means would so interfere with its beneficial use that the danger to be anticipated would not justify their adoption; therefore the public good demands its use without them. But the danger incident to its use may be lessened by the use

[42] Harper & James 930-36.

> of a lock which would prevent children, attracted to it, from moving it; the interference with the proper use of the turntable occasioned by the use of such lock is so slight that it is outweighed by the danger to be anticipated from an omission to use it; therefore the public good, we think, demands the use of the lock.[43]

There are a few situations in which the courts have tried to work out, as a matter of law, certain standards of conduct which, if met, will immunize the defendant from a charge of negligence, or, if not met, will establish negligence. The cases in which anything like a set of standards has been worked out, however, involve situations having no application to atomic energy operations. Usually they have involved railroad crossing situations, such as the rule to stop, look, and listen. Sometimes, in automobile or pedestrian cases the courts have laid down absolute rules defining negligent action. None of these has any application to the complicated scientific and engineering activities which will be involved in the atomic energy business. Actually, most of the cases merely state what the defendant did or failed to do, and the jury, or the court, as the case may be, concluded that this either was or was not negligent. Since most of the cases speak in these general terms, all that can be concluded is that what was held to be negligent conduct in any specific case will be held to be negligent again only if exactly the same set of circumstances arise. This latter condition means there is no practical value whatsoever in using these cases to determine whether or not a person's actions in a new situation meet the legal standard. A plaintiff has to show only that the defendant's conduct in the particular circumstances was not up to the prescribed standard; he does not have to show what would have constituted proper conduct. Courts have been reluctant to do more than conclude in a particular case that the standard of due care was or was not met without any real discussion of why this was so, other than that the reasonably prudent man under the circumstances would or would not have done it this way. We agree with the treatise writers that each case turns on its own facts and that a given set of circumstances seldom if ever arises a second time.

It is true that Mr. Justice Holmes apparently felt that detailed minimum or maximum standards of conduct could be worked out by the courts over a period of years as situations occurred and reoccurred.[44]

[43] Chicago, Burlington & Quincy R.R. v. Krayenbuhl, 65 Neb. 889, 903, 91 N.W. 880 (1902).

[44] "A judge who has long sat at *nisi prius* ought gradually to acquire a fund of experience which enables him to present the common sense of the community in ordinary

Desirable as this would be from the standpoint of the potential defendant, the conclusion of the treatise writers that this is not what the courts have done seems justified. While much of the discussion in the treatises deals primarily with the question of whether it is for the court or the jury to determine negligence, it seems quite clear that the same conclusion would be reached whether the judge or the jury makes the final decision. It is generally agreed, of course, that the jury in the usual case should make the decision.[45]

We see nothing in the atomic energy area to cause the application of any different rules for the standard of care than the one described above. The character of radioactive material, both as to its potentiality for harm and as to the likelihood that harm will result from its use, does not seem to call for the application of any different rules concerning the required standard of conduct. In some cases, where the material is very dangerous and well might travel long distances, last a long time, and expose many people, extraordinary precautions will have to be taken. Where the danger is very slight surely the courts will find that much less by way of precautionary steps will be required. Because we have knowledge of the unusual characteristics of radioactive materials, however, it behooves the person using them to think seriously about the degree of risk involved and what precautions can be taken without undue impediment to the effective utilization of their many beneficial characteristics.

(2) Some General Cautions to Observe

Although it is impossible to establish affirmatively what will be considered reasonable, perhaps it will give perspective to the atomic energy lawyer if we consider what courts have stated about the degree of caution that must be used if one is to avoid a charge of negligence. Sometimes courts speak of the need to use a high standard of care, but they seem to be saying merely that under the circumstances, because the

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instances far better than an average jury. He should be able to lead and instruct them in detail, even where he thinks it desirable, on the whole, to take their opinion. Furthermore the sphere in which he is able to rule without taking their opinion at all should be continually growing." Holmes, The Common Law 124 (1881).

[45] In Detroit & M.R.R. v. Van Steinberg, 17 Mich. 99, 120-21 (1868), Judge Cooley remarked, "The case, however, must be a very clear one which would justify the court taking upon itself this responsibility. . . . The difficulty in these cases of negligent injuries is, that it seldom happens that injuries are repeated under the same circumstances; and, therefore, no common standard of conduct by prudent men becomes fixed or known."

substance or situation may be quite dangerous, a reasonable and prudent man would use greater precautions, not that there is a higher basic standard of due care. For our purposes there are three groups of cases indicating at least certain kinds of precautions which might be required of persons dealing with radiation hazards.

(a) An Obligation to Keep Abreast of Technological Developments—Use of Experts

The concept most likely to be troublesome in atomic energy negligence actions is the requirement that users of dangerous material keep abreast of available safety techniques and methods of evaluating hazards. This is a new and rapidly developing science about which there is a great deal to be learned, even as to the fundamentals. Especially for the users of high level radiation sources within the intermediate range of radioactive half-lives, it is important to keep up to date as to safety techniques.

An application of the general idea that one must keep up with the times is found in the decision in *The T. J. Hooper* case.[46] The loss of two coal barges in a storm was held to be the result of the defendant's negligence in not equipping his tug with a radio receiving set which would have enabled the master to keep in touch with the shore and learn of the approach of the storm in time to have taken shelter. Judge L. Hand concluded that radio was a well known device in 1928 and could have been installed quite cheaply. He reached this conclusion notwithstanding the fact that of all the tug lines, only one used radio receivers on its boats.

The degree of foresight that may be required in the name of what is reasonably foreseeable and what is a reasonable device for the prevention of accidents is illustrated by *Marsh Wood Products Co.* v. *Babcock & Wilcox Co.*, a Wisconsin case decided in 1932.[47] In this case the construction company (which is now in the business of constructing atomic reactors) was held liable for the injuries resulting from the explosion of a boiler tube. The tube had exploded under the pressure of eighty pounds of steam although it was designed to withstand one hundred-fifty pounds. Plaintiff's evidence consisted chiefly of the testimony of a university professor of metallurgy. He had prepared samples of the tube for a microscopic examination to discover the texture

[46] 60 F.2d 737 (2nd Cir. 1932).

[47] Marsh Wood Products Co. v. Babcock & Wilcox Co., 207 Wis. 209, 204 N.W. 392 (1932).

and structure of the steel and thus to ascertain its soundness. He testified that his examination of the steel indicated that there were impurities which well may have caused the rupture. The defendant in the case selected the highest quality steel available in the industry, made the usual hydrostatic test at a pressure of a thousand pounds to determine soundness, and found no leaks. The plaintiff's witness stated that he thought a microscopic examination was required if one was to be sure that the steel was sound. He admitted, however, that he knew of no single manufacturer or seller of tubes who made such an examination during the course of the manufacturing operations. In deciding whether this evidence justified submission of the question of due care to the jury the court stated:

> Is this evidence sufficient to permit the jury to find that the failure to institute the metallographic examination by defendants constitutes negligence? We have concluded that it is sufficient. It represents the judgment of recognized experts in the field as to the requirements of the art in which they are experts, and it is our conclusion that the jury might accept the opinions as establishing the reasonableness of instituting this test and the necessity for its institution in order to discharge a duty of due care. The fact that it was not the practice of tube manufacturers generally to use these tests, and that such an examination is not incorporated in the specifications of the American Society of Mechanical Engineers, or required or provided for in the Wisconsin Boiler Code, is certainly strong evidence against the position taken by the Professors McCaffery and McKay, but it does not dispose of their evidence as a matter of law. . . . Obviously, manufacturers cannot, by concurring in a careless or dangerous method of manufacture, establish their own standard of care.[48]

In *Trowbridge* v. *Abrasive Company of Philadelphia*,[49] plaintiff sued for damages caused by disintegration of an abrasive wheel. Here again the defendant followed the practice of the industry and tested only the centrifugal stress of its products. No test was made of the stress of vibration and impact or shock on grinding wheels and the possibility of disintegration from these forces. Again a university professor testified that adequate equipment for testing these stresses could and should have been designed for the abrasive industry since there was sufficient basic knowledge in other industries to make such tests feasible. A verdict of $150,000 was upheld.

[48] *Id.* at 218-19.
[49] 190 F.2d 825 (3d Cir. 1951).

These cases are very important for our purposes, not only because they indicate the necessity of making use of the best possible safety devices so long as they are economically feasible but also because the cases involved the use of expert witnesses to establish what is a reasonable course of conduct under the circumstances. It is clear that the same kind of expert witness will be needed in most radiation cases.

It should be remembered in considering this problem that it is not enough that the defendant use his own best judgment or that he believes he has acted with reasonable care. Beliefs or desires to act reasonably are never a defense.[50] It is also true that in general one must comply with the customary practices of a particular industry or area of activity to avoid a charge of negligence, and that compliance with those customary standards in many cases will justify a finding that the defendant acted with due care.[51] The cases discussed above make it perfectly clear, however, that compliance with the customs of the industry will not necessarily be sufficient,[52] but is merely evidence bearing on the question of what circumstances require by way of reasonable conduct. The cases also clearly demonstrate that, in dealing with material which calls for extra precautions and special knowledge, one must take advantage of advice that can be obtained from recognized experts in the field and that the standard of care usually will be the standard suggested by the experts. Certainly the cases described above follow this principle.

One other case warrants discussion at this point, not only because it indicates the kind of imagination that may be required of a defendant but also because it illustrates the questions that may arise when expert witnesses are used. The defendant in *Air Reduction Co.* v. *Philadelphia Storage Battery Co.*[53] furnished tanks of oxygen under pressure to the plaintiff and provided a manifold to control the release of the gas. Fire broke out while the oxygen was being delivered through the manifold and the plaintiff's factory was destroyed. The experts produced by the plaintiff testified that a steel surface, especially if it was bored, when exposed to oxygen under pressure created a likelihood of fire. They also testified that the use of brass, copper, or cast pipe of any material would reduce the danger. In spite of the fact that the defendant's experts gave testimony leading to the opposite conclusion, the court

[50] The Germanic, 196 U.S. 589, 25 S.Ct. 317 (1905); Hover v. Barkhoof, 44 N.Y. 113 (1870); Prosser 124; Harper & James 874, 898.

[51] See cases cited at Harper & James 978, n. 5.

[52] Harper & James 977 ff.; Prosser 135 ff.

[53] 14 F.2d 734 (3d Cir. 1926).

upheld the jury's verdict for the plaintiff. This case again indicates the degree of foresight and the kinds of precaution for which the defendant may be held responsible. It seems to be exactly the kind of situation that may arise in the atomic industry where much is still to be learned about the science.

This case, of course, deals with a manufacturer's product liability, and the negligence questions arising in such cases are discussed more fully in Chapter V. These cases do furnish some general principles, however, which undoubtedly will control cases that do not involve product liability. Many of them do illustrate the degree to which the courts may hold a defendant responsible for following out a line of research directed toward minimizing the risks inherent in the use of materials which can cause serious injury. The *Chapman Chemical Company* case[54] (involving the spread of weedkiller dust for several miles so as to destroy the plaintiff's crops) and the *Pittsburgh-Des Moines Company* case[55] (concerning the failure of a new design of tank to hold liquefied gas) illustrate the proposition that, when dealing with a material known to have a great potential for harm, one is under an obligation to use extreme caution and explore all feasible means of reducing the risk of injury.

All these cases demonstrate that it is not enough to have acted in good faith or to have depended upon the opinion of just any expert. They also make it clear that when experts differ as to what is a reasonable standard of conduct the defendant probably will have to run the risk of submission of this issue to the jury. In some cases at least it will be necessary to go beyond the present custom of the industry in taking precautions. There is no reason to think these principles, developed chiefly in manufacturer's liability cases, will not be applied to negligence cases generally. It is recognized that radioactive materials are dangerous. The publicity that attended the dropping of the original A-bombs in Japan and the many testings of A- and H-bombs since then have made the general public aware of the dangerous potential of radioactive materials. No one can plead ignorance of its dangerous qualities. Since the potential for harm is relatively great, the courts very likely will find, perhaps as a matter of law, that the handling of even small quantities of these materials without the advice of experts is negligence. Certainly a jury would be permitted to so conclude. In fact, this would

[54] *Supra* note 32.

[55] Moran v. Pittsburgh-Des Moines Co., 166 F.2d 908 (3d Cir. 1948); Foley v. Pittsburgh-Des Moines Co., 363 Pa. 1, 68 A.2d 517 (1949).

seem to be justified by the policy decisions which Congress made in enacting the Atomic Energy Act of 1954—that this material is potentially very dangerous and should be handled with due regard for the public health and safety.

(b) Duty to Reduce Hazard After Accident—Obligation to Warn and Treat

The above cases, and others noted in the product liability chapter, deal with what one might call a duty to discover dangers and to evolve precautionary techniques when using new and hazardous substances. The law of negligence ordinarily does not impose an affirmative responsibility upon a person to use all reasonable efforts to save others from injury or to reduce injury which the person himself did not assist in creating. The escalator case [56] dealt with a situation where at least the defendant was responsible for the creation of the machine which did the injury and which the defendant had invited the public to use. This kind of case may indicate that the operator of an atomic reactor, even if he should not be held strictly liable, may be held to a standard of conduct which will minimize the losses occuring in the event of a non-negligent discharge of radioactive material endangering persons or property. While a categorical answer cannot be given, it would not seem unreasonable for a court to conclude that such entrepreneurs, should the accident happen and endanger many lives, must take proper precautions to reduce the resultant injury even though they are not held legally responsible for the accident itself. This may dictate that the reactor operator prepare plans to give warning of the danger should it arise, to cooperate in the evacuation of personnel if this seems wise under the circumstances, and to direct the decontamination procedures that may be required should a serious reactor burn-up occur. While the danger may be somewhat less in other activities involving the discharge of radioactive material into streams or into the air from other operations, the same basic principle would seem to apply. *The user of radioactive materials may be required not only to give warning of the discharge and consequent danger but also to participate in the steps needed to minimize the resultant injuries.* In the event of a serious reactor incident, it might be best not to warn people of the potential danger since such warning could cause panic. Certainly attempting the evacuation of a large city within the space of a few hours before a radioactive

[56] *Supra* note 31, where the defendant was held liable for not acting fast enough in aiding a boy caught in the escalator.

cloud covers the city might cost more lives than keeping people within their houses. This is not the kind of decision that should be made by default, however, on the theory that if one refuses to recognize a danger it may go away. It should be a decision deliberately reached, in consultation with public officials who would, of course, have to participate in any such evacuation plan. Even persons who use radioactive materials in industrial or research operations where the potential for harm is much less should consciously make the same kind of decisions and work out disaster or accident plans with appropriate public officials, such as, city water departments or highway police.

(c) Duty to Use New Radiation Techniques

Radioactive material not only has a great potential for harm but also an even greater potential for good by way of assistance in research efforts. This fact itself creates an interesting problem which might be described as the other side of the coin. As mentioned above, although the law ordinarily does not require affirmative action by one not responsible for the creation of a dangerous situation, there are certain situations in which it recognizes that the relationship between the parties dictates that one of them take reasonable steps to prevent, minimize, or eradicate a dangerous situation. The most obvious example of this is the duty of the doctor to take reasonable steps to cure his patient. Even though he is not responsible for the patient's becoming ill, he is under an obligation to take such reasonable steps as other doctors would take under the circumstances. Most of the malpractice cases have involved an affirmative action of the doctor which increased the injury. There seems to be no reason, however, why a doctor should not be held negligent if he fails to make proper use of new diagnostic or research techniques which radioactive isotopes make available to him. One cannot foresee at the present time just what uses of radioisotopes will become common practice in the medical profession, but it is not difficult to predict that many uses will become generally accepted. The use of radioactive iodine 131 to detect the malfunctioning of the thyroid in a new infant while still in the mother's womb (thereby preventing cretinism) may be one example that someday will fit in this new category. The location of brain tumors and the treatment of hyperthyroidism by the use of such materials certainly is becoming more common, even though as yet it is not so well established in the medical community

that it would be considered a lack of professional skill to fail to use it.[57]

The situation here contemplated is more like the case where a patient goes to a doctor under the assumption that he needs treatment, and the doctor makes a faulty diagnosis. *Kuhn* v. *Banker*[58] comes close to illustrating this affirmative duty. There the doctor properly set part of a broken femur bone in the patient and a union apparently formed. The doctor was held guilty of negligence, however, for failing to use an X-ray photograph to determine the reason for the patient's complaint at a later time that there was a grinding sensation in her hip where the broken bone was located. The court clearly suggested that the attending physician was negligent in failing to use an X-ray photograph in these circumstances. The court held, however, that since no evidence was offered to show that the ultimate failure of the break to heal was caused by the failure to diagnose the case correctly there was no proof of proximate cause; therefore the directed verdict for the defendant was upheld. There are a number of other cases in which the court held in one way or another that failure to use X-rays as a diagnostic technique would constitute negligence under the proper circumstances.[59]

Even though the defendant is in no way responsible for the plaintiff's dangerous position, these cases perhaps support the proposition that, because of the status relationship (in this case that of doctor-patient), the defendant is obliged to take account of new devices, information, or techniques which will make those services more adequate for the needs of the plaintiff. This responsibility might arise in connection with the designs, architectural plans, or scientific advice[60] used in a building, machine, or material going into the construction or operation of a reactor. Notwithstanding the fact that the malpractice cases indicate a very broad range of permissible judgment in which the professional person will not be held liable for a wrong judgment, it is possible that the courts may hold that the service must be rendered with imagination and with some ability to foresee the usefulness of new techniques.

[57] See T. J. Hooper case, *supra* note 46 (tug company liable for loss of barges in storm for failure to install radios); Marsh Wood Products Co. case, *supra* note 47 (storage tank manufacturer liable for failure to use metallographic surveys of boiler tube steel); and a case reported in the N.Y. Times, June 15, 1955, p. 63, cols. 1, 2, in which a California couple initiated suit against Cutter Laboratories and a local retail distributor as a result of their four-year-old son's contracting polio after vaccination.

[58] 133 Ohio St. 304, 13 N.E.2d 242 (1938).

[59] 115 A.L.R. 298 ff. (1938).

[60] Prosser 132-33 cites dentists, attorneys, engineers, accountants, druggists, X-ray operators, oil well shooters, threshers, and restaurant operators as other skilled trades where one must use a certain minimum of skill and knowledge.

Radiation as a source of energy or as a research tool surely will present many such possibilities.

In discussing the standard of conduct required, Prosser makes one statement which might be interpreted as indicating the existence of an affirmative duty not unlike the kind suggested here.

> In many situations, a failure to disclose the existence of a known danger may be the equivalent of misrepresentation, where it is to be expected that another will rely upon the appearance of safety. The surgeon who remains silent when he discovers he has left his tools in the patient's anatomy, the landlord who leases defective premises, the landowner who permits a licensee to enter without warning of hidden perils, the seller or supplier of a chattel who fails to disclose its dangerous nature or its concealed defects, each may be liable to the person with whom he deals, or to others to whom harm is to be expected through that person's reliance.[61]

Again, in discussing the duty concept Prosser points out from other cases that when a person voluntarily assumes a certain relationship to others, there may be the duty of affirmative conduct. After stating that in most of these cases the person held liable had made the situation worse than it was before, Prosser says:

> In four cases involving gratuitous repairs by landlords, any such requirement has been rejected, and the defendant has been held to the obligation of reasonable care in his undertaking, although the plaintiff has not been further endangered, misled or deprived of other help.[62]

Although these statements, and the cases cited in support of them, do not go quite as far as is suggested in our analysis above, recently they have been interpreted by the 4th Circuit Court of Appeals in a very broad manner. The decision comes rather close to the kind of affirmative duty we are suggesting. In *Union Carbide & Carbon Corp.* v. *Stapleton*,[63] the court held the defendant corporation liable for failing to inform the plaintiff employee that a routine medical examination had indicated an inactive tuberculosis spot on his lung. After stating that there was no evidence that the tuberculosis which the employee had throughout the period of his employment was caused in any way by the fault of the company or the company doctors (there was no assertion of malpractice nor of negligent failure of the company to carefully select

[61] Prosser 146.
[62] *Id.* at 187.
[63] 237 F.2d 229 (6th Cir. 1956).

a qualified physician), the court held the company liable for not having notified the employee of these periodic findings of an inactive tuberculosis spot. Finding that the disclosure could have been made most conveniently by personnel other than the doctors who made the examination and that the information was of a sort which they certainly could have given to the employee, the court said:

> Failure of the appellant to disclose to Stapleton what its records showed his condition to be was clearly a violation of its duty to exercise ordinary care for his safety. By remaining silent, the appellant permitted Stapleton to rely upon a tacit assurance of safety despite its knowledge of the existence of danger. . . . To warn Stapleton of a known but hidden defect on its property would have been appellant's clear duty. . . . Its duty to warn him of the known but hidden danger here was no less clear.[64]

Admitting the validity of the company's argument that it was under no obligation to make a physical examination and that it should not be penalized for voluntarily undertaking more than its legal duty, the court nevertheless said:

> But, when it undertook to do so, Stapleton was entitled to and did rely on the expectation that he would be told of any dangerous condition actually disclosed by that examination. The appellant was therefore liable for injury to Stapleton caused by its negligent omission to advise him of his tubercular condition.[65]

The court relied upon the statements from Prosser quoted above, but this does not seem completely justified. The case, however, indicates a situation in which a status condition quite unrelated to any obligation to give aid to or protect the plaintiff in the way contemplated nevertheless may impose a duty upon the defendant to take some kind of affirmative steps to give any knowledge he has of potential dangers. The court's emphasis upon the reliance of the plaintiff that a dangerous condition would be reported to him suggests the possibility that an unexpected affirmative duty may result from status conditions that at first glance would not seem to require any action by the potential defendant. This reasoning might be applied to all who use radioactive material which exposes another even though such users were not legally liable for the exposure itself.

[64] *Id.* at 232.
[65] *Id.* at 232-33.

b. Effect of Statutory or Administrative Rulings

The liability of a person handling radiation sources cannot be determined fully without a consideration of the impact of statutory and administrative health and safety regulations. The number and scope of such statutes and regulations, both federal [66] and state,[67] is considerable. These rules and regulations will have considerable effect on the decision as to whether or not the defendant has been negligent.

All of the writers on the subject seem to agree that this problem breaks down into two kinds of cases: (1) those in which the statutes specifically provide civil liability for a breach of the statutory standards or the administrative regulations issued thereunder; and (2) those in which the statute provides only a criminal penalty or simply prohibits action with an injunctive type of enforcement that in no way deals specifically with the problem of tort liability of the violator.[68] For our purposes there is no need to discuss the first category because the federal statute dealing with health and safety matters in atomic energy contains no provisions on possible civil liability from a failure to comply with one of the health and safety regulations of the AEC. There is one catch-all penalty provision, however, making it a crime to violate any of the regulations of the AEC.[69] This certainly would include safety regulations. All other criminal penalty provisions very clearly are directed at violations involving danger to national security.[70] In this respect the federal statute is like the Federal Food and Drug Act,[71] not the Federal Safety Appliance Act.[72] A reading of the entire legislative history of the Atomic Energy Act of 1954 has produced not a single

[66] *Infra* Part IV.

[67] *Infra* Part III.

[68] Restatement, Torts §§285-86. See generally Morris, "The Relation of Criminal Statutes to Tort Liability," 46 Harv. L. Rev. 453 (1933); Morris, "The Role of Criminal Statutes in Negligence Actions," 49 Col. L. Rev. 21 (1949); James, "Statutory Standards and Negligence in Accident Cases," 11 La. L. Rev. 95 (1951); Notes, 32 Col. L. Rev. 712 (1932); 19 Minn. L. Rev. 666 (1935); 13 Corn. L. Q. 634 (1928); 27 Va. L. Rev. 240 (1940); 15 Brooklyn L. Rev. 246 (1950). See also Lowndes, "Civil Liability Created by Criminal Legislation," 16 Minn. L. Rev. 361, 367 (1932).

[69] Atomic Energy Act of 1954, Pub. L. No. 703, Chap. 18, §223, 68 Stat. 191, 958.

[70] *Id.* at §§221, 222, 224-31.

[71] See Kaplan, "Variations on a Single Theme—The Impact of the Pure Food Statutes on Civil Liability," 13 Food Drug Cosm. L. J. 11 (1958).

[72] Harper & James 994, n. 1, citing statutes and cases. There is not even an indirect indication of a legislative attempt to provide a standard of conduct for civil damage cases such as that in the legislative history of the Federal Safety Appliance Act and the provision that any employee injured as a result of a violation of the safety requirements of the act should "not be deemed to assume the risk thereby occasioned."

reference to the question of the effect of federal health and safety regulations on civil liability.[73] Nor is there anything in the legislative history or the provisions of the Price-Anderson government indemnity amendment which gives any hint whatsoever of a congressional intent on this question.[74] We are presented, therefore, with the second situation: What will be the effect of federal health and safety regulations on civil damage suits arising in the atomic energy areas subject to federal regulation? The same general rules apply to a violation of a state statute (and regulations issued pursuant thereto) if violation is made criminal or subject to administrative enforcement, but nothing is said about civil liability.

In a sense all of the federal health and safety standards are administrative in character as are many of the standards set up under state statutes, so it is important to note the distinction that some courts draw between statutory and administrative standards. Some give greater weight to statutory standards, yet all writers on the subject seem to agree that the important issue in both cases is whether to apply a rule of "negligence *per se*" or one of only "evidence of negligence."[75] This same distinction is observed when considering cases in different states when both are dealing with only statutory standards. The real issue in most cases is whether violation of a standard, whether statutory or administrative, is "negligence *per se*" or only "evidence of negligence."[76] For our purposes, therefore, hereafter the distinction between statutory and administrative standards is ignored except where it is mentioned specifically.

One further major point should be kept in mind when considering this problem. Although most of the cases have dealt with the question of whether failure to comply with a statutory standard imposes absolute liability, is negligence *per se*, or is only evidence of negligence, there is another group of cases, in which the defendant pleaded compliance with the statute or administrative standard as proof, either conclusive or presumptive, that he has met the requirement of acting as a reasonably prudent man under the circumstances. As pointed out later, this possibility has considerable significance for the person handling radioactive materials.

[73] Probably the equivalent of 5,000 pages in an ordinary book when hearings are included. There are some references to health and safety matters but nothing referring to this question.

[74] Insurance amendments discussed *infra* at end of Part III.

[75] Morris articles, *supra* note 68; Harper & James 987-1014.

[76] Harper & James 1011, n. 57, and Morris, "The Role of Administrative Safety Measures In Negligence Actions," 28 Tex. L. Rev. 143, 145 (1949).

(1) Failure to Comply

Except in a few odd or anomalous cases which all writers criticize, mere proof that the defendant (or the plaintiff where contributory negligence is pleaded as a defense) has failed to comply with some regulatory or administrative rule of conduct and that the plaintiff has suffered injury is not sufficient to establish a breach of the standard of conduct which constitutes negligence.[77] There must, of course, be a cause-in-fact relationship between the defendant's action and the plaintiff's injury. This is true in every negligence case regardless of whether or not there has been breach of a statutory requirement. Almost all courts agree that no weight should be given to the fact that the defendant breached a statutory standard if the standard was not established to protect the particular class of persons that includes the plaintiff, or if the standard was not created to guard against the particular injury suffered by the plaintiff. The leading case in this area is *Goriss* v. *Scott*[78] where the court refused to hold that the defendant's violation of the statute requiring carriers by water to provide separate pens for stock was any evidence of negligence in caring for the sheep which were washed overboard in a storm. It was clear that the act was directed at keeping sheep or cattle from being exposed to disease on their way into the country.

In many American cases this doctrine has been applied in situations arising under various types of regulations. Examples are, statutes controlling the length of time that trains may obstruct crossings, regulations determining where motor vehicles may stop or park when the regulations are directed at traffic problems such as delay and congestion but are not intended to prevent collisions, provisions requiring licenses for automobile drivers or physicians where the driver or physician actually was competent and met the normal standards of conduct even though he had no license, or Sunday laws which are meant either to observe a religious day or provide a day of rest but not to prevent vehicles which may be involved in accidents from going on the highway, or to prevent business men from fraudulently misrepresenting goods that they sell.[79] While the policies underlying statutes setting up such standards of conduct occasionally are very narrowly construed, in gen-

[77] The odd cases are cited by Harper & James 96, nn. 6, 7, 8.

[78] [1874] L.R. 9 Ex. 125.

[79] Prosser 157-58; Harper & James 1002-1004. For a recent case, see Permenter v. Milner Chevrolet Co., 91 S.2d 243 (Miss. 1956) (defendant left keys in car and thief ran into plaintiff some distance away).

eral the courts give them rather broad construction so long as the hazard actually created comes within the general scope of the harm legislated against and there is a cause-in-fact relationship between the defendant's breach of the standard and the plaintiff's injuries. A recent English case[80] illustrates this liberal interpretation trend. The statute required that roofs in mines should be made secure. Apparently it was directed at preventing injuries from falling roofs. In this particular case the cause of the injury was somewhat different. Before the plaintiff came to the place of injury the roof had fallen, and the pile of debris caused the cart in which he was riding to be derailed. The House of Lords overruled the Scottish court's decision which held that this was a different kind of harm from that intended to be covered by the statute. The House of Lords thought that the statute was directed toward preventing personal injury generally; therefore, since the failure to shore-up the mine roof properly was the cause of the plaintiff's injury, the defendant lost his argument to the effect that the obstruction on the road was too remote from the negligent breach of the statutory standard. There are many American cases which would accord with this kind of broad construction of the statutory purpose in setting up a standard of conduct.

The other generally recognized requirement in treating violation of a statutory standard as negligence is that the person injured must fall within the class of persons meant to be protected by the statute. A good example is a statute which makes illegal normal business activity on Sunday. If a train running on Sunday kills a cow on the tracks, the mere fact that the statutory prohibition against running trains was breached is not sufficient to allow the owner to recover damages from the railroad. An even more graphic example of this proposition, perhaps, is the statute which requires that trains blow whistles when approaching crossings. Even if the whistle is not blown and a cow is killed, it seems rather clear that the statute was not intended to warn cows. Another example is the blackout statute enacted for the protection of the public at large and not for an air-raid warden attempting to put out a light showing in violation of the statute.[81] This statutory purpose limitation is also applicable to the issue of contributory negligence, at least in most courts today.[82]

There is another kind of case in which violation of a statutory stand-

[80] Grant v. National Coal Board, [1956] 1 All E.R. 682.

[81] Cases are collected in Prosser 154, Harper & James 1004.

[82] Harper & James 1004.

ard will not be taken as evidence or proof of the defendant's negligence toward the plaintiff. While there is some difference of opinion among writers as to the exact theory for this exception,[83] there is general agreement that the courts will excuse certain violations of statutory standards. Some of the cases involve situations where the defendant was not at fault and yet violated the statute, such as, in driving on the highway at night without tail lights which had gone out under circumstances beyond the driver's control, or driving on the lefthand side of the street where is was impossible to meet the statutory standard of driving on the right because of temporary obstruction, or when an emergency arises not within the control of the defendant and the only reasonable course of action is to do something in violation of the statute, or taking some precautionary measure that is even better than that required by the statute even though the statute itself is not complied with.

A very interesting excused-violation argument was made in *Ursprung* v. *Winter Garden Co.*[84] The regulation of the superintendent of buildings, requiring a guard around an elevator shaft, had not been published since there was no legal requirement for publication. The court excused the defendant on the ground that there was no proof that he knew of the existence of the code. One writer suggests that there are real possibilities for more frequent use of this kind of defense.[85]

One of the distinctions most often discussed is whether violation of the statutory or administrative standard is negligence *per se* or only evidence of negligence. Writers seem to agree[86] that the weight of authority still is in favor of negligence *per se*. There is a very respectable minority, however, which holds that it is only evidence of negligence, and there is some indication that the trend of authority is in this direction.[87] The reasons for and against each rule are presented very well by Harper and James.[88] For the most part, writers who have given serious consideration to the problem agree that the rule should be one of evidence of negligence only. When one takes into consideration the number of exceptions that must be worked out by the courts when they supposedly follow a negligence *per se* rule, the evidence of negligence

[83] Prosser 158; Harper & James 1004 *et seq.*

[84] 183 App. Div. 718, 169 N.Y.S. 738 (1918), discussed in Morris, *supra* note 76 at 151.

[85] Morris, *supra* note 76 at 146-47.

[86] Early writers thought this; see Prosser 161; Harper & James 997; Morris, *supra* note 76 at 146-47.

[87] Harper & James 1013. But see contrary suggestion by Kaplan, *supra* note 71 at 47.

[88] Harper & James 997-1001.

only seems the preferable one. Undoubtedly one of the reasons why some writers take this position is because the negligence *per se* rule often defeats the plaintiff when he is accused of contributory negligence on the ground that he violated some statutory standard. It is true that the negligence *per se* rule often imposes liability on the defendant or prevents the plaintiff from recovering in a situation where the violation is without fault or negligence in any realistic sense.

As mentioned before, the fact that the standards may be administrative rather than statutory does not change the result except in some jurisdictions. As Morris indicates in his excellent article,[89] there are several jurisdictions in which it is held that violation of administrative regulations is negligence *per se*. He points out that actually the difference between the rule of negligence *per se* and the rule of evidence of negligence only probably is of little significance in most cases. As long as violation can be considered evidence of negligence it is admissible, and this is as far as the plaintiff's lawyer usually needs to go because it allows him to submit the case to the jury. It is quite unlikely that jurors will make very much of the subtle distinction between the two rules. Morris even suggests that as a matter of trial technique plaintiffs' lawyers, except in the most extreme cases, ought to avoid asking an instruction calling for negligence *per se* rules to be applied. His theory is that this does not really change the jury's attitude and it does run the risk of a reversal on appeal if the appellate court follows the rule that violation is only evidence of negligence rather than negligence *per se*.

It is safe to generalize that the practical result in most cases is that violation of a statutory or administrative standard makes a *prima facie* case of lack of due care. This leaves open the possibility that the defendant may be able to show in his particular case that the violation of the rule should not be considered negligence, as suggested later in discussing the validity of administrative rules. It is our opinion that defendants should be forced to accept the burden of showing affirmatively why their failure to comply with the administrative regulations should not be treated as negligence in the particular case. Although some writers on the subject avoid using the *prima facie* case terminology in drawing their conclusions, in effect they reach an equivalent result. The Minnesota court in the recent case of *Lynghaug* v. *Payte* expressly applied the *prima facie* rule where a car owner had *unknowingly* failed to keep his muffler in such condition as to prevent the escape of carbon

[89] Morris, *supra* note 76.

monoxide into the interior of the car, as the statute required. The court said:

> In the absence of excuse or justification, liability follows as a matter of law if, upon proof of violation, the negligence is the proximate cause of the injury. The burden of going forward with the evidence and establishing excuse or justification or such other defense as may be available shifts to the defendant.[90]

It should be remembered, of course, that adopting the *prima facie* case rule cuts both ways; while in many cases it will help the defendants avoid liability by allowing them to show why their action was not negligent in spite of the violation of the rule, in other cases it will help the plaintiffs avoid a defense of contributory negligence *per se* when they violate some administrative or statutory rule of conduct. Harper and James even go so far as to suggest that where the rule is one of negligence *per se* a double standard ought to be used so that it is only evidence of negligence when used against a plaintiff to show contributory negligence.[91] Their avowed position, that all tort law ought to be regarded as a method of compensating as many plaintiffs as possible and distributing the risk of injuries as widely as possible, is probably their real reason for wanting to eliminate the negligence *per se* rule. Dean Prosser agrees with their conclusion that the rule should be evidence of negligence only.[92]

The evidence of negligence rule allows a greater degree of flexibility so that account may be taken of individual differences between cases. Such a rule certainly will cause much less theoretical difficulty for courts when they are faced with the cases which have given rise to the many exceptions to the rule of negligence *per se*. Also it seems eminently more satisfactory in a fast developing field such as atomic energy where statutory and administrative standards are likely to become quickly outmoded and inadequate.

Attacking Administrative Regulations

The federal standards of conduct applicable to atomic energy activities are all administrative in form rather than statutory. The same is true of most of the state standards. Nevertheless consideration should be given to the possible differences between the rules applying to the two

[90] 247 Minn. 186, 195-96, 76 N.W.2d 660 (1956).

[91] Harper & James 999, 1000, n. 21. *Cf.* Prosser 163, n. 92. See also cases collected in Anno., 58 A.L.R.2d 680 (1958).

[92] Prosser 162, n. 83.

kinds of standards, *i.e.*, statutory and administrative. One of these differences is that departure from statutory standards found in criminal laws may result in imposition of a type of absolute liability. No such cases have been found where the violation is of administrative standards only.[93]

The most significant distinction between the two, however, is that the defendant sometimes may attack the soundness of an administrative standard. There are a few statutory standards so ridiculous (*e.g.*, a six m.p.h. speed limit)[94] that a court might not enforce them. For the most part, though, once a statute which includes a specific standard has been enacted, no court will undertake to reverse the judgment of the legislature as to what is the proper standard of conduct. This is not quite so true where the standard is established by an administrative regulation.

When an administrative ruling has been violated, a good argument can be made in a damage suit that it is invalid or unsound on grounds other than those suggested thus far as excuses for non-compliance. Morris gives an excellent statement of the argument.[95] When an attack is made upon the validity of an administrative safety rule in a proceeding to enforce it, the question decided by the court is quite different than when its validity is attacked in a damage suit. In a proceeding to enforce the rule it can be argued that the measure is so unreasonable as to be arbitrary and therefore invalid either because it is not authorized by the statute or because it is unconstitutional. Courts in such cases, however, will not invalidate the measure so long as an honest and reasonable administrator might adopt such a rule. A considerable degree of discretion is left to the administrator in such cases even though it might be proved quite easily that a sounder measure could have been promulgated. On the other hand, in a damage suit based upon proof of negligence because of violation of an administrative safety rule, expert witnesses might agree that the particular safety measures taken by the particular defendant were actually better precautions than those prescribed by the administrative rule. They at least might testify that the administrator's rule was not the general standard of safety adopted by those who deal with the matters which were the subject of the lawsuit. To make the violation of an administrator's rule under such circumstances absolute proof of negligence in a damage action seems quite unjustifiable.

[93] Morris, *supra* note 76.

[94] Prosser 154, n. 3.

[95] Morris, *supra* note 76 at 152 ff.

Another factor that influences courts when the administrative regulatory program is being enforced directly is concern that the upsetting of one rule may weaken the whole regulatory program and make the administrative process quite ineffective. This consequence does not follow from a holding in a particular damage suit that a particular violation of the administrative rule does not constitute negligence *per se*. Finally, it should be noted that when there is a direct action to enforce an administrative rule it nearly always involves a specific determination by the administrative agency that the particular defendant actually has violated the regulation. On the other hand, in a damage suit based upon violation of the regulation, the administrator typically will have made no specific ruling that the defendant's conduct was a violation of regulation. It is not nearly so easy for the court as for the administrator to take into consideration the possibility that there was *practical* compliance with the administrative regulation. To this may be added the argument (also applicable when making violation of a criminal statute negligence *per se*) that in the administration and enforcement of statutory or administrative regulations, the prosecutor or administrator can use common sense in deciding whether the particular action of the defendant under the particular circumstances really amounted to a violation in substance of the statute or administrative standard of conduct. There is no similar restraint on a plaintiff who is making use of the violation to prove the defendant's negligence, since his only desire is to recover damages in the particular case.

Notwithstanding the foregoing possible arguments there is in fact very little actual authority allowing such attacks to be made upon administrative rulings. On the other hand Morris failed to find any cases holding that defendant's proof of the unreasonableness of the administrative ruling is inadmissible.[96] The possibility of using such a defense in an atomic energy case should not be overlooked by counsel. In an area that has developed as rapidly as has the technology of atomic energy, it would not seem at all unlikely that with new developments a sounder safety measure might be found than the one promulgated by the administrative agency on the basis of prior information. If competent experts can demonstrate the greater soundness of the new practice followed by the particular defendant, there would seem every reason to hold that the defendant's conduct was not negligent even though he was in violation of the administrative regulation.

[96] *Id.* at 154-55.

Invalid Statute or Administrative Regulation

Another matter that arises in connection with the use of violation of either statutory or administrative standards of conduct as proof of negligence is the use to be made of such rules or standards of conduct when the statute or administrative order itself is held invalid. All writers seem to agree[97] that if the standard of conduct is invalidated because it is so arbitrary as to be a lack of due process, or is not authorized by the statute, the regulations should not even be admitted as evidence. On the other hand, it is also true that the statutory or administrative standard may be invalidated on a ground that in no way attacks its validity as a general statement of the conduct to be expected of a reasonably prudent man under the circumstances. The invalidity may be because of failure to observe some procedural requirement for the enactment of a statute, or some technical procedural flaw in adopting the regulation. If the contents of the regulation have been made generally known or at least are known to the particular defendant at the time he acted, all seem to agree that the safety standard should be admitted at least as evidence of negligence.

Effect of Federal Pre-emption

One other possible ground for invalidity of a state standard, not mentioned in any of the cases nor by writers in this field, is that of federal pre-emption. There may be several reasons for finding that pre-emption invalidates a state rule, and its use as evidence of negligence should depend perhaps on the reason. Pre-emption may be found because of an actual conflict between the federal and state standards. On the other hand it may arise from the federal government's taking over a general regulatory area even though the specific federal regulations have not been adopted and made effective yet. If the latter is the case, the probative value of the invalid state-imposed standard as evidence of negligence is not diminished, although it may be if there is an actual conflict between the two governmental standards.[98]

A closely related consideration is involved when the administrative regulation, while valid, has no application to the particular defendant. This happened in a California case, *Polk* v. *City of Los Angeles*,[99] where the plaintiff was killed while trimming trees, when he came into contact with a worn spot in the insulation of the line of the defendant

[97] *Id.* at 152. Prosser 160, n. 66, 162, n. 81; Harper & James 1001-14.

[98] See discussion of federal pre-emption generally, *infra* Part III, Chapter V, Section E and specifically discussion *infra* under damages in nuisance. See also *infra* discussion in text at note 699 ff.

[99] Polk v. City of Los Angeles, 26 Cal.2d 519, 159 P.2d 931 (1945).

power company. The company apparently had not followed the practice of making frequent and thorough inspections of its lines as required by the regulatory commission which controlled such practices on the part of privately owned power companies. The company was city owned and therefore not within the jurisdiction of the commission. On appeal the court assumed for purposes of argument that there was no authority of the commission over this power company but nevertheless held that the standard of care set down in the commission's regulations was admissible to prove the standard required of all similar utilities.

Standards Set by Unofficial Bodies

A question not unrelated to those discussed above arises when the defendant has departed from the standards set down by a national safety group. In the area of radiation hazards there is such a committee, the National Committee on Radiation Protection and Measurement, which has been very effective over a long period of years in the promulgation of radiation safety rules.[100] Certainly the safety regulations suggested by this national committee should be received in evidence on the negligence question. There is precedent for this in several cases in which the National Electrical Safety Code published by the United States Bureau of Standards has been received in evidence to prove departure from a reasonable standard of conduct.[101] In the usual case, violation of the code suggested by the national committee probably would be accepted by the jury as rather conclusive proof of negligence.

(2) Compliance as Proof of Non-Negligent Conduct

Governmental safety standards have significance in tort actions not only when they have not been complied with but also when they have been followed by one accused of negligence. Many of the considerations already discussed as important in determining the effect of non-compliance are equally applicable when compliance is asserted as proof of non-negligent action. In addition, while the leading treatises almost ignore the problem,[102] Morris has made an excellent general analysis of this aspect of the problem both as to criminal statutes [103] and administrative

[100] For references to the recommendations of this committee, see *infra* notes 139-43 of Part III, Chapter 5.

[101] Morris, *supra* note 76 at 157.

[102] Prosser 163, 164 and Harper & James 1014 devote one short paragraph to this aspect of the problem.

[103] Morris, "The Role of Criminal Statutes in Negligence Actions," 49 Col. L. Rev. 21, 42 (1949).

regulations.[104] Nevertheless, the matter will be so vital in radiation damage actions that consideration of the application of these general concepts to radiation cases is warranted here. Extensive administrative regulation of safety matters at both the federal and state levels already exists, and most users are willing to abide by them. Use of compliance to show non-negligence should be very frequent.

In considering the effect of such standards it is important to keep in mind that most of the safety measures dealing with radiation hazards involve a judgment based on the balancing of society's interest in the rapid development of this promising new field against the known fact that injuries to specific persons and genetic damage generally are an almost inevitable result of any use of radiation.[105] Likewise important in considering the weight to be given to compliance is the fact that the development of new knowledge is very rapid in this field as indicated by the substantial reduction in the maximum permissible exposure standard in recent years.[106] In the light of these facts, what significance should be attached to compliance with governmental safety standards in tort actions?

It is not possible to reduce all of the cases to a set of simple rules, generally accepted and sufficiently complete to answer even most of the cases likely to arise. Nevertheless, a few general statements can be made with considerable assurance. One is that in many cases courts have accepted compliance with a criminal statutory standard as more or less conclusive proof that the defendant did not act negligently.[107] On the other hand, numerous cases have held that a criminal statute states only a minimum standard and, therefore, it always is possible for the plaintiff to show that compliance with this standard does not meet the standard of conduct dictated by negligence rules.[108] The same is true of administrative regulations.[109] Again, as indicated before in the discussion of *failure* to comply with such standards, it seems to be agreed generally that proof of compliance with criminal statutory or administrative standards certainly should be accepted as some evidence of having used due care but that it ought not to be accepted as conclusive proof. Existing treatments of the subject do not discuss the effect of compliance with a civil statutory standard but there would seem to be no reason for

[104] Morris, *supra* note 76 at 157 ff.
[105] See *supra* Chapter I, subsection on genetic damage.
[106] See Part III, Chapter V, subsection C.
[107] Morris, *supra* note 103. See also cases cited in sources cited *infra* note 108.
[108] *Id.* at 45, n. 80; Harper & James 1014, n. 66; Prosser 164, n. 1.
[109] Prosser 164, n. 2.

treating this case differently from that in which there is non-compliance. Possible distinctions were discussed in the last section and are applicable here.

The present writers feel that, in general, compliance with governmental radiation regulations should be accepted in negligence cases as evidence of having acted reasonably but should not be used as conclusive proof because there are too many variables in such a rapidly developing field. We would apply this rule generally to civil statutory and administrative regulations as well as criminal. Because there has been so little written about the significance of compliance with administrative regulations, it will be helpful to examine some representative cases. We also suggest that there are certain radiation situations in which compliance should be treated as conclusive proof of non-negligence.

In an Arkansas case, *Southwestern Gas & Electric Co.* v. *Deshavo*,[110] a telephone company and a power company were found to have acted with due care in the construction of their lines. Farmers felled a tree where the lines crossed, however, and caused the telephone line to become charged. When sued by a telephone operator who received a shock while using the line, the companies argued that they had complied with the utility regulations for the construction of intersecting lines and could not be held liable. The court held that once compliance was shown the burden was on the plaintiff thereafter to prove that particular acts or conditions created by the companies amounted to negligence. This seems to treat proof of compliance as establishing non-negligence unless something other than the mere creation of the condition by the defendant is shown. There are many general radiation regulations of this same sort, both state and federal, so there are many situations in which the rationale of the Arkansas case could be used by one defending a suit for negligent injuries to another person.

An interesting use of compliance with administrative regulations was made by a plaintiff to meet a claim of contributory negligence in *Rinehart* v. *Woodford Flying Service, Inc.*, a West Virginia case involving a landing accident at a local airport.[111] While a flying contest was being conducted at a local airport the usual landing rules had been changed. The defendants contended that the plaintiff's pilot, under the circumstances, should have circled the field until he saw how the planes were

[110] 199 Ark. 1078, 138 S.W.2d 397 (1940). *Cf.* Merlo v. Public Service Co., *supra* note 41 and Chase v. Washington Water Power Co., *supra* note 41.

[111] 122 W. Va. 392, 9 S.E.2d 521 (1940). The reverse twist is also shown by a recent English case, Marfin v. United Steel Co., [1957] 1 W.L.R. 104.

landing and taking off. The court found, however, that the plaintiff's pilot had complied with the ordinary regulations dealing with landings and, therefore, he had acted correctly and was under no duty to deviate from these regulations and observe local conditions to determine that a different practice for landing was being followed. The court even rejected the defendant's offer of testimony of officials of the federal government, whose regulations the plaintiff had followed, to show the meaning of the regulations in such situations. The court said the regulations were not ambiguous and the plaintiff was justified in following them. Compliance here amounted to a rule of conclusive proof.

Opportunities to use this type of reasoning should arise often in radiation cases where someone has been exposed to radiation but in a situation where the amount of radiation received, or the circumstances in which it was received, does not violate applicable health and safety regulations. The compliance can be argued to prove reasonable conduct by the defendant, or a lack of contributory negligence by the plaintiff.

Perhaps of greater significance for the reactor operator are cases like *Johnson* v. *Maine Central Railroad,*[112] where a government commission had directed the defendant railroad to place warning signs and a flashing signal in a certain way at a particular grade crossing. The commission also had regulated the speed of trains over this crossing and the defendant had complied with all the orders. The court approved the directed verdict for the defendant railroad, stating that the administrative instructions and the compliance with them was conclusive proof of the use of due care. The analogy is very close to that of a reactor license, which the AEC, with the advice of its Advisory Committee on Reactor Safeguards, issues only after determining that the location, construction, design, and proposed operating procedures of the plant are such as to provide the necessary protection of the public health and safety. In respect to these matters, the government agency makes an express finding, in a specific case, concerning a designated radiation device or use of radioactive material to the effect that the defendant's actions are consistent with due regard for public health and safety. If the reasoning of the Maine court should be followed, there could be no finding of negligence in design and operation plans.

Cases such as *Panama Mail Steamship Company* v. *Davis,*[113] also illustrate the rationale that may be used in some radiation situations. In this case public health service officials had inspected the ship after fumi-

[112] 141 Me. 38, 38 A.2d 884 (1944).
[113] 79 F.2d 430 (3d Cir. 1935).

gation by poisonous gas and certified that the holds were safe. A stevedore ordered into the holds by the ship's officers was injured because one of the holds actually was not safe. The circuit court held that judgment for the stevedore was erroneous because the steamship company reasonably had relied upon the health officials' pronouncement that the holds were safe. Much reliance was placed upon defendent's good faith and acceptance of the health officials' determinations as justification for finding the company not negligent.

These cases do not present a situation quite like that arising from the fact that the AEC has made the radiation exposure for government contractors' employees considerably stricter than the old standards which still are applicable to licensees operating their own facilities. It seems clear that the reason for the delay in imposing the stricter standards on licensees is to give them a reasonable time in which to adjust their safety programs. Here, then, is a case where expert opinion indicates that the safer course is to reduce exposure limits; yet, on balancing all the equities, stricter standards should not be imposed at the present time on private licensees. In view of our present lack of knowledge as to exactly how damaging small doses are likely to be over a long period of time, the Commission's exposure regulations cannot be said to fix definitively the point at which radiation becomes unacceptably dangerous. The Commission's finding, however, apparently is a deliberate attempt to balance such factors as the dangers, the necessity for promoting development, and the expense of safety precautions. Taking into account all the interests involved, the standards admittedly are a reasonable compromise. In most cases at least, there will be a reliance by the defendant upon the standards established by the government agency. On the other hand, it is known that there is very good opinion that a stricter standard is a safer course of conduct. Where the AEC has made a deliberate judgment on the specific issue of maximum exposure levels, it may be that this is a case in which a judge should hold that compliance with the requirement is conclusive proof of compliance with a reasonable standard of conduct.[114] For a state court not to accept such a determination by a federal agency in an area where the federal body has the powers to issue rules and regulations may be considered unconstitutional state action because of federal pre-emption.[115]

In general, however, it is important to recognize that mere compli-

[114] Such a view is suggested in Morris, *supra* note 103. Harper and James criticize this view.

[115] See Part III, Chapter V, subsections E2b(1)(a)(i) and (ii)

ance with a statutory or administrative standard often should not be treated as conclusive proof of due care. There are cases[116] indicating that in a particular situation it should have been clear to the defendant that bare compliance with a statutory standard or administrative regulation is not what a reasonably prudent man would do under the circumstances. Undoubtedly, this would be true if the defendant's radiation expert was aware of the fact that the administrative regulations clearly were too lax or that they did not fit the particular situation. This will be true as our knowledge of radiation increases and we discover new dangers not known at the time the pertinent administrative regulations were issued. It seems quite likely that in this kind of case the new and higher standard of care, agreed on by experts in the field, will be applied. Similarly, certain emergencies might arise as to a particular employee or member of the public whose previous exposures made any further exposure inadvisable. Such exposure as permitted by the general regulations might be negligence in these circumstances.

Administrative Silence

Another situation closely related to this limitation is the case where an attempt is made to use the fact that the administrative rules are silent on the point as evidence of the fact that a particular safeguard is not needed. There will be cases, of course, in which a failure of the government agency to order a safeguard to be taken is a deliberate decision that it is not needed. There will be other situations, however, in which silence merely means that the point has not been considered and, therefore, it has no significance in determining whether or not due care requires such action. This idea is exemplified in one of the leading railroad cases, *Grand Trunk Ry.* v. *Ives,*[117] involving the question whether the absence of a crossing flagman constitutes negligence on the part of the railroad. The commissioner was authorized to require crossing flagmen but had not ordered one at the particular crossing where the accident happened. Apparently, the situation at the crossing was such that it was quite reasonable to think that a flagman would be needed. The court held that the commissioner's order which did not include a direction for the employment of a flagman could not be accepted as an administrative determination that one was not needed. In many cases the mere fact that the administrator has passed on some aspect of a particular installation does not mean that he has passed on all aspects.

It also is possible that the administrator's regulation may not take

[116] Prosser 164; Harper & James 1014.

[117] 144 U.S. 408, 12 S.Ct. 679 (1891).

account of a particular situation that may arise. This is illustrated by a case in which a power company, although it had conformed to the clearance rule of the National Electric Code, had not given warning about an installation that was dangerously close to some construction work which its employees knew about. The company was found to be negligent notwithstanding its compliance with the Electric Code.[118] There would seem to be no reason why the same rule would not apply in the case of a statutory or administrative ruling concerning radiation safety.

There also are cases in which the plaintiff has been allowed to attack the soundness of an administrative rule, compliance with which is used by the defendant as proof that he used due care.[119] This is quite like permitting the defendant to attack the soundness of a standard when the claim is made that his non-compliance is proof of negligence. On the other hand, if the regulation is attacked because of a lack of jurisdiction over a particular defendant, this should not make invalid its use as evidence of what is reasonable. So long as the regulation sets up a reasonable standard of care for this type of situation the court well may hold that the defendant is still entitled to a verdict because he has proved compliance with the standard of care expected of a reasonably prudent man; *i.e.,* by showing compliance with the administrative standard.[120]

c. The Care Owed to Licensees and Others

The liability of owners and occupiers of land to various classes of persons who come on the land is a question about which there is considerable confusion as to analysis and terminology as well as conclusions in decided cases.[121] As some of the opinions in recent cases and all the legal writers point out, the old arbitrary distinctions drawn between licensees, trespassers, invitees, the public, and employees are not very helpful in the decision of actual cases. The cases support the general conclusion that even as to trespassers the old familiar rule of no duty to use due care so long as the defendant takes no affirmative action, is being modified, imposition of liability depending upon the kind of trespasser and whether or not there is some kind of expectation of con-

[118] Mississippi Power & Light Co. v. Whitescarver, 68 F.2d 928 (5th Cir. 1934).

[119] Morris, *supra* note 76 at 164.

[120] *Id.* at 165.

[121] Prosser 445-62; Harper & James 1470-1505; Keeton, "Personal Injuries Resulting from Open and Obvious Conditions," 100 U. of Pa. L. Rev. 629 (1952); Anno., 55 A.L.R.2d 525 (1957).

tinued trespass. Certainly as to licensees the rule seems to be shifting toward imposing somewhat greater liability on the owner of the land. There are many cases, however, in which the courts even today draw a rather fine line between the standard of conduct owed to a licensee and that owed to an invitee, particularly if the invitee is on the premises because of some possible pecuniary benefit to the occupier of the land. There is nothing unique in the atomic energy situation which calls for any different analysis from that already available in the literature. To the extent that the courts of the state in which an atomic energy installation is located draw the lines sharply or not at all for most purposes, the same should and probably will be done in cases which involve radiation injury.

There are two situations, however, in which applicability of existing rules to radiation injury cases may impose some unusual standards of conduct on the atomic energy entrepreneur. His lawyer should be particularly careful to take account of these possibilities in planning the owner's course of action.

Duty to Warn

One of these involves the duty of the owner or occupier of land to give warning concerning unusual types of hazards that may not be detected or observed by the visitor or the danger of which the visitor might not be expected to appreciate. As to these hazards there seems little reason to believe that the courts will make any substantial distinction between licensees and invitees as such. They are much more likely to decide the cases on the basis of whether, under the particular circumstances, the defendant acted unreasonably in not notifying the visitors of the specific danger.[122] Most of the cases which have dealt with this problem have involved situations much more mundane than radiation hazards. Nevertheless, the rationale of these decisions seems quite applicable to radiation cases.

A typical example is a 1951 Delaware case, *Maher* v. *Voss*.[123] There the injured woman was an invited guest in the home of the plaintiff. In going to get her coat in what she thought was a closet she injured herself when she fell down a stairway. The defendant's motion to dismiss on the ground that the plaintiff was a licensee only and that therefore no affirmative duty was owed to her was denied. The court said that the old and familiar rule of non-liability did not apply even to a gratuitous licensee if the defendant knew of the dangerous condition and had

[122] Harper & James 1473; Prosser 459.
[123] 46 Del. 418, 84 A.2d 527 (1951).

reason to believe that the licensee might not discover the condition or realize the risk. The court also said that it would be negligent for the possessor of the land to permit the guest to remain on the land without making the condition reasonably safe or warning her about it. The court then concluded:

> The complaints in these cases charge that defendants' negligence consisted of a failure to warn Mrs. Maher of the true nature of the "closet," which is averred to be a grave hazard to one ignorant of its character, when defendants should have known that their guest might be entrapped by it. Under the rules stated above, it cannot be said that the complaints are so clearly defective in showing actionable negligence as to warrant a dismissal thereof.[124]

The court concluded that it could not say as a matter of law that it was beyond the "realm of reasonable foreseeability" that the guest would not realize the danger or appreciate its real extent.

Assumption of Risk

Keeton, in his excellent article,[125] points out the second situation to be noted by the nuclear lawyer. He warns that even as to dangers that are realized by the plaintiff there are cases in which failure to act upon his knowledge of the danger still will not constitute contributory negligence so as to prevent recovery from the defendant. He points out that in these cases the assumption of risk argument no longer constitutes a defense for the possessor of land. He says:

> The idea is sometimes advanced that, for relief to be denied, the full extent of the danger must be as open and obvious to the plaintiff as it is to the defendant. Apparently, therefore, the mere fact that the plaintiff is in a position to be aware of the existence of an appreciable chance of falling is not sufficient to deny relief if the defendant was in a better position to understand the full extent of the damage. It is doubtful that this idea has been fully utilized. It would seem generally that proprietors ought to know more in most instances about the dangers of a particular kind of construction or a particular type of floor than most users and that there would be very few cases where recovery would be denied as a matter of law on the ground of assumption of risk.[126]

The applicability of this doctrine in atomic energy cases seems quite likely. Whether in a particular case it will be found that the plaintiff did

[124] *Id.* at 423-24.
[125] Keeton, *supra* note 121 at 642 ff.
[126] *Id.* at 647, 648.

or should have realized the full extent of the risk may depend on whether or not he is experienced and knowledgeable as to radiation hazards. Certainly there are likely to be many visitors who will be in no position to understand the nature or extent of the hazard present. Under the rules suggested by these cases probably it will be a jury question as to whether defendant acted with reasonable care in failing to give any warning at all or in giving the kind of warning he did. One result might be reached as to a physicist or nuclear engineer and another to a sightseer or other guest who has no knowledge of radiation hazards. This would be particularly appropriate since the ordinary senses of man do not detect the presence of danger by sight, sound, smell, or touch in the usual radiation case. Moreover, as heretofore pointed out in the discussion of radiation technology, what may be a dangerous or harmful dose to one person may not be to another, and the visitor may be in no position to make such a distinction. For example, consider the presence of a visitor who is a pregnant woman. It is well known that irradiation of the embryo during the gestation period creates a significant possibility of serious injury. Depending on the circumstances, including the amount of radiation to which such a visitor might be exposed accidentally, it might be safer for the occupier of land where radiation sources are present to deny access to women of pregnable age.[127]

Warning to Public Officials

In considering the duty to warn visitors, those concerned with radiation hazards should take into account the problem of liability to public employees who come on the property as a matter of right but not in any realistic sense at the invitation of the landowner. There are many persons in this class—postmen, meter readers, inspectors, firemen, policemen, etc. For our purposes, the obligations owed to firemen and policemen present the most interesting legal questions.

While the physical danger presented by the situation in *Shypulski* v. *Waldorf Paper Products Company*[128] is quite different from the hazards inherent in radiation exposure, the reasoning of the court would seem to be equally applicable to the case of a fireman fighting a fire on premises where radiation hazards are present. During the course of inspecting the defendant's building to make sure the fire had been extinguished entirely, a concrete block wall in the factory collapsed and seriously injured the plaintiff fireman. The plaintiff alleged that the wall was so constructed that it could not withstand lateral pressure in any

[127] *Infra* note 1068.

[128] 232 Minn. 394, 45 N.W.2d 549 (1951).

amount, that it therefore constituted a trap which was dangerous to anybody in the warehouse, and that these facts were known to the defendant. All during the time the firemen were present there also were present officers, agents, and employees of the defendant company observing the actions of the plaintiff and other firemen. After rejecting the old analysis which placed firemen and similar persons in the category of licensees or perhaps even trespassers rather than invitees, and accepting the Prosser thesis[129] that such persons have a status *sui generis*, the court then said:

> Since firemen have the unique status just described, it follows that the duties owed to them may properly be unique. . . . Even the rule that firemen must accept premises as they find them has been described by this court as being a hard rule. It is apparent that both in Minnesota and elsewhere the trend of decisions is to avoid extending these harsh rules beyond their present limits, and, at least, in the case of the "wilful or wanton" rule, the tendency is to whittle it away with exceptions. At the same time, a respectable body of authority has developed to support the rule that firemen are entitled to be warned of hidden dangers known to the landowner or occupant. . . .
>
> Certainly, no meritorious reason can be advanced to justify the view that a property owner, with knowledge of a hidden peril, should be allowed to stand by in silence when a word of warning might save firemen from needless peril. The burden of a duty to warn of hidden perils falls lightly upon the landowner in comparison with the cost of his silence, which is frequently measured in the lives and limbs of firemen and in the sorrow and suffering of their families. Although firemen assume the usual risks incident to their entry upon premises made dangerous by the destructive effect of fire, there is no valid reason why they should be required to assume the extraordinary risk of hidden perils of which they might easily be warned. Two courts at least have held that firemen do not assume such risks, and, for the reasons already stated, we regard that holding as sound. . . .
>
> In spite of the recognized split of authority on the question presented in this case, we believe that the better rule by far is that landowners and occupants alike owe a duty to firemen to warn them of hidden perils where the landowner or occupant has knowledge of the peril and the opportunity to give warning.[130]

[129] Prosser 460-62.

[130] *Supra* note 128 at 397-402.

The court approved the overruling by the lower court of defendant's demurrer to the complaint and held that the complaint stated a cause of action.

One of the cases cited in support of its ruling by the Minnesota court is a very interesting New York Court of Appeals opinion, *Jenkins* v. *313-321 W. 37th St. Corp.*, dealing with responsibility of the landowner to give warning to firemen of unusual hazards.[131] The plaintiffs were New York firemen who were seriously injured when gasoline which had collected in a closed basement room exploded as the firemen were fighting a fire in the room. The first explosion, which started the fire, occurred when the building superintendent was in the room, and he also was present when the firemen arrived and entered the building. The gasoline apparently had seeped into the sump pump in defendant's sub-basement from storage tanks in a neighboring building through an old underground rivulet. There was no suggestion that the defendant was in any way negligent in creating the dangerous condition. The superintendent had known of the condition, however, and had warned his superiors of the strong odor of gasoline. The court stated that the presence of small quantities of gasoline ordinarily would not constitute an unusual hazard, but that its presence in a closed room in which a fire was burning did constitute a situation which the jury might find to be an unusual hazard. The court concluded:

> If such a danger existed to the knowledge of the defendant or its agent, the defendant was under a duty if it had opportunity to give warning of the peril. . . .
> This affirmative proof, together with the undisputed fact that while the superintendent was in the sub-basement an explosion had occurred, warranted a finding by the jury that defendant or its agent in charge had notice of the unusual hazard into which the firemen unknowingly walked. Opportunity to warn the plaintiffs of the peril might be inferred by the jury from the fact that the superintendent was on the premises when the firemen arrived and knew of their arrival.[132]

The court ordered a new trial, however, because of an error in the admission of evidence concerning impeachment of the testimony of a witness.

This type of case, involving an unusual type of hazard, is to be distinguished, however, from the kind of case where the hazard even from

[131] 284 N.Y. 397, 34 N.E.2d 503 (1940). For a quite similar case involving gas, see Kentucky & W. Va. Power Co. v. Stacy, 291 Ky. 325, 164 S.W.2d 537 (1942).

[132] Jenkins v. 313-321 W. 37th St. Corp., *supra* note 131 at 401, 402.

a dangerous substance such as gasoline could not be considered unusual. For example, everyone knows that gasoline tanks in a burning car are likely to explode,[133] or that structural conditions of a building (such as a porch) may become dangerous with natural deterioration or improper construction and may cause injury. A court may find that such danger is not an unusual hazard from an inherently dangerous substance.[134] It also is possible that a court will hold in such cases that, if the gratuitous licensee is actually aware of the peril he may not recover, as a recent New Jersey case held.[135] The Minnesota court, however, recently held that merely because a dangerous condition might be open and obvious during daylight hours, this fact does not immunize the owner from a liability if at other times, such as darkness, the dangerous condition would not be obvious, provided that the owner had reason to believe that the licensee might come on the premises under such circumstances.[136]

Applying these principles to radiation cases, while distinctions may be made, depending on the intensity and type of radiation sources present in the building, in the usual situation it would seem quite likely that the court would find that radiation materials constitute an unusual hazard, particularly since their presence will be known only if there is warning or if the fire department furnishes its fire fighters with radiation detection instruments. Actually, during the course of fighting a fire, it is quite possible that even if the fire itself does not release radioactive material from its proper containers (such as thickness gauges, experimental equipment or supplies in research laboratories, or possibly even from a reactor container) the firemen themselves in the course of fighting the fire may cause the radioactive material to spread. This may create serious hazards, at least to those fighting the fire, if not also to others in the vicinity. It is our opinion that under these circumstances it is very likely that courts will hold that there is a duty to give fair warning.

Moreover, the character of the danger is such that the techniques of protecting personnel from radiation hazards will require sufficient advance notice to prepare the fire fighters for the unusual situation. It would not be surprising to find a court saying that the owner of the

[133] Gannon v. Royal Properties, 285 App. Div. 131, 136 N.Y.S.2d 129, *aff'd* 309 N.Y. 819, 130 N.E.2d 616 (1954).

[134] Anderson v. Cinnamon, 365 Mo. 304, 282 S.W.2d 445 (1955). See also Dotson v. Haddock, 46 Wash.2d 52, 278 P.2d 338 (1955).

[135] Taneian v. Meghrigian, 15 N.J. 267, 104 A.2d 689 (1954).

[136] Malmquist v. Leeds, 245 Minn. 130, 71 N.W.2d 863 (1955).

property had to go further than simply giving notice at the time of a fire to the firemen who arrive at the scene. The radiation danger present at a fire is illustrated by the explosion a few years ago in the Sylvania plant in Bayside, New York.[187] It would seem not unreasonable to require users of radioactive material to keep fire departments advised of the presence of the radioactive material. Undoubtedly it would be wise for fire departments to plan for the emergencies which may arise from the existence of radiation hazards. That the obligation to give adequate warning is not to be lightly regarded or easily discharged by the defendant is indicated by a New York case, *Schwab* v. *Rubel Corporation,*[188] in which the plaintiff was allowed to go to the jury on the question of whether the warning given by defendant's employees was adequate when all he did was to warn one of the firemen of the existence of a dangerous dismantled elevator shaft. The court held that it was for the jury to decide whether warning one fireman was sufficient or whether more should have been warned.

The rule is usually stated as requiring the warning which a reasonable and prudent person would give under the circumstances. It usually is suggested that it is not realistic to require that the danger be called to the attention of everyone fighting the fire. This would place too heavy a burden upon the defendant.[189] It also would be wise as a general precaution to post conspicuous warnings of potential radiation hazards, at least in the dangerous areas of the building, if not throughout the building. In emergency situations, such as is the case when fire occurs, this quite likely would not be considered sufficient, but the court might hold that this much at least is required for purposes of warning not only inspecting firemen, policemen, or similar officials, but also visitors to the premises, whether licensees or invitees.

In view of the above cases the person having possession of radioactive materials would be well advised to control very strictly the persons

[187] For an extensive report concerning this 1956 fire caused by the double explosion of thorium, see N.Y. Times, July 3, 1956, p. 1, col. 2, and p. 15, col. 2; July 4, 1956, p. 37, col. 1; July 7, 1956, p. 33, col. 4; July 11, 1956, p. 54, col. 5; and July 12, 1956, p. 51, col. 3.

[188] 286 N.Y. 525, 37 N.E.2d 234 (1941).

[189] Moscow Tire & Rubber Co. v. Lansinger, 15 Ohio App. 310, *aff'd* 108 Ohio St. 377, 140 N.E. 770 (1921). A general warning by way of a manager's shout, "Get out of here," was held insufficient to meet this standard in Lamb v. Sebach, 52 Ohio App. 362, 3 N.E.2d 686 (1935). A recent case beautifully exemplifying the need for labeling dangerous material is United States v. Marshall, 230 F.2d 183 (9th Cir. 1956); a sheriff was hurt while helping fight a fire in a tank car which had not been labeled to indicate its dangerous contents.

allowed in the vicinity of the radioactive material and the conditions under which such presence is permitted.

d. Decided Radiation Cases and the Standard of Conduct

Except for cases where a doctor is charged with malpractice in treating patients, very few cases have dealt with radiation injuries specifically. Our discussion of the breach of the duty to use care would not be complete, however, without a consideration of these few. With the rapid growth of the use of radioactive isotopes in medical diagnosis and treatment the rules of law applied by the courts in malpractice cases involving the use of X-rays will assume increasing importance. In addition, even the malpractice cases may prove useful as analogies in other radiation injury situations.

(1) Medical Malpractice Cases

The courts apparently agree that the use of X-rays for medical purposes is to be governed by the same principles that govern physicians and surgeons in general. There is no reason to believe that a different standard will be applied if the radiation source is a radioactive isotope rather than an X-ray machine.[140] The statement of the general rule in *Lett* v. *Smith* is fairly representative:

> "A person undertaking the use of X-rays is held to the same measure of responsibility as in administering other forms of medical treatment. He impliedly contracts with the patient that he possesses the ordinary skill and learning of members of his profession and that he will exercise reasonable skill, care and diligence in his treatment."[141]

Perhaps the statement by Justice Rutledge in *Christie* v. *Callahan* is a somewhat more informative statement of the rule.

> The physician is not an insurer of health. He undertakes only for the standard of skill possessed generally by others practicing in his field, and for the care which they would give in similar circumstances. He must have latitude for play of reasonable judgement, and this includes room for not too obvious or gross errors according to the prevailing practice of his craft. Generally the standard must be shown by experts and

[140] The only non-X-ray case we found was Hubach v. Cole, 133 Ohio St. 137, 12 N.E.2d 283 (1938).

[141] 6 La. App. 248, 260 (1927), adopting the statement in 13 A.L.R. 1414. See also Nance v. Hitch, 238 N.C. 1, 13, 76 S.E.2d 461 (1953), and Facer v. Lewis, 326 Mich. 702, 711, 40 N.W.2d 457 (1950).

> so must the departure from it. But there are cases in which the result of medical or surgical treatment, considered in the light of the circumstances attending and following it, may warrant an inference of negligence.[142]

This statement is made immediately following one recognizing that the advantages are with the physician, particularly when he is a specialist, because other physicians are reluctant to testify against their colleagues in negligence cases.

As pointed out by the court in *Kuttner* v. *Swanson*[143] the rule means that the doctor must have knowledge reasonably to be expected of a man of his profession and must use that knowledge carefully in the particular case.

Use of New Ideas

While no cases have been found which actually turned on the point, courts occasionally have referred to the fact that a physician must use the ordinary care and skill of his profession, "giving due consideration to modern advance and learning."[144] Usually this is not a critical issue because it is assumed that ordinary care involves use of new knowledge generally known to the profession. Certainly one cannot read the many X-ray cases based upon malpractice charges in which the plaintiffs have succeeded without concluding that in most cases the finding of negligence was based upon the failure to use new knowledge developed over the years. By implication these cases seem to hold that a failure to take account of new developments constitutes a lack of due care. If it is true that failure to take advantage of new techniques such as X-rays for diagnosis of fractures is negligence,[145] there is no reason why the opposite should not be true. As new information is gained as to the situations for which radiation cannot be used safely, doctors should be found negligent if they ignore this new knowledge.

Geographical Standards

A question more closely related to the obligation to become familiar with new developments is whether it is justifiable to use a local rather than a national standard for measuring reasonable professional skill. Many statements in the cases of the general rule concerning the requisite professional care and skill are to the effect that the standard is the

[142] 124 F.2d 825, 828 (App. D.C. 1941).

[143] 59 Ga. App. 818, 820, (1939), *cert. den.*, 2 S.E.2d 230.

[144] Hazen v. Mullen, 32 F.2d 294, 296 (App. D.C. 1929), quoting from a non-X-ray case, Clayton v. English, 23 F.2d 745, 748 (App. D.C. 1927).

[145] See cases cited Harper & James 968, notes 16, 17, and also cases cited in 1958 General Digest, Am. Dec. System, on failure to use X-rays.

care used by persons of equivalent training "in the local community." [146] Yet in none of these cases was the question carefully considered by the court. Some cases, however, indicate that locality is not to be considered and it is submitted that this is the better view for the courts to adopt, at least in radiation cases. The court in *King* v. *Ditto* [147] did not state that locality is not a fact, but it did hold that in this particular case compliance with local standards did not prevent a finding of negligence. The reasoning of the court in the more recent case of *McElroy* v. *Frost* is preferable in the light of general information about radiation and particularly because of the development of specialization and the use of journals to keep practitioners up to date. The court there said:

> The medical testimony relative to the nature, extent and cause of plaintiff's injuries has been set out above. It is true the witnesses were not from the same community but, with one exception, the medical evidence in plaintiff's behalf came from specialists in their particular field. It is a matter of common understanding that a proper method of treating human ailments by X-ray would not vary from place to place or state to state. What is the best practice in one place likewise would be the best in another. This reasoning is the basis of the decision in Giles v. Tyson, Tex. Civ. App., 13 S.W. 2d 452, cited by defendant, wherein it is expressly held than an expert in the use of X-ray can testify to what is proper use thereof, since such proper use would be the same whether in New York or Texas. Such reasoning provides a complete answer to the argument advanced in this respect.[148]

Standards for Specialists

In addition to the geographical factor, a further question arises as to whether or not the specialist in radiology will be expected to use more skill than the average practitioner if he is to avoid a charge of negligence. The court in *Kuttner* v. *Swanson* [149] seems to reject this contention. The contrary was specifically held by a Canadian court in *McCaffrey* v. *Hague,* the court stating:

> It is clear from the evidence that the defendant miscalculated the dosage; it was of too high intensity and too long exposure. This finding is on the defendant's own evidence. A

[146] See Lett v. Smith *supra* note 141; Nance v. Hitch, *supra* note 141; Blankenship v. Baptist Mem. Hosp., 26 Tenn. App. 131, 144, 168 S.W.2d 491 (1942); Wemett v. Mount, 134 Ore. 305, 315, 292 Pac. 93 (1930); Kuttner v. Swanson, *supra* note 143 at 819; Harper & James 969, n. 18.

[147] 142 Ore. 207, 215, 19 P.2d 1100 (1933).

[148] 268 P.2d 273, 279, 280 (Okla. 1954).

[149] *Supra* note 143 at 821.

> higher degree of skill is required from one who holds himself out to be a specialist as the defendant did. . . .[150]

Use by General Practitioners

Closely related to this question is that of whether or not the use of radiation by the general practitioner constitutes negligence. In *McElroy* v. *Frost*,[151] one expert even testified that X-ray treatment was too dangerous for a general practitioner to use. He testified that it was not justified in the treatment of a skin disorder of the scrotum until other treatment had failed. With the increase in medical specialization this will become a growing problem, even though general practitioners will resist attempts to limit their right to practice any medical technique. Certainly at this stage of development in the use of radioisotopes and with our growing knowledge of the proper use of X-rays, much can be said for the contention that only radiologists are trained to determine the proper dosage and take the proper precautions to safeguard against overexposure.[152] With the development of new techniques for reducing the damaging effect on tissue from radiation, it is important to make use of experts who will keep up with all developments.[153]

Even if there is no requirement that only experts should handle radioactivity, there can be very little doubt that the trend toward increased specialization will have an effect upon the standard of care and skill to which the general practitioner must conform. There are two reasons for this. First, the writing and teaching of the specialists, who generally are responsible for new developments, inevitably cause the accepted standard of care to change. Second, there is an obvious tendency on the part of plaintiffs in malpractice cases to call upon specialists to testify as expert witnesses. In no case have we found that a defend-

[150] [1949] 2 W.W.R. 539, 542. See also Eatley v. Mayer, 10 N.J. Misc. 219, 158 Atl. 411 (1932).

[151] *Supra* note 148.

[152] Our private conversations with radiologists lead us to believe they generally think so and many competent internists apparently do refer such treatment cases to radiologists.

[153] See N.Y. Times, March 9, 1958, p. 41, col. 2, wherein it was reported that radiation poisoning may be curbed by chemicals, if given victim soon enough; and N.Y. Times, Aug. 13, 1958, p. 1, col. 3, reporting that pills (AET compound) capable of halving the biological effects of a radiation dose may be available soon for experimental use on humans. See also N.Y. Times, Nov. 20, 1958, p. 39, col. 1, reporting possibility that parathyroid extract may be helpful, especially if taken just before exposure to radiation. The French report they have had success using bone marrow transplants, N.Y. Times, Feb. 17, 1959, p. 4, col. 3. See examples of new developments of information as to internal dose, soil disposal, drinking water, neutron detection techniques, and laundering of protective clothing, reported in Health Physics, Vol. 1, No. 2, Sept. 1958.

ant general practitioner was permitted to challenge testimony on the ground that the witness was a specialist, not a general practitioner. Where expert witnesses have been challenged successfully the reason given is that they did not practice in the same geographical area as the defendant. Even this geographical distinction now seems to be vestigial with respect to the use of X-rays and radium. Theoretically the expert witness is supposed to testify regarding the general and accepted practice in the profession which is the standard to which the physician must conform, but it would be unrealistic to assume that his testimony will be unaffected by his special knowledge. It also would be unrealistic to ignore the fact that the jury is more likely to be impressed by such testimony than by that of other general practitioners. These influences would seem to indicate that, out of the mechanics of trial procedure, there may come a substantive change in the standard. The general practitioner well might be advised against undertaking irradiation treatment for the more serious ailments in the vital areas of the body, unless referral to a specialist is not feasible.

On the other hand it is perfectly clear that considerable room must be permitted for differences of opinion or judgment so long as reasonable care has been used in making that judgment. The court in *Butler* v. *Rule* rejected the contention that in the use of an X-ray machine the highest degree of care should be exercised, and quoted the following language with approval:

> "The law thus requires a surgeon to possess the skill and learning which is possessed by the average member of the medical profession in good standing, and to apply that skill and learning with ordinary and reasonable care. He is not liable for mere error of judgment provided he does what he thinks is best after a careful examination. He does not guarantee a good result, but he promises by implication to use the skill and learning of the average physician, to exercise reasonable care, and to exert his best judgment in the effort to bring about a good result." [154]

In that case the decedent received X-ray treatment of a twelve-month sarcoma on the left groin because surgical treatment was no longer possible. The X-ray treatment resulted in a third-degree burn that was very painful and death followed in three months. The court reversed the judgment for the plaintiff because of the trial court's instructions concerning the high degree of care.

Again, in *Hazen* v. *Mullen*[155] the court decided that a carefully

[154] 29 Ariz. 405, 416, 242 P. 436 (1926).

[155] *Supra* note 144.

formed judgment that a bold course of intense X-ray treatment was required did not constitute a lack of due care. In this case X-ray treatments were administered over a ten-month period, arresting a dangerous condition that would have led to death. The only alternative was an extremely difficult operation. Although the disease was cured, plaintiff suffered X-ray burns as a result of the treatment. The court reversed a judgment for the plaintiff on the ground of insufficient evidence to support a verdict of negligence since the defendant doctor reasonably could have concluded that bold measures were needed to treat a dangerous condition. Apparently medical authorities agree that very aggressive treatment for serious illnesses sometimes is called for in spite of the fact that X-ray burns may result. A malignant growth treated too lightly may become somewhat immune and later doses will have to be much greater if they are to be effective.[156]

There is an additional protection for medical practitioners in a malpractice case. The courts usually take the position that the area of discretion and judgment is broad enough to include the right to follow a given treatment procedure so long as there is a respectable minority of competent doctors that would follow it even though another procedure would be followed by a majority of practitioners.[157]

Contracting for Higher or Lower Standard

In some circumstances, for example when the doctor gives express assurances that specific results can be achieved, the doctor may in effect contract for a higher degree of care and become almost an insurer. Thus in a California case the doctor was held to his assurances that no scar would result from the use of radiation treatment of swollen glands on the plaintiff's neck.[158] The moral for the expert is, "Do not make promises as to results."

Equally significant is the converse possibility that a patient may contract to relieve the doctor of the risk of a negligence action where the doctor warns the patient of the danger involved in the use of repeated X-ray treatment. In one case, *Gross* v. *Robinson*,[159] after three attempts

[156] Dunlap, "Medicolegal Aspects of Injuries from Exposure to X-Rays and Radioactive Substances," 11 Mo. L. Rev. 137 (1946).

[157] Blankenship v. Baptist Mem. Hosp., *supra* note 146 at 148; Wemett v. Mount, *supra* note 146 at 313; and Harper & James 969, n. 20.

[158] Crawford v. Duncan, 61 Cal. App. 647, 215 P. 80 (1923). The only real defense was when the two year statute of limitations began to run. See also Stewart v. Rudner, 349 Mich. 459, 84 N.W.2d 816 (1957), where the court said a contract was made to use caesarian section delivery and failure to do so made the doctor liable for damages for a stillborn child. If our understanding of obstetrics is right the case was very shaky on the causation question, which was not even discussed by the court.

[159] 203 Mo. App. 118, 218 S.W. 924 (1918).

to take X-ray pictures with a defective machine the doctor warned the plaintiff of the danger of further exposures. Nevertheless, being requested by the patient to take a diagnostic picture, further exposures were made and serious injury resulted. The court intimated that in proper circumstances the patient might assume risks but that in this particular case he did not assume the risk that the doctor would be negligent. The court concluded that there was evidence that the doctor was negligent in not realizing that his machine was faulty and that repeated use created a serious danger.

Some General Cautions—Accurate Measurements and Records

Just as is the case with breach of duty generally, few specific precautions can be suggested to avoid the charge of negligence in the use of radiation. It seems perfectly clear from such cases as *McElroy* v. *Frost*,[160] however, that treatment and even diagnostic use of X-rays (the same standard surely will be applied to the use of radioisotopes) has become a very exacting science in which guess work and approximation are not sufficient. In that case the court found it significant that the defendant physician used an ordinary yardstick to measure the distance between the patient and the machine and an old alarm clock to time the exposures rather than the automatic devices available on other machines. The court likewise criticized the fact that the defendant often left the patient unattended during treatment periods. According to expert testimony, the exposure of the scrotum to 2460 roentgens was enough to cause permanent sterility and the development of a fatal cancer.

One positive precaution that would seem to be indicated for a physician who uses radiation in the treatment of patients is indicated in *Thomas* v. *Lobrano*.[161] The plaintiff sustained extensive injuries, diagnosed as "bilateral auxiliary chronic radiodermatitis" (burned armpits). The facts were somewhat complex but the failure of the defendant physician to keep an accurate record of doses and times of exposure played a very significant role in the conclusion of the court that the evidence of negligence clearly was sufficient to support the jury's judgment for the plaintiff. With respect to the failure to keep adequate records the court said:

> It is a matter of common knowledge that the use of x-ray treatments is highly dangerous and it follows that the careless or inefficient administration of x-ray therapy is susceptible of

[160] *Supra* note 148.

[161] 76 S.2d 599 (La. App. 1954).

> disastrous consequences. It is true that Dr. Lobrano contends that records are relatively unnecessary to his administration of x-ray therapy. We not only question the correctness of this assertion but we are convinced that the record of the instant case is completely destructive of any claim of justification for such a conclusion. In the light of the established fact that the x-ray department of the Sanitarium accommodates an average of between 20 to 40 patients per day for photographs and treatment, we think the failure of the physician in charge of the department to maintain and avail himself of proper information which should be reflected by adequate records is a dangerous practice. . . .
> . . . We think the defendant has failed to discharge this burden and to clear himself of the charge of negligence which is predicated upon his failure to have kept complete and accurate records of the treatment of the patient, Mrs. Thomas.[162]

In malpractice cases some difficulty in determining whether the proper standard of conduct has been followed undoubtedly arises from the fact that cases all too frequently fail to distinguish between the various aspects of a physician's duty. A doctor must first diagnose the patient's condition, then must determine and recommend treatment, and, finally, the treatment must be administered. The courts tend to refer to a general standard of care and skill, and allow considerable latitude for errors in judgment, regardless of which part of the physician's function has occasioned the injury in the particular case. While the courts so far have not differentiated between diagnostic and therapeutic uses of X-ray, it would seem well for them to do so.

Distinguishing Diagnostic and Treatment Uses

As more is learned about the dangerous attributes of radiation, the medical profession is beginning to develop humility with respect to its use and to recognize that in most if not in all cases radiation should be used as a *treatment* device only by radiologists. In many cases the use of radiation for treatment by a general practitioner probably should be considered as negligence. Moreover, while radiation levels generally are not as dangerous in diagnostic uses as in treatment techniques, it still is unwise to make any unnecessary use of radiation.

For both diagnostic and treatment purposes it is becoming more important that the operator be expert in the use of new equipment and techniques to obtain the maximum results with the minimum of exposure. This again probably should lead eventually to a rule that it is negligent for a general practitioner to use radiation except at quite low

[162] *Id.* at 612-13.

levels or when the particular technique for a specific condition has been thoroughly standardized.

Standards for Operation of Equipment

In any event, the very liberal standard [163] applied when considering a doctor's judgment or discretion should not be used in considering operation of such dangerous equipment. It is one thing to say that a doctor should not be too quickly second-guessed as to a diagnosis or a decision on a course of treatment. It is quite another to say that he should be given great discretion in deciding how to operate the equipment to achieve the desired results. Radiologists are becoming much more exact in determining the amount of radiation needed to achieve certain results and how the radiation should be applied so as to do the least possible damage. The loose manner in which X-rays and other radiation sources frequently have been used in the last thirty years has come under criticism by the medical profession itself. It has begun to take note of the necessity of avoiding unnecessary exposure even to diagnostic X-rays. In each case considered judgment should be made of whether or not the need for information outweighs the dangers involved in subjecting the patient to radiation.[164]

Hypersensitivity to Radiation

One other aspect of the X-ray malpractice cases may have significance in radiation injury cases arising from the use of radioisotopes for medical and other purposes. Frequently the defendant physician contends that the injury to the patient resulted, not from a lack of due care, but because of the hypersensitivity of the particular patient to X-rays. In nine of sixteen cases collected in a recent A.L.R. annotation,[165] this defense was held to be inadequate. The fact that it was successful in seven indicates it may be available in a proper case.[166]

The Wisconsin court in *Nelson* v. *Newell* [167] placed an important limitation upon the use of hypersensitivity as a defense. The defendant physician offered the hypothesis that hypersensitivity of the patient might explain the injury that resulted from the X-ray treatments, but

[163] Harper & James 968, 969.

[164] Hodges, "Health Hazards in the Diagnostic Use of X-Ray," 166 J.A. MA. 577, 583 (1958).

[165] 41 A.L.R.2d 329 (1955).

[166] The seven cases where the defense successfully asserted hypersensitivity were in states which do not use the *res ipsa loquitur* doctrine in such cases. The other nine were in states which apply *res ipsa loquitur*. The courts did not always discuss the relationship between hypersensitivity and *res ipsa loquitur*, however. This relationship problem will be discussed later in the section on proof problems.

[167] 195 Wis. 572, 217 N.W. 723 (1928).

he did not offer evidence that the particular patient was especially sensitive. The court stated that if a finding of negligence could be set aside merely on the speculation that the patient might be hypersensitive, malpractice cases involving the use of X-rays could never be successfully prosecuted.

In *Hess* v. *Rouse*[168] another possible limitation upon the use of unusual susceptibility as a defense was indicated. The court noted that experts testified to the effect that hypersensitivity usually appeared after the first or second treatment but in this particular case the burns did not appear until after the third treatment. The court concluded that hypersensitivity was not the cause of the burns. Moreover, the court accepted testimony that lack of hypersensitivity could be assumed even though the first exposures were to other parts of the body.

In *Lewis* v. *Casenburg*[169] an expert testified that not only does hypersensitivity appear after the first one or two treatments but also that the likelihood of a person being hypersensitive to radiation was very slight. Under the facts of the case, however, hypersensitivity as a defense did not seem persuasive in view of the fact that 161 separate X-ray treatments of the patient's abdomen had been given by the defendant. On the other hand, the court in *Kuttner* v. *Swanson*[170] held that the jury was authorized to find that plaintiff had an idiosyncrasy of peculiar susceptibility on the basis of evidence that the three doses administered were not enough to produce injury in the absence of idiosyncrasy. Again, in *Nance* v. *Hitch*[171] the court attached significance to the testimony of an expert to the effect that individual idiosyncrasy is a factor with respect to X-ray burns and that the only way to determine whether a patient has unusual susceptibility is to burn him. This testimony was a persuasive factor in the court's decision to reject the use of the doctrine of *res ipsa loquitur;* one cannot assume safely that a burn necessarily indicates negligence, the court concluded.

One other fact should be pointed out in connection with the cases involving a defense of hypersensitivity. Those in which hypersensitivity has been asserted successfully are in general more recent than those in which it was unsuccessful, the former being decided mostly in the past thirty years while the others were prior to 1930. The trend, therefore, may be in favor of the defense, but a possible explanation is that in-

[168] 22 S.W.2d 1077 (Tex. Civ. App. 1929).
[169] 157 Tenn. 187, 7 S.W.2d 808 (1928).
[170] *Supra* note 146.
[171] *Supra* note 141.

surance companies are not defending malpractice cases unless the chance of success is very good.

(2) Radiation Injuries Not Involving Medical Malpractice

There are at least three non-malpractice radiation injury cases which deal with the problem of a breach of duty to use due care. Each of them deals with the liability of an employer to an employee who received radiation injury. They are especially important, therefore, to the atomic energy entrepreneur in assessing his legal responsibilities where radioactive material is being used.

The first is *Vallat* v. *Radium Dial Company,*[172] where the plaintiff alleged that in 1929 she was employed by the defendant as a radium dial painter. She claimed that the defendant took no safety precautions with respect to particles of radium dust in the atmosphere where she worked and that she inhaled and swallowed these particles, which produced anemia, rarefaction of the bones, alveoli of the jaws, and other disorders. The complaint charged that the illnesses resulted from a violation of an Illinois statute (typical of those found in many states) providing that employers "shall, for the protection of all employees engaged in [peculiarly hazardous]. . . work or process, adopt and provide reasonable and approved devices, means or methods for the prevention of such industrial or occupational diseases as are incident to such work or process." The State Department of Factory Inspection was authorized to promulgate rules and require compliance with these standards.

The defendant company filed a motion for judgment on the ground that the occupational disease act was unconstitutional because it failed to set up an intelligible standard of duty and therefore violated the due process clauses of the state and federal constitutions. The company also contended that the act violated the separation of powers concept of the state constitution because it unlawfully conferred legislative powers on the State Department of Factory Inspection. Further, the defendant supported the motion for judgment by arguing that plaintiff had neither a common law nor a statutory remedy because the complaint showed on its face that she was not an employee of the defendant when the disease became manifest, and, finally, it was claimed that the suit was not filed within two years after the cause of action accrued.

The court invalidated the statute on the ground that the phrase "reasonable and approved devices, means or methods for the prevention

[172] 360 Ill. 407, 196 N.E. 456 (1935).

of such industrial or occupational diseases as are incident to such work or process" did not meet the requirements of due process of law. These words were held to be vague and indefinite, not furnishing an intelligent standard of conduct to be observed by the employers. The court also concluded that the delegation to an official of the power to define words not of common knowledge is unwarranted and void. Today it is unlikely that many state courts would hold this a violation of the separation of powers concepts, and certainly the delegation of authority is no violation of the due process clause of the Fourteenth Amendment of the Federal Constitution.[173] While the Illinois court confused the two issues, the question of a standard definite enough to give sufficient notice to meet a due process requirement is treated much more liberally (or loosely) today than formerly, particularly in connection with administratively enforced statutes. The opinion of the court is not clear as to whether the Department of Factory Inspection had actually prescribed standards of conduct to be followed by employers in such cases as involved here. If the standards were laid down before the time of employment of the plaintiff as a radium dial painter, then there could be no question of notice, but simply one of whether or not there was a lawful delegation of legislative power.[174] So long as notice of a specific standard of conduct is given by the administrator before any liability attaches, there usually is no problem of notification. It seems quite unlikely that today such a case would be decided on these grounds, and hence the case is not particularly significant in connection with prospective radiation injuries.

The next case is far more significant for the atomic energy entrepreneur. If it should be followed by other courts, it might mean that compliance with nationally recognized radiation standards in effect constitutes a *prima facie,* if not a conclusive, defense against a charge of failure to use due care. This case is *Rakowski* v. *Raybestos-Manhattan, Inc.,* decided in 1949 by the New Jersey Superior Court.[175] The

[173] Separation of power in the states is only a question of republic form of government and is a non-justiciable issue. See discussion in Jaffe, "An Essay on Delegation of Legislative Power: II," 47 Col. L. Rev. 561, 581 ff. (1947). On republican form of government, see Luther v. Borden, 7 How. 1, 12 L. Ed. 581 (1849); Pacific States Tel. & Tel. Co. v. Oregon, 223 U.S. 118, 32 S.Ct. 224 (1912).

[174] Yakus v. United States, 321 U.S. 414, 64 S.Ct. 660 (1944) is a perfect example of such a case (involving price regulations during World War II). Comment, 53 Mich. L. Rev. 264 (1954) is the most complete collection and analysis of various factors to be considered that was found. See particularly 270-72.

[175] 5 N.J. Super. 203, 68 A.2d 641 (1949), *certif. den.* 3 N.J. 502, 70 A.2d 908 (1949). An award of $52,800 was given to an Australian worker whose leg had to be amputated because of radiation burns received from a small radioactive capsule carried in his pocket for 6 days. Atomic Industrial Forum, April 1958, p. 27.

plaintiff was employed by the defendant in the X-ray department to operate a fluoroscope to test rubber belting for defects. The controls for the fluoroscope were in a room separated from the machine, and the plaintiff viewed the operation through a lead glass window. Evidence submitted by the defendant indicated that the construction of the room and the operation of the machine were such that the radiation which could be received by an operator even with the door open was substantially less than the permissible dosage for such installations under accepted national standards, including that of the American War Standard Safety Code for Industrial Use of X-ray. Tests made before and after the suit was commenced revealed that at no time was the maximum radiation in the room where plaintiff worked more than one half of the suggested permissible dose of 12.5 milliroentgens per hour for an eight-hour day and a six-day week. Plaintiff alleged that prior to her employment she had enjoyed good health and in fact passed the physical examination necessary for employment in the defendant's plant. She also alleged that although she was only twenty-five years old, after commencing to operate the machine she underwent a premature menopause and suffered telangiectasis in the central portion of her face, a condition which manifests itself by showing the fine superficial capillaries and giving an appearance of premature aging. Expert witnesses called by the plaintiff testified that her condition was attributable to the absorption of X-rays that penetrated the room in which she worked. The experts set up their own standard as to what would be reasonable care under the circumstances, a standard which apparently was considerably different from that set up by the American Standards Association. The plaintiff charged that the trial court erred in directing a verdict for the defendant, claiming that she had made a *prima facie* case. In stating the general rule concerning the degree of care required, the court said:

> It is the general rule that the mere fact that an instrumentality may become dangerous to others does not constitute its possessor an insurer against injury that may result therefrom. Liability for negligence in respect to dangerous instrumentalities, as liability for negligence generally, arises from the failure to use due care. A *higher degree of care* is required in dealing with a dangerous agency than in the ordinary affairs of life or business which involve little or no risk. The law exacts of one who puts a force in motion that he shall control it with a skill and care *in proportion to the danger created* and with appliances which, in view of the circumstances, are reasonably safe. In other words, the essential requirement of

> due care under the circumstances necessarily implies that the care required to prevent injury to others in using a dangerous instrumentality is a *great* or *high degree* and every reasonable precaution suggested by experience and the known dangers of the subject ought to be taken.[176]

In other words, a man of ordinary prudence when using a dangerous machine must take greater precautions. As the court stated it, quoting from an earlier case:

> "Rather does it mean the exercise of that degree of care, of that manner of fulfillment of duty, which comprehends a circumspection, a foresight, a prevision which has due and proper regard to reasonably probable contingencies." [177]

The court also approved the following language:

> "Every peril, it is safe to say, including such as are termed 'latent' or 'hidden,' need not be discovered, since liability for negligence in keeping a dangerous instrumentality is not absolute. If, however, common experience has demonstrated that dangers lurk in the method adopted or in the instrumentality maintained by a person, he rests under the obligation of ascertaining the peril and taking precautions to avoid injury therefrom." [178]

The court, nevertheless, held that defendant's motion for a directed verdict was properly granted, because, even under the proofs submitted, there was insufficient evidence to support a jury verdict that defendant was negligent even though he was dealing with a dangerous instrument. Since the testimony revealed that the defendant's construction, installation, and operational techniques complied with the generally accepted standards, and since the defendant used a competent and recognized radiation expert who had advised the two room installation, all necessary precautions had been taken for the reasonable safety and protection of the operator of the machine. The court said that plaintiff's experts could not use a standard of their own but should have shown that the defendant's installations and operations were not in conformity with the "standard practice in the industry." The court concluded that a contrary rule "would mean that industrial concerns would be subjected to the mere caprice of juries, and held accountable for actionable negligence regardless of whether they adopted a recognized standard of installation or not." [179] In effect this is tantamount to a rule that compli-

[176] *Id.* at 207. [Emphasis added.]
[177] *Id.* at 208. See also same idea expressed in cases discussed *supra* at note 40.
[178] *Id.* at 207.
[179] *Id.* at 210.

ance with established codes concerning radiation means that there can be no inference of negligence on the part of the defendant, even if it should be accepted as true that the plaintiff's injuries were caused by the X-rays that penetrate the room in which she worked. The court did not consider the question of whether the industry standard was sufficiently high, it merely assumed it and refused to accept the standard asserted by plaintiff's experts.

If this view should be followed generally in radiation cases, it would make the problem of tort liability a much easier one to solve. The opinion of the court, however, may be contrary to the views of treatise writers; they are inclined toward the view that proof of compliance with a safety code, whether established by unofficial experts in the field or by statute or official administrative rulings, should be treated merely as evidence of use of due care.[180]

Moreover, from the opinion in the *Rakowski* case one cannot conclude without question that the court is holding that compliance with such a safety code is conclusive for the defendant. This is a fair implication from some of the language used, but the plaintiff rested her case solely on the testimony of experts as to what they would regard as a reasonable standard. So far as the opinion indicates, no attempt was made to show directly that compliance with the accepted standard would not meet the standard of what a reasonably prudent man would do under the circumstances, although this is implied rather clearly by the testimony solicited from the plaintiff's experts. It might be possible for plaintiff in a subsequent case involving similar compliance to show that the code promulgated by the National Committee on Radiation Protection is somewhat out of date and, therefore, compliance with it might not amount to reasonable care. The recent establishment by the Atomic Energy Commission of a standard of exposure for its own employees of roughly one third of that which is still permitted for employees of licensees raises this possibility. The AEC apparently thinks that the lower dosage probably should be adopted from the standpoint of the workers' safety. Nevertheless, on balancing the interests of society in developing the atomic energy industry against admittedly only a possible danger from such low level radiation, the higher level is considered reasonable. All things considered, too much reliance should not be placed on the *Rakowski* case, although it is an important precedent.

The third case in point is *Kress* v. *City of Newark,* decided in New

[180] *Supra* Section B, 2 a.

Jersey in 1950.[181] In this case the plaintiff was the employee of the Newark City Hospital where she worked at first as a maid and later in the X-ray department, where she helped prepare patients for photographing. After several years in this task she was assigned to the development room, and until 1941, some eight years after she was first employed, her exposure to X-rays was minimal. In 1942, however, the plaintiff was asked to become an X-ray technician. She received no formal training, "learning" by watching other technicians whom she assisted. After a relatively short period of observing she was given a portable X-ray machine to be used in the wards. She was furnished no portable safety screen and frequently stood across the table from the patient in such a manner that she also would be exposed. While taking dental X-rays she often held the film in place herself. This occurred as many as sixty times a week over a period of several years, during which time she received no warning of the danger inherent in the X-ray beam. A blood count was never taken during this period, except once on the occasion of an operation. Only once, in 1944, did a doctor suggest that a monitor film be attached on her uniform. On development the film showed presence of X-rays. It was not until a year or two later, however, that plaintiff noticed spots on her hand which she showed the chief of the X-ray department. In August, 1946, the plaintiff's finger accidentally was torn open and a biopsy was made by a doctor in another New York hospital. She ceased working in the X-ray department at that time, and was referred to a doctor who confirmed a diagnosis of skin cancer. Further operations were performed in later years, and, finally, in 1949 the whole surface of her hand down to the tendon sheet was removed. Prognosis at the time of the trial was that amputation would probably have to follow, with no guarantee that the cancer would be arrested. One of the experts in the case was Dr. Arthur Mutcheller, a biophysicist and radio-physicist, specializing for twenty years on the effect of radiation upon living material. He testified that standard practice in the use of portable X-ray machines called for a protective screen for the operator. He stated that in taking dental X-ray pictures the standard procedure was to use a lead screen, and to prohibit holding the film in place by the technician.

The lower court sustained defendant's motion to dismiss on four grounds: (1) plaintiff had failed to sustain the burden of establishing

[181] 9 N.J. Super. 70, 74 A.2d 902 (1950). A statement reported in N.Y. Times, February 20, 1959, p. 10, col. 4, indicates hospital operators of radiation sources are not well enough protected.

defendant's negligence; (2) she was guilty of contributory negligence; (3) a municipality can only be liable for "affirmative wrongdoing"; and (4) a charitable institution is not liable for the negligence of its agents. On the first two grounds the court on appeal held that there was sufficient evidence to raise a question properly to be decided by the jury. On the third ground, the court decided that if the jury found that the city put the X-ray machine into operation without a lead screen, without giving adequate instruction to the plaintiff as to the dangers, and without periodic use of monitor film and adequate protective gloves and apron, then the city was clearly "an active wrongdoer." The court felt that this was quite like cases involving unguarded holes and ditches where proper safeguards are not taken, and quoted with approval the opinion recorded in the *Rakowski* case. As to the fourth ground, the court held that a hospital was not a "charitable" institution with respect to the plaintiff, who was not a beneficiary of the charity but an employee of the hospital.

Conclusion

In a field developing as rapidly as atomic energy, particularly as to our knowledge of the injurious effect of radiation, it would be most unfortunate if statutes, administrative regulations, or decisional rules should develop hard and fast lines as to what is or is not a reasonable standard of conduct. Some dramatic discovery, for example some simple chemical or drug which will either give considerable immunity or considerably reduce the aftereffects of radiation exposure,[182] could be important in determining whether or not the conduct followed by the defendant in a particular case meets the standard of reasonableness. Some such discovery might reduce dramatically the risks involved in temporary, fairly high radiation exposure, or make it perfectly reasonable to expose persons to higher levels of radiation if the new techniques were used.

The converse is equally true. If new concepts and techniques are found, an employer or other user of radioactive materials should not be allowed to adhere stubbornly to a code previously promulgated and accepted in the industry. This variable standard of conduct will not be quite as comfortable for the defendant as would be the official pronouncement. He would like to know exactly what standard of care will be considered reasonably prudent action. Nor will it be as good for the plaintiff who would like to be able to prove his case merely by showing non-compliance with official standards, yet it would seem more nearly

[182] See *supra* note 153.

fair in individual cases. A defendant's reasonableness should be judged by taking into account the techniques, new as well as old, which are available for reducing the hazard or preventing the aftereffects of exposure. This is important, for example, in a case such as the recent Oak Ridge accident where at least one worker was reported to have received 320 rads.[183] It might become standard practice to have employees who undertake these operations during which serious exposure would result in the event of an accident take such pills as may prove to be effective in reducing the injurious consequences of exposure. Compliance or noncompliance with industry safety codes certainly should be given weight, and in most cases perhaps should constitute *prima facie,* if not conclusive, proof, when no evidence to the contrary is introduced. Courts, however, should avoid a rigid rule and decide individual cases on the basis of the specific evidence produced.

As suggested in the *Lobrano* case,[184] due care probably requires the user of radioactive material to keep accurate and detailed records of his operations. Not only doctors and radiologists, but also other users of radioactive materials should keep such records. Often it will prove helpful to the defendant himself. Certainly, it seems a necessary requirement to protect the potential plaintiff because without such information it becomes very difficult for him to prove injury from radiation at a particular time and from a particular source, except in the most obvious cases such as when third degree burns result. Possibly a rule requiring the keeping of careful records should be adopted and combined with the *res ipsa loquitur* doctrine so as to make failure to keep such records a *prima facie* case of negligence. This is discussed later in connection with *res ipsa loquitur.*[185]

(3) The Use of Expert Testimony

Running through all of the radiation cases so far discussed is a common problem. How does one prove that the defendant in the particular case did or did not meet the standard of conduct of a reasonably prudent man under the circumstances? Must expert testimony be used or will lay testimony serve the purpose? Harper and James state the general rule as follows:

> Except for malpractice cases (against a doctor, dentist, etc.) there is no general rule or policy *requiring* expert testimony as

[183] *Infra* Chapter IV at note 125.

[184] *Supra* note 161.

[185] *Infra* discussion in text beginning at note 1146, particularly at notes 1234-35.

> to the standard of care, and this is true even in the increasingly broad area wherein expert opinion will be received. On the other hand, any given matter may conceivably be so far out of the range of general experience that a jury will not be allowed to decide upon the reasonableness of an actor's conduct without the aid of expert testimony which at least explains to the layman the esoteric problems and the possibility and practicability of precautions. *** Courts could very easily expand the area in which expert testimony is required to establish the standard of conduct, but the tendency has been instead to resolve doubtful questions in favor of allowing the jury to decide the issue of negligence without its aid.[186]

One situation in which the courts have not resolved doubtful questions concerning the need for expert testimony in favor of enlarging the jury's sphere is when a doctor is accused of malpractice. There may be cases where "negligence is so grossly apparent that a layman would have no difficulty in recognizing it," [187] but in general the plaintiff must use experts to show a lack of reasonable professional skill.

In a recent case, *Facer* v. *Lewis,* the Michigan Supreme Court said:

> Although we have held that leaving a sponge in a wound is not good medical practice and does not require the testimony of expert witnesses to establish this fact, the proper or improper use of X-rays does require the testimony of experts.[188]

In this case the defendant doctor used X-rays to treat the decedent for warts on his foot. The patient suffered a radiation burn severe enough to cripple him and he sued for damages charging defendant with negligence. Upon his death his administratrix was substituted as party plaintiff. The only expert testimony offered by the plaintiff was to the effect that in X-ray treatment procedure intensity, time and distance are important factors in determining the proper dose. The only evidence indicating negligence was that of decedent's son describing what the defendant had done in treating his father's foot. Defendant moved for judgment notwithstanding the verdict on the ground that only an expert can establish negligence in such a case. In approving the trial court's granting of the defendant's motion the court said:

> Although laymen generally are acquainted with the fact that X-rays are destructive and may result in burns or other

[186] Harper & James 966-67.

[187] Harper & James 968 (quoting from 7 Wigmore, Evidence §2090 (3d ed. 1940)) and cases cited at n. 15. To these should be added Ballance v. Dunnington, 241 Mich. 383, 217 N.W. 329 (1928), where the court said that the exposure period was such that "even the merest tyro would know was improper." Even the defendant admitted it.

[188] Facer v. Lewis, *supra* note 141 at 713.

> serious conditions, yet the testimony of plaintiff's own medical witness was such as to clearly demonstrate that an X-ray treatment for warts involves questions of skill, judgment and practice beyond the knowledge of laymen and upon which a jury would need the advice of experts to determine whether or not the claimed acts of defendant were improper. We believe the facts in the case at bar are such that the questions of negligence became exclusively for expert testimony.[189]

A Mississippi decision, *Waddle* v. *Sutherland*,[190] appears at first reading to reach a contrary result. After X-ray treatment by the defendant of the plaintiff for eczema his leg had to be amputated because of radiation burns. Both sides presented expert testimony and in addition the plaintiff testified as a witness in his own behalf, apparently describing acts and circumstances concerning the final treatment tending to show an overdose of X-ray because of overlapping.[191] The plaintiff also testified that defendant stated at the time of his last treatment that this was going to be a stronger dose than he had previously given. The plaintiff's wife testified that the defendant doctor told her that they would probably have to amputate both of his legs and that the doctor blamed himself for the burns, not his assistant: "it was his mistake and not hers." The trial court instructed the jury that, in deciding whether the doctor treated the plaintiff in a "proper manner and with ordinary care and skill," and whether there was any negligence on the part of the defendant in the use of the X-ray machine, they could consider only the testimony of those "who themselves possess the skill required to administer such treatment and qualify themselves as expert in such treatment. . . ." The trial court's verdict was for the defendant doctor. The supreme court reversed, using the following language:

> By the instruction given appellee, copied above, the court told the jury, in effect, that in considering and deciding the issues of fact, they were confined alone to the evidence of the experts. By this instruction the court necessarily excluded from the consideration of the jury, not only the doctrine of res ipsa loquitur embodied in the two instructions given appellant, but also the evidence of both appellant and his wife, to the effect that appellant's injuries were the result of a third

[189] *Id.* at 714.

[190] 156 Miss. 540, 126 So. 201 (1930).

[191] Overlapping results when the operator fails to keep the beam sufficiently narrow. To avoid unnecessary exposure of the good tissue, particularly at the surface, repeated deep therapy X-rays are focused on the deep spot from different surface angles. If the beam is not narrow there will be overlapping and therefore unnecessary exposure of the surface which can lead to serious burns.

> degree burn, which fact he had admitted to appellant's wife, along with the statement that such burn was the result of his fault, and not that of Miss Satterfield, his assistant.
>
> . . . In a case depending upon expert testimony alone such instruction would be proper; but this is not that kind of a case. This is a case where there is nonexpert testimony, as well as expert testimony bearing on the issues. The effect of this instruction was to tell the jury not only to disregard the doctrine of res ipsa loquitur embodied in two of appellant's instructions, but also to disregard the evidence of both appellant and his wife.[192]

It is also important that the plaintiff's testimony was in addition to that of his own expert witnesses.

Laying aside the fact that Michigan does not apply *res ipsa loquitur* to this type of case while Mississippi does, it is possible to reconcile these cases on a ground that well might be a satisfactory basis for determining when expert testimony is required and when it is not. If the lay testimony goes only to a description of events occurring during a treatment and to reporting comments made by an attending physician or his assistants, there is only the question of probative value to be attached to the evidence. But if the lay witness attempts to show that this action constitutes lack of careful and prudent attention by the doctor because it is not in accordance with the care and skill ordinarily expected of a doctor under these circumstances, this would seem to be outside the area of knowledge of a non-expert witness, unless it is a situation where the "merest tyro" could determine that ordinary care and skill was not used. The court in *Butler* v. *Rule* seems to make just this distinction, although the only expert testimony there was to the effect that the treatment was given as the defendant testified and that it was proper. Because there was conflict as to how far the machine was placed from the patient the court said:

> However, if there was evidence as to the manner in which defendant administered the treatment in conflict with his testimony, and tending to show that in some essential the treatment was not given as defendant stated, the expert testimony to that extent would fail, and a question of fact for the jury arise.[193]

The judgment for the plaintiff was reversed, however, because the instructions to the jury were based upon the wrong standard of care.

[192] *Supra* note 190 at 550, 551.

[193] *Supra* note 154 at 412. See also *supra* note 140.

In *Christie* v. *Callahan* all the expert witnesses testified that the treatment, if given by the defendant doctor as described by him, was reasonable. Nevertheless, the jury had found the doctor to be negligent. The majority of the court of appeals stated:

> The jury must have found that the treatments were not given exactly as Dr. Merritt testified they were, and that, unfortunately, he gave more than the amount proper for treatment of pilonidal cyst. . . .
>
> The opposing view appears to be based on the theory that negligence in X-ray treatments can be shown only by direct and positive testimony of X-ray specialists to specific acts of negligence taking place in the course of the treatment. A burden so heavy is not required either by the general law of negligence or by the Sweeney case. Generally speaking, direct and positive testimony to specific acts of negligence is not required to establish it. Circumstantial evidence is sufficient, either alone or in combination with direct evidence.[194]

The majority concluded that there was sufficient evidence to support the jury's finding that the defendant had been negligent.

Where the only question is whether or not the actions of the defendant doctor met the accepted standard of reasonable care and skill under the circumstances, surely it would be proper to insist on expert testimony. When this is the case, a statement by the California court in *Bennett* v. *Los Angeles Tumor Institute* indicates the typical judicial attitude: "The question as to whether there has been a breach of this standard of care is one which can be resolved only by the testimony of experts." [195]

Where testimony by experts creates a conflict as to what is a proper course of treatment in a particular case, the opinion of the court in the *Blankenship* case is typical. The court said:

> In view of this divergence of opinion among the specialists it cannot be said that it should be left to a jury of laymen to determine which method of treatment is right, which would be the effect of saying that the court erred in directing a verdict for the defendant Hospital in this case.[196]

Later in the same opinion the court said:

> As long as there is room for an honest difference of opinion among competent physicians, a physician who uses his own

[194] *Supra* note 142 at 839.

[195] 102 Cal. App.2d 293, 296, 227 P.2d 473 (1951).

[196] *Supra* note 146 at 142. Not to be confused, however, with the case where action did not conform to either school or they both agree on this point, Wemett v. Mount, *supra* note 146.

> best judgment cannot be convicted of negligence, even though it may afterward develop that he was mistaken. . . .
>
> And where there is a difference of opinion among physicians or surgeons with reference to the treatment to be given in a particular case, a physician will not be held liable for malpractice if he follows the course of treatment advocated by a considerable number of physicians of good standing in his community. It would not be competent for a court or jury in such a case to say that a physician who followed either of said different methods of treatment was negligent.[197]

On the other hand, in *Simon* v. *Kaplan* the court said that where expert testimony for the plaintiff and the defendant was in conflict, it would not set aside the jury's verdict for the plaintiff because, "in these circumstances we are not warranted under the law, in disturbing the verdict of the jury."[198] The decision of the majority in the *Christie* case,[199] allowing the jury to decide the question of negligence, did not really involve a question of the doctor's judgment being a reasonable one. The attack was not on the opinion of the expert witnesses for the defendant but on the accuracy of the defendant doctor's statement as to what was done. It might be argued, however, that the doctor also was accused of not using proper treatment and the court did allow the jury's finding to stand.

Another problem concerning the use of expert witnesses may prove very important in atomic energy cases. It is the training and experience that qualifies a person as an expert on radiation injuries. The general rule certainly is that stated by the court in *Young* v. *Stevens:*

> Appellant's first point is that it was error to permit certain expert testimony to be given by witnesses who were licensed physicians. The questions had to do with X-ray and the like, and the argument is that because these physicians did not hold themselves out as specialists in that branch of the profession they were not competent to testify thereon. It is well established that having qualified as medical doctors they are competent to testify on all medical subjects upon which they claim sufficient ability to express an opinion. The qualification of an expert is for the determination of the trial court and such determination will not be disturbed where the ruling is supported by evidence. . . .[200]

[197] *Supra* note 146 at 144.
[198] 321 Ill. App. 203, 210, 52 N.E.2d 832 (1944).
[199] *Supra* note 142.
[200] 132 N.J.L. 124, 126, 39 A.2d 115 (1949).

As to the weight to be given to testimony of various expert witnesses, however, the fact pointed out by the court in *Thomas* v. *Lobrano* is true:

> It has been well and soundly established with reference to the evaluation of the opinion testimony of expert medical witnesses that the conclusions of qualified specialists in the various fields of medicine are entitled to greater weight than that accorded the opinions of general practitioners.[201]

In deciding this question of the use of expert testimony, it is most important that the court take into account the distinction previously suggested[202] between the operation of radiation equipment and deciding whether or not to use it for diagnosis and treatment. The proper way in which to use the radioactive source or technique has now been developed into a fairly complex science in which the amount of voltage, size of the opening, type of shielding, and the distance from the machine to the affected area are all important calculations that can and must be made with considerable accuracy. Unless the person using the equipment is prepared to make the calculations and to use the machines with expert care, he ought not to attempt it, even though he is a licensed physician. In addition, in determining what is due care, a court should not accept loose practices followed in a particular local community. As is indicated by the court in the *McElroy* case,[203] knowledge of the use of radioactive sources is nation-wide and there would seem to be no reason to allow local practices of a small group, even of licensed physicians, to vary from the standard now generally accepted throughout the country.

Even more important in the atomic energy cases will be the question of whether persons not licensed to practice medicine should be allowed to testify. Since a great deal of our knowledge in this area is being developed by experts who are not licensed physicians (biologists, physicists, chemists, and others with similar scientific training), it would seem quite ridiculous for the courts to refuse to recognize the validity of opinion testimony given by such persons, especially in non-malpractice cases. Although the question was not litigated specifically, such non-physician experts were allowed to testify and their testimony given great weight in several recent cases.[204] The court in the *Rakowski* case,

[201] *Supra* note 161 at 614.

[202] See discussion *supra* at notes 173, 164.

[203] *Supra* note 148.

[204] Kress v. City of Newark, *supra* note 181 at 74 (bio-physicist and radio-physicist

apparently allowed non-medical experts to testify for they refer to the plaintiff's "medical and expert witnesses." [205] In addition, non-medical experts participated in establishing the standards which were promulgated by the American Standards Association and admitted as evidence in the case.

(4) Conclusions

The general impression one gets from reading the radiation cases is that there is a growing tendency among the courts to recognize that it has become general knowledge among informed people that the use of radiation is something to be undertaken only if due consideration is given to the substantial dangers inherent in its use. The courts are beginning to recognize that the use of such materials has developed into a fairly exact science as far as measurement and production techniques are concerned. It also is true that the courts apparently are insisting that recognition be taken of new advances by any one who uses such material, whether he be a doctor or an industrialist. It is not suggested, however, that courts will hold doctors liable for errors in judgment as to the amount of radiation necessary to cure diseases or in drawing fine lines as to how much radiation can be risked, all things considered. Certainly the reasonable-man standard would require the advice of radiation experts in most cases, at least at the time of setting up the plan of operation and installing the radioactive source or operational technique. In the light of the rapid development of specialized knowledge in this area, it also would seem that there are some instances, both in the area of medical practice and that of industrial uses, where radiation should not be used without the supervision of a person fully qualified in the field. This would be true in the operation of a nuclear reactor as well as in many other cases involving less severe radiation hazards. The better part of valor would be to use the expert—the reasonably prudent man will. Our suggested model state statute accepts this premise.[206]

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specializing in effects of radiation on living tissue); Henslin v. Wheaton, 91 Minn. 219, 221, 97 N.W. 882 (1904) (a professor of physical sciences specializing in electricity); Lamme v. Ortega, 267 P.2d 1115, 1118 (Colo. 1954) (radiology-physicist and expert in use of X-ray machines). See also La Porte v. U.S. Radium Corp., 13 F. Supp. 263 (D.C.N.J. 1935) (court referred to non-medical experts needed in radiation field).

[205] *Supra* note 175 at 211. The opinion does not state this fact specifically but it is clear that the experts must have been non-doctors.

[206] *Infra* Part III, Chapter VI.

3. Vicarious Liability for Negligence of Independent Contractors

a. Introduction and Limitations of Discussion

Remembering that radioactive material is uniquely insidious not only because it gives no warning to the usual human senses but also because in many cases its hazard continues for many years and in some cases centuries, and finally because the radiation source cannot be turned off like a machine, the owner or operator surely will consider seriously the possibility of immunizing himself from some of the consequent tort liability. One of the ways in which immunity may perhaps be obtained is through the use of independent contractors for certain operations. Therefore, consideration must be given to the concepts of vicarious liability.[207] It does not fit well into either duty or breach analysis and is treated separately here although admittedly both duty and breach ideas are involved.

Vicarious liability is a very broad subject. It covers the whole ambit of principal-agency, master-servant, independent contractor, and joint enterprise. Many aspects of vicarious liability would seem to present no significant problems in atomic energy situations, at least in the sense of being unique or unusually troublesome. For example, the rules of master-servant will not be changed for radiation cases. The same is true as to joint enterprise questions.

The use of independent contractors, however, will create troublesome questions. Yet even within this area there are many questions which present no peculiar problem for our purposes; *e.g.*, where to draw the line between an employee and an independent contractor. The distinction between an independent contractor and an employee is not nearly so significant as it once was in tort cases. The important question today seems to be not whether the negligent person was an employee or an independent contractor but, assuming he was an independent contractor, whether his negligence will be imputed to the one who hires him. Without question the old immunity said to follow automatically from hiring an independent contractor (who by definition was not within the control of the other contracting party) now has so many exceptions that it is scarcely recognizable as a general rule. This is quite consistent with the general trend toward extending liability, such as in

[207] Prosser 350 ff; Harper & James 1361 ff; early Annot., 23 A.L.R. 984-1135 (1923). For California cases, see Comment, 44 Cal. L. Rev. 762 (1956), and for West Virginia cases see Brown, "Liability for the Torts of Independent Contractors in West Virginia," 55 W.Va. L. Rev. 216 (1953).

product liability cases to be discussed later,[208] and the extension of liability of the independent contractor himself for injuries taking place after his work has been accepted but caused by conditions created by his negligence which he reasonably could have foreseen might cause injuries to a third party.[209] This trend is also discernible in cases involving the liability to be imposed on the employer for the negligence of an independent contractor. It should not be assumed, however, that all distinctions will be ignored and that the independent contractor's negligence will always be imputed to the other party. In this regard the English courts evidently have been moving in the direction of expanded liability more rapidly than have American courts.[210] On the other hand, there have been some moves in Parliament recently to reverse this trend although English legal writers have criticized this attempt.[211]

b. Liability of Owner or Occupier of Property

Once an independent contractor relationship has been found, one of the most frequently litigated questions deals with the liability of an owner or occupier of land for the negligence of an independent contractor whose work on the premises causes injury to others. It is in this area that the courts are moving most rapidly toward looking upon the independent contractor almost as an employee of the owner and holding the latter liable for negligence of the former. Typical of this trend is a recent Wisconsin case, *Nechodomu* v. *Lindstrom*,[212] which held the owner of a building liable when an independent contractor doing construction work on the property allowed a young child to place his hand in a mixing machine in which there were exposed, revolving blades. This decision is somewhat unusual for even in cases where courts find that an independent contractor was performing a duty which can not be dele-

[208] *Infra* Chapter V.

[209] Annot., 58 A.L.R.2d 865 (1958), particularly at 891 ff. The cases cited clearly bear out the conclusion stated in the annotation. A striking example of imposing such liability is Roush v. Johnson, 139 W.Va. 607, 80 S.E.2d 857 (1954), where a faulty installation of electrical connections caused the electrocution of a moving company employee long after the installation was made.

[210] Prosser 358, citing Chapman, "Liability for the Negligence of Independent Contractors," 50 L. Q. Rev. 71 (1934).

[211] Munkman, "Liability for the Acts of an Independent Contractor," 107 L. J. 245 (1957). A recent English case certainly moving in this direction, but which could be explained under some of our American decisions requiring the owner to see that reasonable precautions are taken, is Balfour v. Barty-King, [1957] 1 Q. B. 496, noted 1957 Camb. L. J. 132.

[212] 269 Wis. 455, 69 N.W.2d 608 (1955), noted 28 Rocky Mt. L. Rev. 128 (1955).

gated by the owner, the latter is not responsible for what is usually termed "collateral negligence," meaning that some specific part of the operation being performed by the independent contractor was not unusually dangerous nor unexpected. A carpenter using a hammer, saw and nails in the usual way is an example. It is arguable, however, that in the Wisconsin case the job required the presence of this mixing machine so the danger was inherent in the job, not just incidental or "collateral" to it. In one sense, however, this is true of all "collateral negligence" cases. Whether or not "collateral negligence" terminology is used, the basic question remains: Is this the kind of action for which the independent contractor only should be held liable, or is the nature of the negligence and the activity of the independent contractor so essential a part of the job desired by the owner, the kind of accident so foreseeable, and the danger so unusual that immunization of the owner should not be allowed?[213]

Certain activities generally are carried out by an independent contractor and are thought to be delegable, for example, transportation of passengers by taxi, or the use of ordinary carpenter tools to do routine jobs in which the risk is not too great.

The cases involving independent contractors working on the property of the other contracting party have become so numerous that annotations usually group them under separate headings for each part of building and construction work; *e.g.*, excavation and refill work,[214] demolition work,[215] excavation that affects adjoining realty,[216] and awnings,[217] to mention only a few. It has even been argued in a recent Michigan case, *Cary* v. *Thomas*,[218] that such liability ought to carry over to the ordinary home owner. In this case a home was fumigated by an independent contractor who was competent and carefully picked by a home owner who undoubtedly had no expertise in such matters. Two dissenting judges would have held the defendant liable because the danger was great. The plaintiff was a water softener serviceman who was overcome by cyanide gas when he entered the home after the independent contractor failed to block all the entrances by posting

[213] Prosser 359-62; Harper & James 1395-1410; and particularly Smith, "Collateral Negligence," 25 Minn. L. Rev. 399 (1941).

[214] 33 A.L.R.2d 7 (1954).

[215] *Id.* at 89.

[216] *Id.* at 111. See Annot., 24 A.L.R.2d 288 (1952) for liability where the independent contractor sets a fire and negligently allows it to spread.

[217] 34 A.L.R.2d 486, 493 (1954).

[218] 345 Mich. 616, 76 N.W.2d 817 (1956). One of the dissenting justices was Smith, *supra* note 213.

notices. *Pure Oil Co.* v. *Lassing*[219] is another recent case in which the independent contractor concept gave immunity from liability. An independent repairman working on gasoline pumps at a filling station negligently flipped a lighted match into the gasoline tank bin. This is a good illustration of an instance in which a court places considerable emphasis on whether or not the contractor is really independent and therefore not subject to the control of the employing party as to methods of performing the task.

Significant for our purposes are two types of cases concerning work by independent contractors *on the owner's property* in which the courts often hold the owner liable for the contractor's negligent actions. The first type deals with damage caused during construction, repair, or maintenance which are not a normal part of the day-to-day operation of the business. "Collateral negligence"[220] is the term used in construction and repair cases to state the policy question of whether or not to impute the contractor's negligence to the employer. In the second type of case, concerning harm done in the course of the normal day-to-day operation of the owner's business, the question is usually put in terms of "non-delegable duty."[221] Writers and courts often use a third phrase, "inherently or intrinsically dangerous,"[222] to state the policy question. Actually, in all these cases the same test should be used to determine the liability of the employer for the independent contractor's negligence, when the employer himself could not be considered as having acted negligently within the ordinary standards. The policy question in each situation is whether to allow the employer to shift the tort responsibility to an independent contractor or to insist that the employer remain responsible for any negligence, even that of the independent contractor. The activities of an independent contractor which will be the non-delegable responsibility of the employer are those which are appropriately described as involving "unusual danger" rather than being "inherently dangerous" or involving "collateral negligence." The phrase "non-delegable" merely states the court's conclusion that the activities involve "unusual" hazard.

By the word "unusual" it is meant that the risk of harm is somewhat

[219] *222* F.2d 886 (6th Cir. 1955), noted 24 Tenn. L. Rev. 268 (1956).

[220] Prosser 361; Harper & James 1410; Smith, *supra* note 213.

[221] Prosser 359; Harper & James 1406.

[222] Prosser 360; Harper & James 1408. See language of "unusual danger" in Olah v. Katz, 234 Mich. 112, 117, 207 N.W. 892 (1926), and Scales v. Lewellyn, 172 N.C. 494, 497, 90 S.E. 521 (1916). See also cases collected and distinctions made in 23 A.L.R. 1016, particularly at 1084 (1923) and 21 A.L.R. 1229 (1922).

greater than normal either because the harm is relatively serious or extensive, involves danger to a great many persons, or is of a unique or unexpected type.

It should be understood that this discussion concerns the liability of the employer for the negligent acts of the independent contractor, not for the negligent acts of the employer himself. In many situations the employer himself may be negligent, such as, (1) in failing to use care in selecting a competent independent contractor, (2) in failing to give an independent contractor the necessary information to avoid unnecessary danger, (3) in failing to prepare properly for the independent contractor's operation, or (4) in failing to meet all the statutory standards or administrative regulations which may govern a particular operation while it is still clearly within the control of the employer. The only situation of significance in atomic energy operations is that in which the employer is being held for the negligence of the independent contractor although the employer himself has not been negligent in any of the respects just mentioned.

It also is assumed here that the nature of the operations is such as not to be classed as "ultra-hazardous" within the doctrines of absolute or strict liability.[223] Liability in the cases here discussed, and as limited above, should be determined by deciding whether or not the activities are somewhat out of the ordinary; if so, they are "non-delegable" and the owner is liable for the independent contractor's negligence.

(1) For Operations Performed on the Premises

During Construction

It seems quite unlikely that many cases will arise in which harm from radiation hazards will occur during construction, repair, or maintenance operations. Certainly during the construction of a reactor there is no radiation hazard until the building is completed and all component parts have been carefully tested. Even in the repair and maintenance operations for which an independent contractor is likely to be called, radiation hazards are not always present because often such periodic maintenance activities will have to be carried on only after the radioactive material has been removed. For accidents happening at the construction, repair, or maintenance stage and not involving radiation hazards, there is no reason to believe that the principles to be applied in atomic energy cases will differ from other situations. To the extent

[223] This problem is discussed *infra* Chapter IV.

that radiation hazards are an integral part of the contractor's operations, such as if an independent contractor is called in to do a repair job and makes use of radioactive material to make radiographic inspections of machinery, or if he is called in to do a clean-up job after radioactive material has been accidentally released in the area,[224] it is likely that the court will classify this kind of activity as "inherently dangerous," or, as we would say, the kind of activity which involves "unusual" hazards. If this is the case, responsibility for these operations will be non-delegable.

Excavation cases are good examples of situations in which courts have drawn lines in terms of the degree of danger from the excavation. If it is of such a character and in such a place that unless unusual precautions are taken there is a substantial risk of a passerby falling into it, the courts conclude the duty to use due care is non-delegable. If, however, the excavation is made in a remote location where visitors are not expected, the duty may be delegated and the independent contractor's liability will not be imputed to the employer.[225] The same distinction is drawn in the cases involving demolition of buildings.[226]

An excellent example of this distinction is the decision by the Massachusetts Supreme Judicial Court in *Whalen* v. *Shivek*.[227] The plaintiff was killed while walking on a sidewalk adjacent to the building where the independent contractor was engaged to remove the parapet at the top of the building. The contractor did not construct a barrier on the sidewalk below, and his employees negligently allowed a piece weighing about two hundred pounds to drop on the plaintiff. Finding both the tenant and the owner of the building liable, the court said:

> We recognize that the principle with which we are concerned does not apply to cases where the danger does not come from work performed with proper skill and care, "but comes only from an unskilful or negligent act of the contractor or his servants, even if a lack of skill or care on the part of some of the persons engaged in the business reasonably may be expected.". . . . But we are of opinion that a finding was warranted in this case that the removal of the parapet by the contractor, in the circumstances disclosed here, involved work of such kind that it would probably cause injury to persons using

[224] *E.g.*, Tracer Labs, Inc., was called in to clean up after an accident in the Texas plant of another company using radioisotopes under license from the AEC. A.E.C. Release No. 1213, Nov. 6, 1957.

[225] 33 A.L.R.2d 7 (1954), especially 52 ff.

[226] *Id.* at 89.

[227] 326 Mass. 142, 93 N.E.2d 393 (1950).

> the sidewalk below unless special precautions were taken. . . . [The court then distinguished a previous case involving repair of a chimney where a brick fell onto the sidewalk as follows.] The work there involved consisted in taking bricks off of the chimney for a few feet and relaying them. What happened, the court said, was "a mere detail of the work" arising from negligence which was not a probable consequence of the work. A different case is presented here where the contractor was engaged in removing from a building bordering on a public sidewalk a parapet containing blocks weighing approximately two hundred pounds and in a state of disrepair.[228]

There are literally dozens of cases of this nature but the reasoning and result of *Whalen* v. *Shivek* exemplify the modern attitude of the courts. Certainly, if a radiation hazard is at all significant it seems quite likely that courts will find that the use of such material even during construction, repair, or maintenance operations involves the kind of unusual hazard for which the owner will continue to be liable even if the only negligence in the ordinary sense is that of the independent contractor. This will be true even though the operation does not amount to an "ultra-hazardous" activity such as to result in strict liability. A distinction is drawn between such activity and the less hazardous operation which nevertheless possesses sufficient potentialities for harm to others so that it can not be delegated to an independent contractor, thus relieving the operator from liability.

The same reasoning is the basis for the holding in most jurisdictions that the owner who hires an independent contractor to excavate for a building is liable for the negligence of that independent contractor in not properly shoring up the excavation so as to give the necessary lateral support for abutting buildings. The courts always refer to this as a type of work in which it is readily foreseeable that a substantial risk of harm is involved unless special precautions are taken. In such cases, if the independent contractor is negligent, the owner who hires him will also be liable even though otherwise the owner is not careless.[229] Probably if radioactive material is used, at least if it is sufficient in quantity and intensity to present a substantial risk, the operator himself will be held liable for the negligence of an independent contractor.

A recent opinion in the Ninth Circuit Court of Appeals in *Fegles*

[228] *Id.* at 151.

[229] Law v. Phillips, 136 W.Va. 761, 68 S.E.2d 452 (1952), and other cases annotated in 33 A.L.R.2d 111, 131 (1954).

Const. Co. v. *McLaughlin Const. Co.*[230] illustrates the possible criteria that may be used by a court in deciding whether to hold the employer liable for the negligence of an independent contractor. In this case the prime contractor, rather than the owner of the land, was held liable for the negligence of a sub-contractor. The sub-contractor's employees allowed hot rivets to fall on timbers and other inflammable material being used by another contractor doing a different job on the premises. In holding the contractor liable for the sub-contractor's negligence, the court said:

> An employer or primary contractor is liable for injuries caused by the failure of an independent contractor to exercise due care with respect to the performance of work which is inherently or intrinsically dangerous. "An employer may not divest himself of the primary duty he owes to other members of the community by contracting with others for the performance of work, the necessary or probable result of which is injury to third persons.". . . This exception places an absolute, nondelegable duty upon the employer to see that all reasonable precautions shall be taken during the performance of the work to the end that third persons may be adequately protected against injury.
>
> Work not inherently dangerous under some circumstances may be inherently dangerous under other circumstances. Thus, construction work near a street or sidewalk may, by reason of proximity to the street or sidewalk, be inherently dangerous. Riveting, while not inherently dangerous under all circumstances, becomes inherently dangerous if done over men and materials where no protection is afforded the men and materials below.[231]

There is no reason to assume that radioactive materials being used by an independent contractor in the course of construction, repair, or maintenance are less dangerous than "hot rivets."

During Normal Operations

The cases that are much more likely to arise involve radiation hazards which cause harm as the result of the normal operation of the owner, even though the negligence that makes it possible for the radiation to cause harm is that of an independent contractor. Liability probably will be imposed on the owner and operator of the reactor regardless of whether or not the negligent act was committed by the building

[230] 205 F.2d 637 (9th Cir. 1953). (An interesting early case allowing delegation in conducting a fireworks display is Deyo v. Kingston Consol. R.R., 88 N.Y.S. 487 (1904).)

[231] *Id.* at 640.

contractor who constructed the reactor tank, the supplier who furnished defective cores, the architects who designed the building, the repairmen who were negligent in repairing piping that carried radioactive material, or the installers or repairers of the ventilation system which filters out radioactive particles before air is discharged into the atmosphere or water into the river. Even though we assume that the operation of a reactor, or the use of a radiation source for radiography or of radioactive isotopes in research or industrial processing will not be classified as ultra-hazardous,[232] such activities, at least where the danger is at all significant because of type or amount, will be considered to create an ususual hazard and will therefore be non-delegable. Consequently, the owner probably will be vicariously liable for the negligence of the independent contractor. Within the class of non-delegable duties Prosser lists such matters as the duty of a carrier to carry its passengers in safety and to maintain safe railroad crossings, or of a municipality to keep its streets in repair or to refrain from obstructing a public highway, or of an employer to provide employees with a safe place to work. Concerning the line to be drawn between the non-delegable and the delegable duties, he states:

> It is difficult to suggest any criterion by which the non-delegable character of such duties may be determined, other than the conclusion of the courts that the responsibility is so important to the community that the employer should not be permitted to transfer it to another.[233]

Harper and James, in commenting upon the line to be drawn between delegable and non-delegable or inherently dangerous and non-inherently dangerous activities, say:

> At present the line is a ragged and irrational one somewhere between the two extremes. Several factors have been suggested as significant, but closer examination of their significance proves disappointing. Thus an operation's threat to highway travel has been thought important; and indeed the duty of care owed to travelers with respect to adjacent premises, or work done in the highway itself, may not be delegated. Nor perhaps may the obligation of care in working on scaffold over the sidewalk. On the other hand the duty of care in driving automobiles and trucks along the highway is fully delegable though this operation presents an infinitely greater threat to travelers than do premises or structures near or over the highways.[234]

[232] See *infra* Chapter IV on strict liability.

[233] Prosser 359.

[234] Harper & James 1409.

The opinion of the Kentucky court in *Brown Hotel Co.* v. *Sizemore,*[235] in which the hotel was held liable for injuries to the plaintiff when he fell into a manhole negligently replaced by the coal company delivery man, illustrates the typical approach of courts which apply the non-delegable duty concept. The court said:

> The courts are quite uniform in holding that there is an affirmative duty of seeing that a coal hole or similar servitude is properly guarded or protected when being used, and, as well, that the covering has been safely replaced; that the owner or possessor cannot absolve himself from liability or avoid performance of the duty by leaving it to another, such as the deliveryman of coal. The owner or possessor cannot receive the benefits of having the coal company use the chute to supply him with coal and at the same time renounce all interest or concern as to the condition it is left in, which may be to the manifest jeopardy of persons using the public thoroughfare being caught in the trap of an open hole or insecure covering.[236]
>
> * * * * *
>
> The displacement evidently was not obvious or apparent at a casual glance. But we do not think that fact excuses the defendant. The basis on which liability of the Hotel Company was submitted in the instruction was whether the Hotel Company should have discovered the loose lid within the interval of time. The correct basis should have been whether the Company exercised ordinary care and vigilance to discover the condition. The instruction was perhaps more favorable to the defendant than it was entitled to. It is not to be overlooked that the burden had shifted to the defendant to justify its non-action. The jury was authorized in law to find as a fact that the defendant was guilty of negligence.[237]

The rationale of the court seems to be that where the public generally is so likely to be endangered by a negligent act of an independent contractor on a public way abutting the owner's property, the owner will be held liable for the contractor's negligence if the act is not done carefully; the situation is not ultra-hazardous nor normally hazardous, it is unusually hazardous. The unusualness of the hazard here is two-fold: there is a great likelihood that someone will be hurt from such negligence and the number of persons who will be exposed to danger in a public way is great.

[235] 303 Ky. 431, 197 S.W.2d 911 (1946).
[236] *Id.* at 436.
[237] *Id.* at 439.

A recent lower court case in New York, *Thibault* v. *City of New York,*[238] illustrates another situation in which a court is likely to find a non-delegable duty, even though the danger does not affect the public generally nor create a hazard for a large number of persons. Only a small group of employees was endangered but the hazard was unusual in the sense that severe harm was likely to result, in this case death by electrocution. The contracting company which installed an overhead electric line for a city electric trolley bus system and the city itself were both held liable for the electrocution of a lineman resulting from faulty installation of insulators. In concluding that both the city and the contractor were liable, the court said:

> Whatever the cause, it is clear the failure to inspect and remove it proximately produced the accident, and the jury so found. It seems to me that neither the City nor the contractors could escape the obligation for thorough inspection. Though an electrical installation is a hazardous undertaking to workers and public alike, concededly neither of these parties inspected the insulator which, being defective, added to that hazard. The contractors plainly convenanted with the City. . . that such equipment would be free of defects. They could reasonably anticipate that *its own linesmen* would be exposed to danger while making mechanical adjustments. They also knew that the City would energize the system to make the test runs. Their admitted failure to inspect and remove the dangerous device therefore constituted active negligence on their part.
>
> . . . Clearly the City's act of energizing the lines for test run purposes, without its own prior "full and minute inspection", as provided for by Contract Article 29, and with knowledge that mechanical adjustments would thereafter be made, also constituted active negligence.
>
> . . . sound public policy demands that he who authorizes a basically hazardous work be vigilant regardless of who performs it and whether or not he voluntarily participates in or controls its operation. . . . The logical corollary to this rule is that in the course of basically hazardous work positive care be exercised by the owner even though he be promised indemnity by the person authorized to perform it.[239]

[238] 154 N.Y.S.2d 338 (1956).

[239] *Id.* at 342-43. [Emphasis added.] A similar duty was placed on the federal government for the death of an electric power lineman killed as the result of the government employee's failure to see that an independent contractor doing rehabilitation work turned off the current before the men climbed the poles. Pierce v. United States, 142 F. Supp. 721 (E.D. Tenn. S.D. 1955). To be distinguished is the problem of a general contractor's liability for negligence of a sub-contractor under an express indemnity agreement with the owner; City of Polytechnic v. Redmon, 217 S.W. 730 (Tex. Civ. App. 1919).

In effect the court is saying it is negligence not to inspect the work done by an independent contractor. If this is "active negligence" then it is a non-delegable duty situation.

Burns v. *Vaughan*[240] may be another example of a case imposing vicarious liability on an owner of land. In this case a farmer hired an airplane pilot to dust crops with 2, 4-D. The defendant admitted that he knew that the dust was dangerous but claimed that he had taken care to instruct the pilot not to release the dust if there was any wind. The owner defendant nevertheless was held liable for the damage that resulted to other crops on adjoining land in spite of the fact that he tried hard to stop the pilot after a breeze came up but did not succeed in time to prevent the damage. The court said that the jury could find from this evidence that the owner was negligent notwithstanding the precautions he had taken to warn the pilot and to stop him once a breeze arose. The court does not refer to the pilot an an independent contractor but the situation is one in which it is likely that the pilot was not an employee and the court states that the basic facts are similar to those in a previous case in which it seems quite likely that the pilot was an independent contractor.[241] This case, if actually it involved an independent contractor, goes even further than cases which hold the owner of land liable for injuries resulting from construction work where objects fall on public sidewalks rather than on the owner's own property. The damage occurred at a point more than a mile distant from defendant's land, not immediately adjacent to it. Nevertheless, liability is imposed because the activities are being carried out on the owner's own property, and the injuries result quite directly and almost simultaneously with the performance of the operations themselves.

The use of radioactive materials on one's own property is likely to be at least as "unusually hazardous" as uncovered man-holes, power lines, or 2, 4-D.

(2) For Operations Performed off the Premises

The on-site cases discussed above make it rather clear that the user of atomic energy, even if his operations are not "ultra-hazardous," will

[240] 216 Ark. 128, 224 S.W.2d 365 (1949). See annotation on liability for damages of all kinds arising from crop spraying, 12 A.L.R.2d 436 (1950). That such duties cannot be delegated, see cases collected at 440, including another Arkansas case.

[241] Chapman Chemical Co. v. Taylor, 215 Ark. 630, 222 S.W.2d 820 (1949). At 639 the court said the dusting was done "by an aviator whose regular business it was to

be held responsible in damages to persons injured through the negligence of independent contractors who carry out operations in the premises. These operations often will involve "unusual hazards" and, therefore, will be non-delegable. In reaching this result the courts have ignored the independence of the contractor and the consequent inability of the owner to control the contractor's employees except by telling the contractor to have his employees do things a certain way or stop work altogether. Liability has been imposed on the employer or owner regardless of how responsible the independent contractor was and whether or not he was able financially to respond for damages. The theory of the cases is that the duty simply is not delegable because the operations present an unusual hazard. Logically, therefore, argument can be made that the concept of non-delegable duty also should be applied to off-site operations involving unusual hazards. On this question, however, the answer is not nearly so clear. Legal literature and judicial opinions considering the question apparently are almost non-existent.

Will or should the user, such as a reactor operator, be allowed to immunize himself from liability for certain operations, such as transportation of radioactive material, fuel fabrication, or disposal of radioactive waste products, by hiring an independent contractor? The question posed assumes that the one hiring the services is not dealing with "ultra-hazardous" activities and in every other respect has acted as a reasonably prudent man would act. It is assumed that due care has been used in the operator's designs, requests, and specifications, as well as in giving notice of the dangerous nature of the commodity, in handling the material including preparation for shipment, in complying with all statutory requirements and administrative regulations, and in carefully selecting a competent independent contractor. Once the activity is found to be unusually hazardous, in determining the vicarious liability of the user or owner, should it make any difference whether the operation is performed on or off the premises? The dearth of treatment of the problem may indicate that all lawyers assume vicarious liability should not be imposed or perhaps it only means that plaintiffs' lawyers have not seen the logical possibility of applying the modern trend to off-site cases. The answer to this policy question will be very important to those engaging in atomic energy activities, and it should take into account the effect of liability or non-liability on wise development of nuclear enterprise.

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dust crops. . . ." It stated that the operator had engaged in crop dusting for 22 years from Florida to California and from Mexico to Canada.

(a) Decided Cases

(i) Transportation

The only recent case found which possibly deals with the liability of a shipper for the negligence of a carrier is *Pope* v. *Edward M. Rude Carrier Corp.*,[242] decided by the West Virginia Supreme Court in 1953. The plaintiff was injured when dynamite exploded while being carried on a public highway by a contract carrier which was licensed and regulated by the Interstate Commerce Commission. Both the carrier and the shipper, DuPont, were sued. The court held that neither the shipper nor the licensed regulated contract carrier which transported high explosives were carrying on a nuisance, and the doctrine of strict liability was not applicable. In holding both the shipper and the licensed and regulated contract carrier not to be subject to nuisance or strict liability doctrines, the court reasoned:

> The manufacture and the shipment of dynamite and its transportation by carrier are lawful and essential business enterprises. High explosives, such as dynamite, are valuable, important and necessary articles of commerce and industry. Without their manufacture and transportation for many essential uses the economy of the nation would be restricted and impaired. There is no allegation that either defendant in manufacturing, shipping or transporting the dynamite before or at the time of the explosion violated any provision of any law of the United States or of this State or any valid regulation imposed by the authority of either of them, or that the design or the construction of the equipment used was faulty or improper, or that there was any delay in transporting the shipment or any undue stoppage in the movement of the truck or any storage of the dynamite which would imperil the safety of the public or subject the dynamite to any unnecessary hazard which would cause it to explode.[243]

In holding the manufacturer and shipper of high explosives subject to the same kind of liability as the carrier, the court cited American Jurisprudence to the effect that "The same rule that applies to the carrier in the transportation of explosives, namely, that it is not an insurer against injuries, but is liable only for negligence, applies also to the shipper."[244] The court therefore dismissed the first and third counts, based on nuisance and strict liability theories respectively, as to both the licensed contract carrier and the manufacturer. The second count, how-

[242] 138 W.Va. 218, 75 S.E.2d 584 (1953).

[243] *Id.* at 226.

[244] *Id.* at 243; 22 Am. Jur. 203 (1939).

ever, alleged that the doctrine of *res ipsa loquitur* applied because explosives if properly handled ordinarily do not explode. The court held that this was not subject to demurrer even if no specific acts of negligence were alleged.

If this case should be accepted as good authority it would mean (1) shipping and transporting a dangerous explosive is neither a nuisance nor an ultra-hazardous activity, even though the manufacture or storing of it may be, so negligence rules govern; and (2) if a master-servant relationship exists, the shipper may be liable for the negligence of the carrier and *res ipsa loquitur* may be applied. The language of the opinion clearly implies that unless the shipper is guilty of negligence himself there is no liability even if the carrier (including common as well as contract according to the opinion)[245] is negligent; but this is not a holding in the case. The lower court certified the question of whether or not the relationship of independent contractor existed but the supreme court held that each count contained an allegation that the relationship of master-servant existed and this had to be accepted on demurrer.

The language to the effect that a shipper's liability is only for negligence is made even more doubtful as authority for refusing to apply vicarious liability principles because the concept of unusual hazard was not even mentioned. Its usefulness is reduced further by the fact that the only authority cited is the quotation from American Jurisprudence. The quotation itself is nothing but a repetition of an earlier statement in Lawyers' Reports Annotated which says:

> . . . [I]t has been held that a shipper of crude petroleum is not bound to so protect and guard it that harm therefrom shall come to no one, but his duty is performed by providing a suitable vehicle, able to encounter the usual risks of transportation.[246]

Even this statement is based upon a single case, *Goodlander Mill Co.* v. *Standard Oil Co.*,[247] in which the shipper was excused from liability for a fire resulting from overflowing oil caused by a leaky valve since the consignee of the oil in operating the valve was an intervening agent. The court said:

> The shipment of such an article of commerce casts upon the shipper a certain duty to the public,—that of providing a suitable vehicle for the petroleum in all respects adapted to

[245] *Id.* at 242.
[246] 1916B L.R.A. 730.
[247] 63 Fed. 400 (7th Cir. 1894).

> the purposes of carriage, and able to encounter the usual risks of transportation, so that the petroleum in its transit should not be exposed to danger of ignition from causes incident to its transportation, reasonably to be anticipated. We think that to be the true limit of the shipper's duty, and that duty, as it appears to us in this case, was properly discharged. The petroleum was contained in a tank impervious to fire. The shipment reached its destination in safety. The case is not like that of the shipment of explosives, the character of the shipments being concealed. [Citations omitted.] Here the contents of the tank were declared by the peculiar construction of the car. The properties of the petroleum were known to the consignee and to the public equally with the defendant. They are a matter of common knowledge. There was here no disguise and no concealment.[248]

The court in another part of the opinion emphasized the fact that defendant's negligence in connection with the valve was not the proximate cause of the fire because of the delay in time and remoteness in space between the negligent act and the accident.

If accepted at face value, the language quoted indicates that so long as the dangerous material is plainly marked and so packaged that it can withstand the ordinary strains of shipment, no liability will be imposed upon the shipper. Surely vicarious liability for the negligence of the carrier would not be imposed either. In light of recent trends in tort law, however, this case is of doubtful value as a precedent, except in West Virginia. The intervening agent and lack of privity arguments used by the court are not consistent with the trend today. The emphasis upon remoteness in time and space likewise is not consistent with current concepts. In addition, radioactive materials may be differentiated from crude oil and be found to present an unusual hazard.

Unfortunately no other recent transportation cases have been found clearly dealing with the vicarious liability of a shipper. All other discussions and cases dealing with a shipper's liability involve negligence of the shipper himself, such as in failing to meet packaging, notification, or marking requirements.[249] Even these cases almost always concern injury to employees of the carrier, not to the public generally. The West Virginia opinion, therefore, is not a satisfactory precedent on the question of a shipper's liability for negligence of an independent carrier.

[248] *Id.* at 404. The Deyo case, *supra* note 230, denying vicarious liability in shooting fireworks is probably also explained by its vintage—before the more liberal (loose) modern trend.

[249] See cases discussed and cited in 22 Am. Jur. 203 (1939) and 1916B L.R.A. 730.

Joseph R. Foard Co. v. *Maryland,*[250] decided in 1914, may be another off-site transportation case. An explosion occurred on the chartered vessel *Alum Chine* while it was being loaded with dynamite by an independent contractor stevedoring company hired by the charterer. Suit was brought against the stevedoring company and the charterer for the death of several men and for damage to ships and other property in the vicinity of the *Alum Chine.* The explosion was found to have been caused by the negligence of the foreman of the stevedoring company. The charterer was found to have hired a competent company to do the loading and the court refused to impose vicarious liability, although plaintiffs argued that the work was inherently dangerous and therefore non-delegable. The court stated:

> The rule that responsibility is on the independent contractor alone does not apply when at the inception of the undertaking a man of ordinary reason should know that in the natural course of things the work would certainly or probably result in injury to another, unless some distinct and definite precautions be taken, although the details of the work be done with due care; as, for example, guarding a hole dug in the street, or protecting buildings close to blasting operations from rocks which would probably strike them, or protecting a wall when excavating by it. But the exception does not extend to work which could be surely performed with safety upon the sole condition that due care be exercised in the details of its execution.
>
> Applying this rule, the Munson Company [the company which hired the stevedore company to load the vessel] is not liable. Loading dynamite, gasoline, gunpowder, naphtha, and other inflammable or explosive substances is necessary to commerce and is not a nuisance. [Citations omitted.] There was no distinct and definite precaution to be taken, so as to make sure that due care in the details of the work would make it safe. It was not disputed that dynamite may be loaded with perfect safety, if adequate care be taken against concussion and heat. There was no danger of either, except from the details of the work, and therefore the independent contractor alone was liable.[251]

Neither this opinion nor that of the lower court[252] considers the question of whether the arrangement was a bare-boat (demise) charter, in which the charterer takes over all management and operation functions,

[250] 219 Fed. 827 (4th Cir. 1914), *affirming* 213 Fed. 51 (D.C. Md. 1914).
[251] *Id.* at 833-34.
[252] Maryland v. General Stevedoring Co., 213 Fed. 51 (D.C. Md. 1914).

or a charter of affreightment, in which the owner continues in possession and is responsible for all operations.[253] Where there is any dispute as to which type of charter is involved, however, the courts lean to affreightment,[254] and in such cases liability for injuries to third persons ordinarily is imposed on the owner, not the charterer.[255] If this was the type of charter in the *Foard* case it lays down a rule of no vicarious liability in an off-site situation involving the handling of dangerous material because the accident happened on property owned and legally controlled by another. On the other hand, if the boat was legally in the possession and control of the charterer, it simply is an on-site situation in which the court refused to find that an unusual hazard was involved. Perhaps the case means that in determining the vicarious liability of an employer for the negligence of an independent contractor no distinction is to be drawn between on-site and off-site cases. The way in which the lower court opinion describes the policy question involved certainly makes no such distinction.[256]

[253] Robinson, Admiralty 594 (1939).

[254] *Id.* at 597.

[255] *Id.* at 614.

[256] *Supra* note 252 at 86-87: "To them the Foard Company seems called on to pay a high price for a very trifling error of judgment. On the other hand, if the decree here made shall be affirmed above, all that the Foard and the Stevedoring Companies have will make good to the libelants but a fraction of what they have lost. It is no comfort to them to tell them that dynamite is necessary to modern industry. Few of them had an appreciable interest in shipping the dynamite to the Isthmus. Many of them had none at all except that which they shared with everybody else. What happened at Communipaw and to the Chine shows how widespread disaster an explosion of dynamite may cause. That they should bear the loss does not seem fair to them. It is natural that they should feel that every one who had a part in causing the dynamite to be stowed on the ship should be liable to them. On the other hand, what has been said shows that it does not seem to be in accordance either with natural justice or with settled legal principles to make every one who has any part in the handling of the dynamite answerable for all the consequences of an explosion, although he was not in fault either in person or through some one for whom under the ordinary rules of law he must answer. It may be that some day the law will be so moulded that more exact and complete equity may be done. Public opinion has apparently come to the conclusion that workmen should be indemnified against the pecuniary consequences of accidents suffered by them in the course of their employment. Hereafter a step further may be taken. It may then seem just to compensate all persons who without fault of their own suffer from industrial accidents. Such a policy may be wise. Even if it be, courts would not be now justified in holding liable for the consequences of the accident him who directs the shipment of an explosive or who knowingly and willfully takes any part in such shipment or permits it having power to prevent it. Whether indemnification shall be given at all, and if so how, is a complex problem. It is for the Legislature to work out. In this case the court may not impose the burden upon either the city or upon any person or corporation who was no more directly responsible for the explosion than was the Munson Line."

Williamson v. *Southwestern Bell Tel. Co.*,[257] decided in 1954, perhaps should be treated as an off-site transportation case. A tree-trimmer was hired by the defendant telephone company to prepare the way for erection of telephone wires. He was negligent in driving his employees from work one day, causing the plaintiff to be injured. The court found that the tree-trimmer was an independent contractor and refused to hold the telephone company liable. This case, however, although it involves off-site transportation, is not very good authority on the vicarious liability question. The defendant's material was not being shipped and was not the cause of the injuries. More importantly, driving a car today, although an inherently dangerous operation in one sense, hardly classifies as one presenting an unusual hazard as the concept is used in the vicarious liability cases.

(ii) Other Cases Involving Off-Site Activities

The question of vicarious liability for the negligence of an independent contractor may arise in off-site activities other than transportation. An injured party may seek to impose liability upon the person who hires another to carry out such off-site activities on the same basis discussed already in connection with both the on-site and transportation cases, namely, the activity presents an unusual hazard and liability for negligence cannot be avoided by delegating the operation to another. The policy considerations influencing the courts seem to be the same. These cases illustrate how shadowy the line between on-site and off-site cases can become once it is determined that the specific activity has been requested by the employer of the independent contractor.

In *Scales* v. *Lewellyn*,[258] the defendant city raised the street grade, cutting off access to several houses, including the one in which the plaintiff was a tenant. The city hired an independent contractor to raise each of the houses, this operation of necessity not being performed on city property. The negligence of the contractor in shoring up the porch of the house where the plaintiff lived caused the latter's injuries, Although the court held that the city was not liable because the operation was not inherently dangerous and presented no unusual hazard, the opinion rather clearly implies that if it had, liability would have been imposed.

Judge Learned Hand, in *Person* v. *Cauldwell-Wingate Co.*,[259] in

[257] 265 S.W.2d 354 (Mo. 1954).
[258] *Supra* note 222.
[259] 176 F.2d 237 (2d Cir. 1949).

determining whether or not a contractor should be held vicariously liable for the negligence of an independent sub-contractor, clearly applied the same test as used when the owner is sued. The plaintiff's husband, an employee of another contractor, was killed because of the prior negligence of the sub-contractor in stringing high tension wires. The plaintiff argued that the main contractor was liable because it was an inherently dangerous operation which was non-delegable. Judge Hand said:

> In such cases the law imposes the duty of inspection upon the owner or contractor in invitum, and forbids him to delegate it, just as it does when a statute or an ordinance directly imposes such a duty. Often the factor which appears particularly to determine "the inherent danger" is the proximity of the work to a highway, since it is then more likely that any mischance will do harm, but these are merely instances of the general doctrine. Nor are the decisions anomalous which hold that the duty to inspect upon such occasions does not extend to matters "collateral" to the work itself. These do not concern the existence of the duty to inspect, but the extent of the inspection required.[260]

Judge Hand concluded that if the jury found the sub-contractor liable, it "might also find the Contractor liable."[261] This seems to be holding that the employer cannot avoid liability for the negligence of an independent contractor when ususual hazards are involved, at least if an inspection would have discovered the dangerous condition, since surely Hand was not suggesting that the law question of whether or not to impose vicarious liability was for the jury.

In some older cases involving the laying of pipelines,[262] pipeline companies which hired independent contractors to carry out certain operations were not held vicariously liable for the negligence of the independent contractors which caused injuries either to employees of the contractor or third persons. In both cases the operations, if performed negligently, could and did create a quite hazardous situation. These might be considered on-site cases in the sense that the pipeline companies undoubtedly had easements to use the adjoining property during

[260] *Id.* at 240.

[261] *Ibid.*

[262] Holt v. Texas-New Mexico Pipeline Co., 145 F.2d 862 (5th Cir. 1944) (Negligence of independent contractor in using dynamite caused employee of another contractor to be injured); O'Hara v. Laclede Gas Light Co., 244 Mo. 395, 148 S.W. 884 (1912) (A sub-contractor was alleged to have been negligent in piling pipes for use in building a pipeline, causing injury to a third party).

their construction work. Perhaps the same explanation could be applied to the *Person* case on the theory that the contractor had temporary control of the property during the construction period, although in the *Person* case the army camp property itself was owned by the government. In none of the three opinions, however, is any distinction between on- and off-site cases discussed.[263]

In *Doran* v. *Flood*[264] vicarious liability was held applicable to the building contractor who hired another to haul timbers to be used as piles to the building site. The death of plaintiff's son resulted from the negligence of the hauler as he was dragging the timbers along the streets to the site, clearly an off-site situation. The court held that the owners who had contracted to have the building constructed were not liable because they had nothing to do with procurement of the piles. The principal contractor would be liable vicariously, however, if his understanding with the hauler was to drag rather than truck the timbers through the streets. The court said:

> Those who have work, dangerous in itself, and requiring particular care, done, cannot shield themselves by letting it out to others without providing for the necessary care. If these defendants had contracted for dragging these logs along the streets as they were dragged, and so dragging them caused the injury, they would, without doubt, be liable. Letting the hauling for that distance at that price, to a person not a common carrier, who had no trucks or connection with facilities for doing it otherwise than by dragging, would have some tendency towards showing that the understanding with the defendants was that it was to be done by dragging, as it was done.[265]

The court specifically withheld judgment as to whether or not liability would be imposed if the arrangement were found to permit the hauler to choose a method other than the one way contemplated. The one contemplated happened to be unlawful because of a city ordinance prohibiting such operations. The case can be interpreted to mean that vicarious liability is imposed only when the arrangement in effect controls the manner in which the independent contractor is to work. Yet apparently the only control was the price paid, which was so low as practically to limit the methods to the one used, which was unlawful and negligent. There was nothing in the contract specifically allowing the employer to control the method.

[263] See also similar case discussed in connection with on-site cases, *supra* note 230.
[264] 47 Fed. 543 (Cir. Ct. S.D. N.Y. 1891).
[265] *Id.* at 544.

The question of whether or not to impose vicarious liability on the employer has arisen in a series of logging operation cases when an independent contractor has been hired to transport the logs to the mill of the employer. In one, *McDonell* v. *Rifle Boom Co.*,[266] such liability was imposed for much the same reason applied in *Doran* v. *Flood*.[267] The terms of the arrangement were such that the operations could be carried on only in the manner actually used by the contractor. The employer was held liable when the logs being handled by the independent contractor jammed and caused the river to flood plaintiff's land. To meet the conditions imposed by the contract the river operations had to be carried out in this manner and the court imposed liability on the mill owner on the theory that for practical purposes it had not relinquished control. Although it had no power under the contract to control the contractor's operations directly, it had done so effectively because of the performance required of him by the contract. Clearly this is an off-site situation in which vicarious liability is imposed, yet the reasoning of the court, as in the *Doran* case, is remarkably like that used in the on-site cases discussed above.[268] The similarity is particularly marked in the cases involving spread of fire from one piece of property to that owned by the plaintiff,[269] it being impossible sometimes to determine whether it was an on-site or off-site situation.[270]

[266] 71 Mich. 61, 38 N.W. 681 (1888).

[267] *Supra* note 264.

[268] See discussion in text *supra* notes 224 to 241.

[269] Cases are collected in Annot., 24 A.L.R.2d 241, 288 ff. (1952). The opinion of the court in St. Louis & San Francisco R.R. v. Madden, 77 Kan. 80 at 91-92, 93 Pac. 586 (1908), is typical: "We find no difficulty in determining that the work of burning the fire-guard was a part of the operation of the road. The company could not, therefore, absolve itself from the liability by letting out the work to an independent contractor, for the reason that it owed to the plaintiff an obligation, placed upon it by the law, to respond in damages for all injuries by fire thus caused; and for the further reason that it employed a dangerous agency which in the experience of every one required that precautions be taken to prevent damage to the property of others. Thus a second duty was cast upon the railroad company not to cause the work to be done, either directly by its employees or indirectly by a contractor, without seeing that precautions were taken to prevent the escape of fire and consequent injury to the property of plaintiff. Neither of these obligations, or duties, could be avoided by delegating the performance of the work to another."

[270] See, for example, John L. Roper Lumber Co. v. Hewitt, 287 Fed. 120, 122 (4th Cir. 1923). The owner of land hired an independent contractor to carry out a logging operation knowing that inflammable debris would collect along the railroad right of way over which the logs were carried. Fire, set in the negligently accumulated debris, spread to neighboring land and the landowner was held responsible. The court reasoned: "In our view, the work which defendant contracted to have done was of that character commonly described as intrinsically or inherently dangerous, and, if this be

Other logging cases,[271] however, indicate that vicarious liability will not be imposed when the independent contractor floating logs down river to the hiring company's mill is not so narrowly limited in his methods or timing by the performance terms of the contract. The courts concluded that the operations (which were off-site, though this was not discussed in the opinions) were sufficiently separate to justify denying liability. Plaintiffs argued that floating logs was inherently dangerous but the courts did not accept the contention. The courts, however, did meet squarely the basic policy question involved in all independent contractor vicarious liability cases; *i.e.*, are the operations distinct enough, is the danger not too unusual, is the economic value to society of this activity sufficient to allow the employer to immunize himself against tort liability by hiring competent independent contractors for certain operations?

A similar result in another early off-site case was reached by the Washington court in *Johnston* v. *Seattle Taxicab & Transfer Co.*[272] Here the sub-contractor, in removing dirt from the main operation, set up a counter-weight sled device to help his horses keep the wagons loaded with dirt from running down hill too fast. The plaintiff was injured when the taxicab in which he was riding struck this device. Again the court found that the operations of the independent contractor were not controlled by the principal contractor and so refused to impose liability on him for the former's negligence. The court said that the inherently dangerous exception did not apply because placing the drag in the street did not relate to the actual performance of the work contracted for but only to the manner of its performance.[273]

In *Woodard* v. *A. F. Coats Lumber Co.*,[274] the Oregon court used

true, it follows, we think, that the contractee may not, under such circumstances, let the work to others to do, and avoid liability in case it is negligently done; for where danger to the property or person of others is likely to attend the doing of the work, the liability of the contractee is not avoided by committing it to someone else to do. Under the circumstances as they here obtained, defendant owed the duty to the owners of neighboring property to see that the work was carefully performed, and that proper means were adopted by which the consequences of the negligent accumulation of combustible material on the right of way would be avoided; in other words, to see that the mischief which would likely occur did not occur by removing the danger or otherwise adopting such precautionary measures as experience has shown to be necessary under like conditions."

[271] Carter v. Berlin Mills Co., 58 N.H. 52 (1876); Town of Pierrepont v. Loveless, 72 N.Y. 211 (1878).

[272] 85 Wash. 551, 148 Pac. 900 (1915). This case comes closer to the on-site situation since the injury occurred closely adjacent to the main operation on adjoining land, unlike the logging cases.

[273] *Id.* at 557.

[274] 97 Ore. 302, 191 Pac. 668 (1920).

much the same reasoning when plaintiff, a fisherman, sued for damages to his nets caused by oil which leaked from a barge which had sunk while being operated negligently by an independent sub-contractor. The barge had been hired to carry defendant's wood but oil was left in the bottom of the barge from previous operations for other persons. Finding that the barge company was an independent contractor and that towing barges was not "inherently dangerous or liable to inflict damage upon another," [275] the court refused to hold the lumber company liable for the negligence of the tug operator.

Although the logging and the *Johnston* and *Woodard* cases might be considered as transportation cases, the injuries resulted not from the dangerous nature of the commodity being transported but from the way in which the independent contractor carried out his operations. Unless the particular method of operating is specified by the contract or is indirectly dictated by the terms of the contract, the courts generally refused to impose on the employer vicarious liability for the negligence of the independent contractor, even though the operations certainly involved as unusual hazards as many of those in on-site cases where such liability was found. These cases illustrate the possibility that courts will find certain operations sufficiently separate to permit the employer to avoid liability for the independent contractor's negligence in carrying on operations having considerable hazard potential. They all, however, are rather old cases.

(iii) Waste Disposal Operations

The problem of vicarious liability for an independent contractor's negligence surely will arise to trouble the atomic energy producer or user when it comes to disposing of radioactive wastes or "garbage." It is perfectly clear that in the light of the dangerous nature of radioactive material there is a real obligation of the user to take special precautions to insure proper disposal. Recognizing the unusual character of such material, surely the courts will say that due care requires that greater precautions be taken than are required for ordinary waste disposal procedures. In most cases such wastes certainly will be considered as dangerous as empty five gallon shellac cans [276] or oil filters,[277] and so

[275] *Id.* at 308.

[276] Salas v. Whittington, 77 Cal. App.2d 90, 174 P.2d 886 (1946). A shellac can exploded when put in fire by a small boy who had found the can in a trash pile used in common by defendant and the boy's parents. Defendant held liable.

[277] Justice v. Amherst Coal Co., 101 S.E.2d 860 (W.Va. 1958). Defendant dumped oil filters in a trash pile which he knew was frequented by children. Defendant was held liable for injuries to child hurt when filters exploded.

cannot merely be tossed into the trash pile, literally or figuratively. On the other hand, if care commensurate with the dangers is used, authority exists denying recovery to an injured party even when the waste material is dangerous explosives.[278]

Assuming, however, that a person such as a reactor operator is careful to choose a competent chemical processor or disposal agent who has been licensed by the AEC and meets his packaging and notification responsibilities, but the disposal operation is done negligently, will the operator be liable vicariously? The number of cases found which deal specifically with off-site disposal actually can be counted on one hand, once cases involving a negligent owner or employer are excluded.[279] Even as to these, factual distinctions are not difficult to make; three deal with garbage and one with sewage.

The Garbage Cases. The case of *Gulf, Colorado & Santa Fe Ry.* v. *Chenault* [280] involved the disposal of cattle killed in a train wreck on the defendant's road. The railroad's roadmaster contracted with a butcher to remove the dead cattle to the butcher's pasture some two or three miles out of town. The butcher assured the roadmaster that this was far enough away so as not to bother anyone. The butcher's pay for disposing of the cattle was the hides of the eighteen head. The butcher placed the cattle in his pasture but close enough to the plaintiff so that they became a nuisance. The court permitted damages to be recovered for the nuisance in spite of the claim by the railroad that the butcher was an independent contractor who had undertaken to dispose of the carcasses so as not to create a nuisance. The courts *total* discussion of

[278] Ford v. United States, 200 F.2d 272 (10th Cir. 1952), and Iokepa v. United States, 158 F.Supp. 394 (D.C. Hawaii, 1958). Both involved explosives left after the property had been thoroughly searched by the federal government for unexploded shells and other weapons used during war-time training maneuvers. The properties at the time of the explosions no longer belonged to the government. In each case the court found that the government had conducted its decontamination searches carefully and was not to be held liable. There was no dependence in either case upon the doctrine of Dalehite v. United States, 346 U.S. 15, 73 S.Ct. 956 (1953), that the government, under the Federal Tort Claims Act, had not submitted to suits for injuries resulting from discretionary acts of government officers. It might also be argued that there was an element of assumption of risk in each case since the people occupied or used the property knowing of its prior use but the reasoning of the court in neither case based its decision on this idea.

[279] Liability is imposed if the owner is negligent himself in garbage or refuse disposal operations, Annot., 156 A.L.R. 714, 734 (1945), or is negligent in supervising how others use the city disposal site, City of San Antonio v. Mackey, 14 Tex. Civ. App. 210, 36 S.W. 760 (1896).

[280] 31 Tex. Civ. App. 558 (1903).

the policy involved and its reasons for deciding that the railroad was liable is as follows:

> It was due the public by appellant to dispose of the carcasses so as to prevent a nuisance, and this duty could not be delegated to someone else, and appellant thereby escape liability. It was responsible for the acts of Phillips in failing to properly dispose of them.[281]

On a motion for additional conclusions of fact, the court stated that they found the following:

> 1. Defendant exercised ordinary care in selecting E. J. Phillips as a suitable person with whom to contract for the removal of the carcasses.
> 2. Phillips employed his own means and facilities in removing the carcasses from the defendant's right of way near Garland to his pasture remote from said right of way. He was an independent contractor, provided it was possible as a matter of law for the defendant railway company to create such a relation in the disposition of such cattle.[282]

Fourteen years later the Alabama appellate court had occasion to decide a remarkably similar case, *Southern Ry. Co.* v. *Robertson.*[283] The plaintiff sued the defendant railroad for creating a nuisance by putting the carcass of a dead animal so close to the plaintiff's residence that the odors of decay were more than barely perceptible. The railroad's defense was that an independent contractor, not the railroad or any of its employees, was responsible for creating the nuisance. After stating that there were two exceptions to the general rule of nonliability for the acts of an independent contractor—one, inherently dangerous work and two, where "certain duties" are owed—the court said:

> The common intent of the defendant and Cornett was to rid the defendant's premises of a nuisance that would result from having the carcass on the defendant's premises, and in accomplishing this result, a nuisance was created, to the annoyance and hurt of the plaintiff, so, assuming that Cornett was an independent contractor, the defendant would be liable. . . .
>
> Negligence of the defendant is not an essential element in an action for damages resulting from a nuisance; the action is founded on the wrongful act in creating or maintaining a

[281] *Ibid.*
[282] *Id.* at 559.
[283] 16 Ala. App. 155 (1917).

> nuisance—in this case, in creating it. . . . The application for rehearing ignores the principle that the defendant owed the plaintiff a duty not to create a nuisance on his premises. If we should grant the contention that the defendant could avoid liability by employing an independent contractor in such cases, then by employing an irresponsible insolvent who could, with impunity, violate the rights of a third party the rule of law imposing a duty on a principal would be rendered futile and useless.[284]

The court then stated that the question of fact was for the jury, in any event, as to whether Cornett was an agent or an independent contractor of the defendant railroad.

Courts probably will not ignore completely the fact that the injured plaintiff often will be suing a public utility or other large corporation which is covered by an insurance policy and the government indemnity program. On the other hand, the applicability of these cases to the atomic energy problem we have posed is not clear. In the *Chenault* case it is possible to interpret the brief statement of facts and conclusion of the court as meaning that there was in fact an agreement between the roadmaster and the butcher as to where the carcasses were to be removed, and that the roadmaster was negligent in failing to investigate personally and determine that this disposal site did not create a nuisance. Even the Alabama case might be read as involving an agreement between the defendant's foreman and the independent contractor as to where the carcass was to be placed. If this is true, then these cases come much closer to *McDonell* v. *Rifle Boom Co.*,[285] involving an independent contractor hired to float logs down a stream. In that case the court held the company liable for the negligence of the independent contractor since to carry out the terms of the contract, he was forced to do the very thing which caused the injury.

Even if this fact is not read into either of the cases, some important distinctions should be recognized before applying them to the disposal of radioactive waste material. In neither case was the independent contractor licensed or controlled in any way by a governmental agency. Likewise, there was no evidence of special qualifications or expertise in disposal operations, though admittedly there is not much special knowledge needed in disposing of dead animals. In addition, while dead animals may create a hazard to health, for the most part the hazard is one of obnoxious odors only. In the case of radioactive waste

[284] *Id.* at 156.
[285] *Supra* note 266.

materials there is a health and safety danger to property and particularly to persons. The danger may be great and it usually will last a greater length of time than the smell of a decaying carcass. These cases, however, deal with the disposal of waste material which is usually classified as garbage, a term sometimes used to describe the fission products of the atomic energy business.

The third garbage case, *Kuehn* v. *City of Milwaukee*,[286] presents a situation somewhat closer to the problem of disposing of radioactive waste materials. The commissioners of public works for the city of Milwaukee hired a contractor to dump all garbage and refuse collected within the city in Lake Michigan at some point not less than fifteen mile from the city. A right to suspend the work or to let it to somebody else in case of "improper or imperfect performance" was reserved by the city. The court held that this did not give the city the power to direct and designate the dumping place, and, therefore, the city was not liable for damages when on two occasions the garbage dumped by the independent contractor was carried by the ordinary currents and movements of the lake waters to the spot where the plaintiff's fish nets were located, damaging the nets. The court said:

> It requires no citation of authorities to show that, if the act which caused the damages was the work of an independent contractor, the city is not liable. Whether the person whose act caused the damages was, in legal contemplation, an independent contractor, is sometimes debatable on the facts. The test is, Had the defendant the right to control the conduct of the person doing the work, as respects the *mode* and *manner* of doing it, in the particular complained of?[287]

There are several difficulties in using this case to answer our waste disposal problem. In the first place, it was decided in 1896 before many courts developed the idea of inherently dangerous material and nondelegable duties. Certainly the dependence of the court upon the independent contractor analysis with no recognition of the non-delegable duty principle makes it doubtful authority, even though it is true that unless garbage is properly disposed of and particular care taken in the disposal operation there will be very undesirable results both as to odors and health hazards. In *Kuehn* v. *City of Milwaukee* it resulted in damage to property only. Perhaps more important is the fact that the court, after holding the city not liable because an independent

[286] 92 Wis. 263, 65 N.W. 1030 (1896)
[287] *Id.* at 265.

contractor was used, said that if the commissioners of public works had used their own employees in this work the city still would not be liable, "for it is a public service, as distinguished from a corporate duty. In that respect, it is like the fire, health, or police departments of cities." [288] A different result might have been reached if a private concern were disposing of its own wastes.

One other case was found in which there at least is some language concerning the power to contract away liability for disposal of waste material. In *People* v. *City of Los Angeles,*[289] several outlying cities had contracted with the City of Los Angeles to dispose of their sewage. It was disposed of in such a way that, when swept back to shore, it caused damage to the beaches along the ocean. The court said:

> A primary obligation rested upon appellants to dispose of sewage accumulating within their respective boundaries, and an equally binding obligation rested upon them to dispose of the sewage in such a way that it would entail no injury to other parties. *And appellants cannot relieve themselves by contract with other municipalities of their primary obligation imposed upon them by law* [The contract with Los Angeles is irrelevant.] . . . There rested upon appellants a bounden duty to dispose of their sewage in such a manner as not to bring injury or damage to others. It therefore follows, that the fact that the screening plant and submarine tube at Hyperion are owned, maintained and controlled by the city of Los Angeles does not relieve appellants of responsibility for the admitted public nuisance sought to be abated, if they contributed thereto.[290]

The fact situation seems analogous, the language denying immunity from liability is strong, and the case is the most recent found. The difficulty for present purposes is that it was not only an action by the state rather than by a private individual but also it was an action merely to abate a nuisance, not to recover damages. Even as to abatement of the nuisance, the only liability sought to be avoided was a duty to contribute toward the construction of a new disposal system for the whole area which would treat the sewage adequately and prevent pollution of the ocean and beaches. The case involved the question of whether the outlying cities had to help Los Angeles finance a new plant, or could insist on their original contract. The language was

[288] *Id.* at 266.
[289] 83 Cal. App.2d 627, 189 P.2d 489 (1948).
[290] *Id.* at 643. [Emphasis added.]

directed to this liability, not the quite different one involved in a damage action by a private person harmed by the pollution.

In the event an injury is claimed to have been caused by radioactive waste, it will be very difficult to identify not only the particular radioactive material but also the person or independent contractor who handled it. Therefore, as the use of radioactive materials becomes more widespread, it will become increasingly important to attain centralized control of disposal operations. At the present time most disposal operations are under the control of the Atomic Energy Commission.[291]

(b) Conclusions Concerning Off-Site Operations

Existing cases do not give a very satisfactory answer to the question of whether or not vicarious liability will be imposed on the employer for the negligence of an independent contractor handling radioactive wastes in off-site situations. Courts do differ on the policy conclusion to be drawn in individual cases, both on and off-site, but they all are peculiarly uncommunicative as to precisely why in a particular case the hazard is or is not unusual enough to preclude delegation of liability. Proper development of this new industry, however, is dependent to some extent upon the answer to this question. The authors suggest that the answer should depend upon two factors; the degree of unusualness of the hazard created, and the distinctness of the operation delegated to the independent contractor, both considered in the light of what effect a rule of non-delegable duty will have on development of the industry and what effect a rule of delegable duty will have on the public possibly subject to the hazard created. The following conclusions are suggested by the authors.

The transportation of radioactive materials, whether by land, water, or air, undoubtedly will create some considerable risks, possibly to the passengers and employees of the carrier, to the property of shippers, or even to the general public should an accident occur. The extent of the hazard will vary greatly from case to case, depending upon the intensity and type of the radiation as well as whether it is in the form of a liquid, gas, or solid. Surely liability should not be imposed upon the shipper as a general rule and perhaps never so long as he is careful in all respects, including the choice of a competent, licensed common carrier.

[291] The AEC is not given jurisdiction over some radioactive materials such as radium and radioactive isotopes produced other than in reactors.

The question is not whether someone must assume liability to compensate for negligently caused injuries but rather, is it to be imposed upon the shipper or carrier? Undoubtedly a competent, licensed common carrier will carry normal public liability insurance coverage and there would seem to be little reason for breaking down the traditional dividing line among various industrial operations. Traditionally one of these has been that between transportation and other phases of business activities. If an accident caused by the negligence of the carrier should release radioactive materials, the hazard to other property ordinarily would be much less than that created by the shipment of other kinds of materials regularly transported on common carriers. Explosives, dangerous chemicals, and various highly inflammable materials have a much greater destructive potential as to property than will radioactive materials in many if not most cases. Decontamination in every situation will not be possible but in many it will be quite feasible to remove the radioactive material with no substantial injury to the property itself.

When the number of persons possibly endangered and the extent and seriousness of the injuries that might result are considered, the same result should be reached as to personal injuries arising from shipment of such materials. The danger of personal injury from shipment of ordinary explosives and inflammables in the usual case will be much greater, both as to numbers and seriousness of injuries. In fact, except for the possibility of ingesting radioactive materials into the human body, it is doubtful that the risk is nearly as great. With adequate labeling,[292] increased public awareness of the nature of radiation hazards, and particularly with special training for rescue personnel, injury to great numbers of persons through accidental release of radioactive material should be less likely than in the case of carrier wrecks involving explosives, dangerous chemicals, and inflammable material. In general, the risk is no more unusual, if as much so. When the negligence of the carrier is the sole cause of the accident, the number of persons and the extent of injury caused by inhalation or ingestion of radioactive material does not warrant breaking down the desirable separation of responsibilities in business operations which allows some activities to be carried on by independent contractors. This is the case particularly when the carrier is licensed by the federal government and its activities in transporting such material will be regulated closely with relation specifically to the health and

[292] On the duty to label, see *supra* note 139.

safety problem. A rule imposing vicarious liability would tend to cause shippers to transport their own material and more danger to the public might be created than if use is made of carriers who have enough business in such shipments to acquire the necessary special knowledge and take the required precautions to protect the public. Administration of health and safety rules will be less difficult than if there are many persons engaged in shipment operations. If a carrier were not so licensed and controlled a different result perhaps is justified, but even here if a competent and financially responsible carrier is selected, it is doubtful that the traditional line between transportation and other business activities should be broken down.

Fabrication of fuel elements and similar activities related to work on the radioactive material before it is shipped to the ultimate user should be treated in the same way as transportation cases so far as the vicarious liability question is concerned. This conclusion is limited to harm from accidents that occur while the independent contractor is working on the product; it is not meant to apply to injuries which occur after the user has started to make use of the material in his regular operations. The question of the user's liability for a defect resulting from the supplier's negligence and of the supplier's liability for such defects after the material reaches the ultimate user surely will be governed by the usual rules.[293]

Although no very closely analogous cases were found on this problem, those found (all quite old) suggest that vicarious liability would not be imposed,[294] except possibly where the contract in effect dictates the method to be used by the independent contractor.[295] The modern trend in general to expand liability in negligence situations may lead more plaintiffs to assert the unusual hazards idea in off-site cases. It is likely, therefore, that courts will have to decide whether to impose vicarious liability on the employer for the independent contractor's negligence. The policy justification for forcing the user of the material (*e.g.*, the reactor operator) to supervise personally all of the supplier's plant operations to guard against negligence is questionable.

At the present time, the reactor operator apparently does not make his liability insurance effective until he is ready to operate the reactor. In addition, apparently the AEC does not yet require the fuel fabricator to take out financial protection under the indemnity amendments

[293] See discussion of enterprise liability, *infra* Chapter V, and cases concerning liability of a landowner for defective construction discussed *supra* note 227.

[294] Cases discussed in text *supra* at notes 258-75.

[295] See cases discussed in text *supra* at notes 264, 266.

to the Atomic Energy Act of 1954.[296] The consequence of these two facts is that the government indemnity program does not cover the fuel fabricator's operations; nevertheless, vicarious liability should not be imposed on the reactor operator if he uses due care in selecting the fabricator. The hazard involved in fuel fabrication operations is not nearly as great as that arising from the accumulated fission products resulting from reactor operations. The fabricator's public liability policy, even without the government indemnity program, should cover any liability that would result and should provide adequate compensation for damages imposed. If coverage is not adequate, the solution should be to require financial protection and give government indemnity coverage, not shift responsibility for the independent supplier's negligence to the reactor operator. If it is shifted, participation in atomic energy activities by the relatively small user who is interested in industrial or research uses, not reactors, probably will be discouraged considerably. The small operator, perfectly capable of abiding by safety requirements and meeting financial protection responsibilities for his own small operation, undoubtedly would not be equipped or want to supervise the plant operations of a supplier, nor would he feel justified in assuming liability for injuries to the supplier's employees or third parties injured through the supplier's negligence. The risks involved in fuel fabrication are not so unusual as to justify adoption of a rule of liability having this effect.

If the *fuel reprocessing operator* is negligent, however, the hazard could be considerably greater, though the operation is as distinct as that of fuel fabrication. Reprocessing operations often will involve great quantities of highly radioactive fission products with great potential for harm. In this respect these operations raise the same considerations presented by reactor waste disposal activities and should be treated in the same way.

Even *disposal and reprocessing operations* generally should be considered a separate function. The entrepreneur who creates the necessity for disposal or reprocessing should not have to assume vicarious liability for the negligence of the reprocessor or disposal concern. The most impelling reason for this legal result is that there is so much to be gained by centralized disposal operations carefully controlled or even conducted by the federal government itself through the AEC or its contractors. It would be very unwise to adopt a rule which would lead individual entrepreneurs to undertake the disposal operation them-

[296] See discussion of federal indemnity legislation, *infra,* in text at notes 1265 ff.

selves. If they are to be held liable for the negligence of the disposal contractor, however, they will tend to do just this. Because it is desirable to concentrate materials in preparing them for disposal and to dispose of them in designated places, it would seem that creating a separate and distinct disposal operation is the best solution. Where an entrepreneur contracts with a disposal company which has been specifically licensed[297] and approved by the AEC with particular care directed to the question of preserving the public health and safety, it is best that only this company, or the federal government if it carries out the operation itself, be liable. So that the public which might be damaged by the negligent disposal operations can have the benefit of the indemnity program, however, the AEC should license such persons, *require them to show financial responsibility and sign indemnification contracts so as to bring the $500,000,000 government indemnity coverage into effect.*

There may be reason to impose upon the atomic energy user full responsibility for all operations carried on by his own employees or on his own premises by independent contractors; the trend of recent cases makes this result very likely in a radiation case. On the other hand, it would seem that reprocessing and waste disposal operations are sufficiently distinct and so closely regulated by the AEC that our tort liability rules should recognize them as distinct. If this is not done the small atomic energy operators will be seriously deterred from continuing in the field even though their specific activities create no unusual hazards (either in terms of number of people exposed or the kind of exposure involved) and do not call for a high financial protection requirement.

An additional reason for separating such functions for purposes of tort liability is to avoid some extremely difficult proof problems. The complications of proving whose radioactive material does specific damage are considerable. The disposal operator often will mix the material from several users making it impossible to tell whose was responsible for what injury. This might lead to making all who contributed some material liable for all damages from any of it and this is too much for most small operators. Instead the law should allow compartmentalization to the extent suggested, even as to tort liability rules.

The authors do not suggest, however, that a manufacturer of radio-

[297] *E.g.*, American Mail Lines, Ltd., has been licensed to dispose of waste products from the Boeing Airplane Company operations. Very specific limitations on the disposal method are imposed by the license. AEC Press Rel., July 31, 1958.

active material should not be held on a product liability basis as discussed in Chapter V. Neither do they mean to suggest that the user of the material should be immunized from injuries that occur during his use of the material even though the injury results from negligence of a supplier. He should be responsible for seeing that proper materials and proper procedures are used in his own operations. It also seems perfectly reasonable to hold the user to a standard of conduct which requires him to be extremely careful not only in his preparation of such materials for reprocessing, transporting, or disposing but also in labeling and giving adequate notice and in selecting competent licensed contractors.

So long as strict liability is not imposed upon all atomic energy operations, (and it should not since many of them are not even as hazardous as some normal business activities) and so long as there is careful governmental control directed specifically toward protecting the public health and safety, some compartmentalization of tort liability as well as operational activities should be allowed where it seems perfectly natural and useful and is not adopted solely to avoid liability. Such a rule should aid considerably in the development and diversification of atomic energy activities. When and if, as seems likely, separate insurance companies write atomic energy risk policies, it will become very important to decide which persons having contact with the particular material alleged to have caused damage are to be held liable. At the present time, since there are two separate insurance funds furnishing two separate insurance coverages for atomic energy hazards, the question may still be important. While the government is the only source of recovery if the damages go above the financial protection requirements set by the AEC for a particular operator, it is important to determine who is to be held liable up to the point where the government does take over. As insurance operations and the whole atomic energy business fall into more normal, standardized business patterns, it will be quite important that recognition be taken of this vicarious liability problem. Perhaps a legislative solution should be adopted. In our opinion it would be desirable to allow some compartmentalization along the lines suggested.

In deciding whether to apply the "inherently dangerous" or, as we prefer, the unusual hazard concept to fuel reprocessing or waste disposal operation, at least one line should be drawn—between cases where the injured person is a member of the general public and those in which the injured person is an employee of the independent con-

tracting company carrying out one of these distinct operations. The same distinction is applicable also to transportation and fuel fabrication cases. A radiation accident that occurred at Oak Ridge recently illustrates the kinds of situations that will arise as greater use is made of radioactive materials.[298] Eight employees of the plant received significant exposures to radiation, one as much as 320 rad. The exposure occurred when a critical mass was created accidentally during handling of enriched uranium in the form of a slurry.

There will be similar types of accidents in all of the operations which we suggest are distinct, with the possible exception of transportation. It may be entirely satisfactory, as a matter of policy, to impose vicarious liability on the landowner for dangerous conditions which cause injury to the employees of an independent contractor if the negligence creates an unusual hazard, such as is found in the construction cases. Surely, however, there is no policy justification for applying such rules to a fabrication, transportation, reprocessing, or disposal operation employee whose injury results solely from the negligence of his own employer. His injuries certainly should be and in some cases would be covered by workmen's compensation carried by his employer.[299]

Where the user has carefully selected a licensed operator for one of these distinct activities and has been careful to give the necessary information and to properly label material so that the independent contractor is advised of the dangers involved, the best position would seem to be not to impose vicarious liability upon the user for damages caused by the independent contractor, even when the injury is to innocent third parties. In any event, surely there is no justification for holding the user vicariously liable for negligent injuries to employees of an employer-independent contractor.

This is a quite different problem from that involved in the product liability and construction cases where a manufacturer who is negligent in producing or building some article is held liable after the product has been turned over to other persons for their sale or use.[300] In those cases the person is being held liable for damages caused by his own negligence, not for the negligence of another party carefully selected and duly licensed to carry out a particular function by a governmental agency charged with regulating the very problem of health and safety

[298] The facts of the incident are set out, *infra*, Chapter IV at note 125.

[299] See discussion of workmen's compensation, *infra*, Part II.

[300] See discussion of enterprise liability, *infra*, Chapter V.

with which we are concerned. There seems little reason to shift responsibility for these distinct operations or to encourage attempts by the employer to control the independent contractor's operations far removed from the employer's own operations.

4. Damages—Interests Protected

a. Introduction — Limitations on Discussion — General Theory of Compensation

Some aspects of the damage problem typically are treated as part of the duty concept,[301] while others usually are discussed after the other three elements—duty, breach, and causation—have been shown. Prosser does not consider it a separate question; to the extent that he discusses it he does so in connection with individual types of action.[302] On the other hand, the general theory of damages in negligence actions is treated as a separate problem by Harper and James.[303]

In part, this difference of opinion undoubtedly arises from the fact that frequently a court's determination of whether or not to allow compensation for a particular kind of injury is tied up with proof difficulties, real or imaginary. Courts will often cite the difficulty in attaining reasonable certainty of proof as a reason for denying recovery for certain kinds of injuries. In dealing with the underlying policies, it will help our analysis if the damage question is separated into two parts: (1) what types of injuries will be considered compensable, assuming that causation can be proved, or, in other words, what kinds of interests will the law of negligence protect by allowing a damage action against a person who has invaded another's interest; and (2) what kind of proof should a court consider, or let the jury consider, in determining (a) whether the particular defendant has caused injury to the plaintiff, and (b) the extent of this injury. In resolving these questions a social policy determination must be made as to what interests should be protected by our legal system against negligently caused harm. Some of the injury situations arising from overexposure to radiation will be decided unjustly if present proof difficulties are used to deny any recovery for invasion of a particular interest. Fortunately the trend seems to be away from any arbitrary limitation upon compensable interest; it is in the direction of treating

[301] Harper & James 1028 ff; Prosser 174 ff.

[302] *E.g.*, Prosser 40 (mental disturbance), 56 (trespass), 416 (nuisance), 566 (misrepresentation), 593 (libel and slander), 765 (injurious falsehood).

[303] Harper & James ch. 25 at 1299.

the proof problem as a matter of procedure, not as a matter of limitation upon the types of interest protected against negligent invasion.[304]

Not all radiation injuries will present unique damage considerations; in fact, many will not. In determining whether or not to allow recovery in tort actions it would seem to make little difference whether the loss was caused by radiation or by fire, explosion, automobile accident, or scalding by hot liquid. If personal property is destroyed the usual rule of allowing the value of the property before the accident, less any salvage value,[305] surely will be used. In personal injury cases loss of earnings and even of earning capacity, medical and similar expenses arising from the injury, and pain and suffering will be compensable in the normal way when the loss arises because of overexposure to radiation.[306] Several types of radiation injury, however, are relatively unknown in tort litigation or present damage issues in such a way that the serious inadequacies in current damage concepts are dramatically revealed. These latter types are our concern here; they include (1) prenatal—both post-conception and genetic, (2) sterility and related incapacities, (3) increased susceptibility to disease (latent injuries), (4) shortened life span, and (5) several miscellaneous injuries such as inability to continue in a chosen field of work, psychic injuries, and lost business profits because of the proximity of a reactor or other radiation operation. The difficult proof matters will be discussed in the following section; but we feel proof difficulties should not determine whether a type of interest should be protected in general. In a specific case, lack of proof may call for denial of recovery.

This analysis is oriented specifically toward radiation cases, but the problems are basic to tort litigation generally; and it is our hope that a fundamental contribution will be made to achieving a more realistic and therefore satisfactory concept of damages. Legal scholars have written relatively little on this general subject, yet it is extremely important. It would seem to be one of the remaining frontiers of development in the law.[307] The discussion of damages that follows in this and in the next section on proof should be of interest to all law-

[304] Prosser 174-75; Harper & James 1028-29. Both condemn use of proof problems as a basis for denying recovery for prenatal injuries. The same is true for mental disturbance and to some degree as to lost profits from injury to property. See Harper & James 1305.

[305] Harper & James 1310-11.

[306] See generally *id.* at 1316-23.

[307] See the foreword by Wright to the symposium of articles on "Damages for Personal Injuries," in 19 Ohio St. L.J. 155 (1958).

yers who deal with tort problems. The policy decisions to be made are extremely important, not only to interested parties, such as potential plaintiffs and defendants, but also to society as a whole because the group may suffer from any serious diminution in the value of persons or property. The manner in which our legal system distributes this loss may even have a considerable impact on our economy. We have attempted to identify these problems, to analyze the most nearly analogous cases, and to suggest policy solutions.

Rightly or wrongly, in dealing with negligently caused injuries, the Anglo-American system generally has adopted the principle of allowing compensating, not punitive, damages. As Harper and James put it:

> What then is compensation? The primary notion is that of repairing plaintiff's injury or of making him whole as nearly as that may be done by an award of money. The "remedy [should] be commensurate to the injury sustained." "[W]hoever does an injury to another is liable in damages to the extent of that injury." Sometimes this can be accomplished with a fair degree of accuracy. But obviously it cannot be done in anything but a figurative and essentially speculative way for many of the consequences of personal injury. Yet it is the aim of the law to attain at least a "rough correspondence between the amount awarded as damages and the extent of the suffering," or other intangible loss.[308]

The appropriateness of applying the compensation theory of damages to tort cases in general and to radiation cases specifically is assumed in the following discussion and also when making suggestions for more adequate solutions. So long as tort law provides damages for negligent injuries, compensation seems to be the best theory to adopt, even though measuring the amount of damages to be awarded is very uncertain in many cases. Radiation injuries will not present different considerations as to these matters; but we will point out where existing law, at least as applied to nuclear accidents and often as applied in tort cases generally, does not give results which are a logical or fair application of the compensation principle. Decided cases too often illogically deny recovery for injury to an interest which is no different from an interest for which in another type of case recovery is allowed. On the other hand, double recovery is in effect allowed in other cases because the courts have failed to recognize that two claims for damages supposedly for different interests of different victims

[308] Harper & James 1301.

actually, to some extent, are duplicating claims. This is particularly true in the area of personal injuries as will be pointed out in discussing the rights of parents and next of kin under wrongful death and survival statutes. The overlapping nature of the claims should be recognized and duplication of awards avoided. Although it should be as complete as possible, only one recovery should be allowed to each victim for each injury.

b. Prenatal Injuries—Post-Conception and Genetic

The social policy involved in the question of whether to allow damages for injuries to unborn children is one which the greatly accelerated use of radiation will bring into very sharp focus. Until the last ten years there were very few claims for compensation involving injuries received by the child while being carried by the mother and almost every case denied recovery. Since 1949, however, the number of cases has increased and there has been a dramatic shift toward recognizing that the interest of the embryo or foetus, is a legally protected one. Moreover, legal scholars have begun to comment on this problem.[309] There is need for more adequate analysis and a resolution of a number of uncertainties as to damages arising during this post-conception period. More important, legal periodicals have contained no discussion whatsoever[310] and no reported opinion has been found that deals in any way with the problem of genetic damage.[311] Yet scientists are unanimous in their opinion that exposure to radiation causes genetic damage, at least in that it increases the risk of genetic mutation. To understand adequately the legal concepts that will be applied to the solution of the genetic damage problem, it also is important that a careful analysis be made of the existing cases and legal principles which are applied to the non-genetic, prenatal, post-conception injury cases.

In discussing whether the unborn will be protected against negligent

[309] See Harper & James 1028-31. See also Frey, "Injuries to Infants En Ventre Sa Mere," 12 St. Louis L. Rev. 85 (1927); Muse & Spinella, "Right of Infant to Recover for Prenatal Injury," 36 Va. L. Rev. 611 (1950); McBride & Norvell, "The Extension of Tort Liability in the Field of Pre-Natal Injuries," 26 Ins. Counsel J. 148 (1959); Notes, 50 Mich. L. Rev. 166, 167 (1951); 35 Cornell L. Q. 648 (1950); 63 Harv. L. Rev. 173 (1949); 48 Mich. L. Rev. 539 (1950); 34 Minn. L. Rev. 65 (1949); [1951] Wis. L. Rev. 518; 10 A.L.R.2d 1059 (1950); 39 Cornell L. Q. 542 (1954); 8 Vand. L. Rev. 521 (1955); 27 A.L.R.2d 1256 (1953). Further, see Seavey, Book Review, 45 Harv. L. Rev. 209 (1931); Note, 51 Mich. L. Rev. 312 (1952).

[310] Only discussion found is reference to problem in Workshops on Legal Problems of Atomic Energy 25, 27 (U. of Mich. Law School 1956).

[311] See discussion *infra* notes 374-75.

invasion by another, it is assumed that the plaintiffs have established, either under the rules of strict liability or of negligence, that a duty was owed to the parent and that the duty was breached. It also is necessary to prove causation even though in many cases this will present real difficulties. There already is general agreement among experts, however, that overexposure to radiation will result in some kind of injury. This certainly is true as far as injury to the foetus itself is concerned, sufficient radiation giving rise to the possibility of microcephalic idiocy. In addition, irradiation of the parents' gonads followed by the birth of a deformed child shows causal relation with sufficient probability to satisfy existing rules. Even if this were not the case, as our knowledge of radiation exposure and genetic damage increases, it may well prove possible to satisfy the causation-in-fact requirement. Nevertheless, there is no reason to deal with proof of causation (which undoubtedly will present difficulty in genetic damage cases) if, as a matter of social policy, it is decided unwise to allow damages for invasion of this interest. It seems more logical, therefore, to discuss the question of whether this is an interest to be protected, prior to a discussion of the problems of proof as they relate to causation.

If justification is needed to support the proposition that the court ought first determine whether there will be any recovery at all (rather than to *assume* that the proof problem is too difficult), it can be found by looking at the opinions in states where the cause of action is always denied. In only three decisions on the subject, so far as we have discovered, has the court concerned itself with proof of the causal relation between the act complained of and the resulting damage to the foetus.[312] In the others the courts either assumed that the proof problem was too difficult without in any way analyzing or even suggesting what the difficulties would be or how the proof problem differed from that arising in other tort actions, or else decided there should be no such substantive right without discussing the proof problem. Practically all of the cases treat the substantive right question as different and separate from the causation question.

[312] Valence v. Louisiana Power & Light Co., 50 So.2d 847 (La. App. 1951) (woman jolted in bus accident and medical testimony showed no causal connection so no recovery); Durivage v. Tufts, 94 N.H. 265, 51 A.2d 847 (1947) (court found no evidence of causal connection to fright from assault by defendant since no medical testimony offered, and there was evidence child died from measles or pneumonia); Montreal Tramways v. Leveille, [1933] 4 D.L.R. 337 (fall from tramway by mother and club-footed child born; found to be supported by enough evidence to go to jury which held for plaintiff).

(1) Injury to the Embryo or Foetus

For purposes of discussing the question of whether or not damages should be awarded for injury to the child while in the mother's womb, several important distinctions should be made, although courts seldom have made them. The first is to distinguish between the right of the child, or his estate, and that of his parents. In discussing the rights of all plaintiffs the existing cases fall into two additional categories: (1) those allowing recovery in certain fact situations; and (2) those denying recovery under all circumstances. Within jurisdictions allowing recovery, a further distinction must be made between three kinds of cases: (1) where the foetus was viable (able to survive if delivered) at the time of impact of the force set in motion by the defendant and the child lives for some period of time after birth, no matter how short, (2) where the foetus is viable at the time of impact but is born dead, and (3) where the embryo is not viable at the time of impact but is born alive showing an injury resulting from the impact. To be completely consistent a fourth category should be established, *i.e.*, where the embryo is not viable at the time of impact and is born dead, although no case on this point has been found.

(a) Rights of the Child

All but one[313] of the writers start their discussion of the problem with the 1884 Massachusetts case, *Dietrich* v. *Northampton*,[314] in which the opinion was written by Justice Holmes. Five years previously, however, the Iowa Supreme Court, in *Kansz* v. *Ryan*,[315] decided that a husband could not sue a defendant physician for producing his wife's miscarriage, the plaintiff contending that he was damaged by being deprived of offspring by the miscarriage. The court said:

> Regarding, for the purposes of this case, the rights of the father as to an infant *in ventre sa mere* to be the same as though the offspring were in life—a point that we do not determine—he cannot recover for injury to such offspring except for the loss of services resulting therefrom. Addison on Torts, 907. Plaintiff does not and cannot claim for loss of services of an unborn child. Whether he could have claimed for future services to be rendered after the birth of

[313] Ramsey, "Liability for Prenatal Injuries," 1956 Ins. L. J. 151, 152. Also 10 A.L.R.2d 1069 (1950).

[314] 138 Mass. 14, 52 Am. Rep. 242 (1884).

[315] 51 Iowa 232, 1 N.W. 485 (1879).

> the child we need not consider, for no such claim is found in the petition. We may suggest that such a claim for damages would be based upon very remote and uncertain consequences of the act complained of. *It is hardly probable that it would be allowed by the law.*[316]

As the court decided the case it does not involve the rights of the child but rather those of the parent for loss of services, a quite different question to be discussed later. The court's suggestion as to the remoteness and uncertainty of the consequences of the miscarriage for damages of this kind, however, is indicative of the kind of concern that has caused some courts to deny recovery even to the child.

It was Holmes' opinion in the *Dietrich* case, however, that undoubtedly set the pattern of judicial decision in this country until 1949, when suddenly the decisions started going the other way. In denying recovery to the administrator of the child assumed to have lived a few minutes after a premature birth caused by a defect in the highway of the defendant town, Holmes wrote:

> . . . [I]f we should assume, irrespective of precedent, that a man might owe a civil duty and incur a conditional prospective liability in tort to one not yet in being, and if we should assume also that causing an infant to be born prematurely stands on the same footing as wounding or poisoning, we should then be confronted by the question raised by the defendant, whether an infant dying before it was able to live separated from its mother could be said to have become a person recognized by the law as capable of having a *locus standi* in court, or of being represented there by an administrator. . . .
>
> The Pub. Sts. *c.* 207, §9, . . . punish unlawful attempts to procure miscarriage, acts which of course have the death of the child for their immediate object; and, while they greatly increase the severity of the punishment if the woman dies in consequence of the attempt, they make no corresponding distinction if the child dies, even after leaving the womb. This statute seems to us to shake the foundation of the argument drawn from the criminal law, and no other occurs to us which has not been dealt with.
>
> Taking all the foregoing considerations into account, and further, that, as the unborn child was a part of the mother at the time of the injury, any damage to it which was not too remote to be recovered for at all was recoverable by her, we think it clear that the statute sued upon does not embrace the plaintiff's intestate within its meaning; and have not found

[316] *Id.* at 234. (Emphasis added.)

> it necessary to consider the question of remoteness or the effect of those cases which declare that the statute liability of towns for defects in highways is more narrowly restricted than the common law liability for negligence.[817]

In his usual succinct but also obscure-as-to-meaning style, Holmes does not make clear exactly what his reason is for denying recovery, except to deny the validity of the analogy to criminal law and property law (where potential rights of the unborn are recognized). It would seem that the main thrust of his opinion is that until the child is born no person in being is hurt. His opinion did not consider the question of remoteness.

There is one further suggestion in Holmes' opinion which has received little attention in later cases or discussions of the problem but which should not be ignored. This is that the child is a part of the mother until actual birth, which Holmes suggests might give the mother grounds for a damage action.

Courts which deny recovery, even when the child lives and suffers a serious defect resulting from a prenatal injury, differ as to the reasons for doing so. The following would seem to be a fair summary of the various grounds that have been or could be suggested to deny recovery: (1) there is no common law precedent allowing recovery, or precedent in a particular jurisdiction denies recovery so that denial must continue to be the result under the doctrine of *stare decisis;*[818] (2) any unborn infant is a part of its mother and has no separate juristic existence until it is born alive; therefore, there is no duty of care owed to it prior to birth;[819] (3) the causal relationship between

[817] *Supra* note 314 at 16-17.

[818] Squillo v. New Haven, 14 Conn. Supp. 500 (Super. Ct. 1947); Dietrich v. Northampton, 138 Mass. 14 (1884), *reaff'd* in Cavanaugh v. First Nat'l Stores, Inc., 329 Mass. 179, 107 N.E.2d 307 (1952) and Bliss v. Passanesi, 326 Mass. 461, 95 N.E.2d 206 (1950); Newman v. City of Detroit, 281 Mich. 60, 274 N.W. 710 (1937); Buel v. United Railways Co., 248 Mo. 126, 154 S.W. 71 (1913); *overruled,* Steggall v. Morris, 363 Mo. 1224, 258 S.W.2d 577 (1953); Stemmer v. Kline, 128 N.J.L. 455, 26 A.2d 489 (1942); Ryan v. Public Serv. Co-ordinated Transp., 18 N.J. Misc. 429, 14 A.2d 52 (Sup. Ct. 1940); Berlin v. J. C. Penney Co., 339 Pa. 547, 16 A.2d 28 (1940); Morgan v. United States, 143 F. Supp. 580 (D.C. N.J. 1956) (applying Pennsylvania law); Rimpa v. Sears Roebuck & Co., 37 Erie 267 (Pa. C.P. 1952); Jacketti v. Pottstown Rapid Transit. Co., 67 Montg. Co. L.R. 37 (Pa. C.P. 1950); Gorman v Budlong, 23 R.I. 169, 49 Atl. 704 (1901).

[819] Stanford v. St. Louis-San Francisco Ry., 214 Ala. 611, 108 So. 566 (1926); Allaire v. St. Luke's Hospital, 184 Ill. 359, 56 N.E. 638 (1900) and Smith v. Luckhardt, 299 Ill. App. 100, 19 N.E.2d 446 (1939), *both overruled,* Amann v. Faidy, 415 Ill. 422, 114 N.E.2d 412 (1953) (allowing cause of action); Drabbels v. Skelley Oil Co., 155 Neb. 17, 50 N.W.2d 229 (1951); Drobner v. Peters, 232 N.Y. 200, 133 N.E.

the negligent act and injury being too difficult to prove and the possibilities of pure speculation creating so great a danger of a fraudulent or fictitious claim, it is unfair, and perhaps impracticable from the standpoint of overloading the courts, to allow recovery for such claims;[320] (4) to recognize a cause of action of an unborn infant raises the spectre of an action by the child against the mother for her negligence,[321] to which might be added the related problems of contributory negligence of the mother and assumption of risk by the mother in her relations to the defendant.[322]

As the Table of Cases appended at the end of this section indicates, slightly more than one-half of the fifty jurisdictions in this country have faced the question in some form.[323] Considering all the cases decided in this country, the very clear preponderance of authority is now in favor of allowing recovery, at least where the foetus is viable at the time of the injury and is born alive. Legal writers are practically unanimous in approving recovery for prenatal injuries[324] but they fail to consider the question of *who* ought to recover for invasion of *what*

567 (1921) and Nugent v. Brooklyn Heights R.R., 154 App. Div. 667, 139 N.Y.S. 367 (2d Dep't 1913), *both overruled,* Woods v. Lancet, 303 N.Y. 349, 102 N.E.2d 691 (1951) (recovery allowed); In re Roberts' Estate, 158 Misc. 698, 286 N.Y.S. 476 (Surr. Ct. 1936); Mays v. Weingarten, 82 N.E.2d 421 (Ohio App. 1943), *overruled,* Williams v. Marion Rapid Transit, 152 Ohio St. 114, 87 N.E.2d 334 (1949) (recovery allowed); Lipps v. Milwaukee E. Ry. & L. Co., 164 Wis. 272, 159 N.W. 916 (1916); Walker v. Great Northern Ry., 28 L.R. (Ir.) 69 (1891).

[320] Krantz v. Cleveland, Akron, Canton Bus Co., 32 Ohio N.P. (n. s.) 445 (1933) no longer the law in Ohio as a result of Williams v. Marion Rapid Transit, *supra* note 319; Magnolia Coca Cola Bot. Co. v. Jordan, 124 Tex. 347, 78 S.W.2d 944 (1935); Lewis v. Steves Sash & Door Co., 177 S.W.2d 350 (Tex. Civ. App. 1943).

[321] Implied in Allaire v. St. Luke's Hospital, *supra* note 319.

[322] Suggested in 50 Mich. L. Rev. 166, 168 (1951).

[323] Twenty-seven jurisdictions have faced the problem.

[324] Prosser 174 ff; Harper & James 1028-31; Anderson, "Rights of Action of An Unborn Child," 14 Tenn. L. Rev. 151 (1936); Barry, "The Child en Ventre sa Mere," 14 Austl. L. J. 351 (1941); Winfield, "The Unborn Child," 4 U. of Tor. L. J. 278 (1942); Cason & Collins, "May Parents Maintain an Action for the Wrongful Death of an Unborn Child in Missouri?" 15 Mo. L. Rev. 211 (1950); Comment, "Tort Liability for Prenatal Injury," 24 Tul. L. Rev. 435 (1950); Note, "Tort Actions for Injuries to Unborn Infants," 3 Vand. L. Rev. 282 (1950); Muse & Spinella, *supra* note 309; A. A. White, "The Right of Recovery for Prenatal Injuries," 12 La. L. Rev. 383 (1952); Ramsey, *supra* note 313; Lambert, Reviews of Leading Cases, 19 NACCA L. J. 230 (1957); McBride & Norvell, "The Extension of Tort Liability in the Field of Pre-Natal Injuries," 26 Ins. Counsel J. 148 (1959); noted, 32 Va. L. Rev. 1203 (1946); 63 Harv. L. Rev. 173 (1949); 48 Mich. L. Rev. 539 (1950); 50 Mich. L. Rev. 166 (1951); 39 Cornell L. Q. 542 (1954); 29 N.Y.U. L. Rev. 1154 (1954); 145 A.L.R. 1104 (1943); 10 A.L.R.2d 634, 639 (1950); 10 A.L.R.2d 1059 (1950); 27 A.L.R.2d 1256 (1953).

interest. Whether only the child, only the parent or next of kin, or both the child and survivors should recover is not considered, leading to the possibility that double recovery will be allowed, the existence of wrongful death and survival statutes compounding the confusion. As suggested later, it is very important to differentiate between the recovery of the child and that of others such as parents; but the cases do not do so, being content to decide *generally* there should be recovery for prenatal injuries or there should not.

The argument that there is no common law precedent in other jurisdictions no longer is a valid one when the question of whether or not to allow recovery is raised in a jurisdiction which has not had occasion to consider the matter. Actually several courts have refused to follow *stare decisis* where previous decisions in that jurisdiction denied recovery. As the New York Court of Appeals said in the 1951 case of *Woods* v. *Lancet,*[325] in overruling an earlier decision denying recovery:

> What, then, stands in the way of a reversal here? Surely, as an original proposition, we would, today, be hard put to it to find a sound reason for the old rule. Following *Drobner* v. *Peters* (*supra*) would call for an affirmance but the chief basis for that holding (lack of precedent) no longer exists. And it is not a very strong reason, anyhow, in a case like this. Of course, rules of law on which men rely in their business dealings should not be changed in the middle of the game, but what has that to do with bringing to justice a tortfeasor who surely has no moral or other right to rely on a decision of the New York Court of Appeals? Negligence law is common law, and the common law has been molded and changed and brought up-to-date in many another case. Our court said, long ago, that it had not only the right, but the duty to re-examine a question where justice demands it. . .[326]

The court then continued in answer to the charge that such changes of the law were for the legislature:

> The same answer goes to the argument that the change we here propose should come from the Legislature, not the courts. Legislative action there could, of course, be, but we abdicate our own function, in a field peculiarly nonstatutory, when we refuse to reconsider an old and unsatisfactory court-made rule. Perhaps, some kinds of changes in the com-

[325] *Supra* note 319.
[326] *Id.* at 354.

> mon law could not safely be made without the kind of factual investigation which the Legislature and not the courts, is equipped for. . . . [referring to the study of the Law Revision Commission] The report, itself, contained no recommendations for legislation on the subject but that apparently was because the commission felt that it was for the courts to deal with this common-law question.[327]

In the *Woods* case the plaintiff alleged injuries received during his ninth month in his mother's womb. The court held that the foetus at that time had a separate existence.

As to the "separate existence" argument, at least in the case of a viable foetus, both legal writers and the majority of courts have now carried over the analogies from the criminal law and property fields (where separate existence for some purposes is recognized). They say that medically there is a separate being and there is no reason why injury to this being should not be treated separately from that of the mother. There are many recent cases expressly rejecting the no separate existence objection to recovery.[328]

Kelly v. *Gregory*[329] is the one decision squarely holding that, if causation can be shown, a negligent defendant will be held liable for injuries sustained during the third month of pregnancy and, therefore, probably while non-viable. The court felt that the decision of the Court of Appeals in *Woods* v. *Lancet*[330] should be applied whenever there is "biological separability," which the court held could be clearly demonstrated as beginning at conception.

Kelly v. *Gregory* was cited by the Georgia court in *Hornbuckle* v. *Plantation Pipe Line Co.*[331] In the *Hornbuckle* case it was held that

[327] *Id.* at 355-56.

[328] Myers v. Stevenson, 125 Cal. App.2d 399, 270 P.2d 885 (1st Dist. 1954); Prates v. Sears, Roebuck & Co., 19 Conn. Supp. 487, 118 A.2d 633 (Super. Ct. 1955); Tursi v. New England Windsor Co., 19 Conn. Supp. 242, 111 A.2d 14 (Super. Ct. 1955); Tucker v. Howard L. Carmichael & Sons, 208 Ga. 201, 65 S.E.2d 909 (1951); Rodriquez v. Patti, 415 Ill. 496, 114 N.E.2d 721 (1953); Amann v. Faidy, *supra* note 319; Mitchell v. Couch, 285 S.W.2d 901 (Ky. App. 1955); Cooper v. Blanck, 39 So.2d 352 (La. App. 1923); Damasiewicz v. Gorsuch, 197 Md. 417, 79 A.2d 550 (1951); Verkennes v. Corniea, 229 Minn. 365, 38 N.W.2d 838 (1949); Rainey v. Horn, 221 Miss. 269, 72 So.2d 434 (1954); Steggall v. Morris, *supra* note 318; Woods v. Lancet, *supra* note 319; Jasinsky v. Potts, 153 Ohio St. 529, 92 N.E.2d 809 (1950); Williams v. Marion Rapid Transit, *supra* note 319; Mallison v. Pomeroy, 205 Ore. 690, 291 P.2d 225 (1955); Montreal Tramways v. Leveille, *supra* note 312; Smith v. Fox, [1923] 3 D.L.R. 785.

[329] 282 App. Div. 542, 125 N.Y.S.2d 696 (1953).

[330] *Supra* note 319.

[331] 212 Ga. 504, 93 S.E.2d 727 (1956).

the trial court properly overruled a general demurrer to a petition for relief which simply alleged that defendant's negligence caused prenatal injury to the plaintiff; there was no allegation that the foetus was viable at the time. The Chief Justice in the *Hornbuckle* case concurred in holding that relief should be granted for prenatal injuries but only if the embryo was "quick." "Quick" is to be distinguished from "viable" because it demands only separate existence that can be recognized but not that the embryo be able to survive if born. Fearing that carrying the cause of the action back to a point of time before the embryo is quick will make the courts a "dumping ground for faked and fraudulent suits," the Chief Justice concluded:

> If a baby can sue for injuries sustained five seconds after conception, as the majority rules, why not allow such suits for injuries before conception, even unto the third and fourth generations?[332]

He concluded that it should be a matter of proof in each case upon the facts and not a matter of law as to when the baby becomes quick, although this might take place prior to four months after conception. The reduction to an absurdity argument of the Chief Justice is particularly interesting because it raises the very problem that radiation exposure of potential parents clearly creates, a subject that will be discussed below under genetic damage.

One other jurisdiction possibly rejects the viability distinction, allowing recovery when the injury in received before viability. The Maryland court, in *Damasiewicz* v. *Gorsuch*,[333] seems to suggest that the dividing line ought not be viability (capability of life separate from the mother), but rather whether the child is quick, in the sense that it can be recognized medically, *i.e.*, when the embryo is a separate life within the mother. The court said:

> Some of the later cases attempt a distinction between a child which is viable and one which is not. . . . This is an apparent effort to correct the early doctrine that the child is a part of the mother by bringing it more in line with known medical facts. Children are frequently born prematurely and live. And at times they have been removed from a dead mother and have survived. At some period in their growth they reach a stage where they can live apart from their mother. But, from a medical point of view, a child is alive within the mother before the time arrives when it can live

[332] *Id.* at 506.

[333] 197 Md. 417, 79 A.2d 550 (1951).

> apart from her. If it is injured at a time when, according to Blackstone it is "able to stir in the mother's womb" there would seem to be just as logical a basis for allowing it to recover, as if it were injured after it had reached the period in its growth when it could be removed from the mother and live. In both cases it is alive, and in both cases there has occurred an injury to a living human being for which the responsible party should be made liable.[334]

Legal writers agree that the distinction of viability is an artificial one, and it would seem that the same holds true as to the distinction of being quick or recognizably a separate being. It is difficult to justify any such line when a causal relationship between exposure to radiation during any stage of pregnancy and an injury manifested after birth can be proved. In such cases as microcephalic idiocy, for example, the greatest danger from radiation arises during the first three months of pregnancy.[335] Medical evidence makes a very strong case for ignoring the distinction, an artificial one at best.[336] Nevertheless, the lawyer predicting his client's potential liability must take account of this distinction because it still may be followed in many jurisdictions.

While the reasons given for making the distinction between a viable and a non-viable foetus are usually stated in terms of whether or not there is a separate being, the real reason for this distinction until recent years has been a fear that it is too difficult to prove that a woman is pregnant when the blow is struck unless the foetus has developed sufficiently to be viable. This, however, really goes to the difficulty of proof of causation, still another objection to allowing recovery. Today, however, proving the existence of an embryo should not prove much of an obstacle. With modern tests for pregnancy, it seems quite unrealistic for a court to say there is no way of proving a separate entity that can be hurt until the child can be detected by the mother herself or until the child could live if separated from the mother. Even the assumption that a normal pregnancy lasts for 280 days after the last menstrual period is a more correct generalization than many assumptions upon which rules of law are based in other areas.

As previously suggested, one of the most obvious cases for allowing

[334] *Id.* at 438.

[335] *Infra* note 360. Denial of recovery in general criticized, see Prosser 174-75; Harper & James 1028-31.

[336] All cited *supra* note 324. See particularly 48 Mich. L. Rev. 539 (1950); 50 Mich. L. Rev. 166 (1951); Cason & Collins, *supra* note 324. See also Dunlap, "Medicolegal Aspects of Injuries from Exposure to X-Rays and Radioactive Substances," 11 Mo. L. Rev. 137 (1946).

damages arises when radiation exposure occurs during the first two or three months of pregnancy.[337] This indicates the unrealistic arbitrariness of the distinction between the viable and the non-viable foetus. It is not meant to suggest, however, that under all circumstances the foetus should be treated as a separate entity for tort liability purposes. For example, as is suggested at the end of this section, particularly as to contributory negligence and assumption of risk, there may be occasion for not treating the foetus as separate. Nevertheless, the argument against recovery based upon absence of separate identity is unrealistic, and, in addition, will involve the court in a very difficult proof problem in trying to determine when the embryo becomes viable.

The possibility of applying contributory negligence or assumption of risk concepts is important in some cases because it makes unacceptable the argument given by practically every writer on the subject,[338] that the analogy from criminal law and property cases involving unborn infants should be applied in tort recovery cases. In addition, the theories of recovery are different. So long as criminal law is based upon an odd mixture of "an eye for an eye" and "deterrence-by-example," it has no justifiable application in connection with liability for negligence, which by definition involves unintentional injuries. If the theory of negligence recovery is one of compensation, then the policy decision should be directed to the question of whether or not this is the kind of injury for which compensation ought to be given and, if so, to what extent.

In connection with proving causation, the speculative character of the actual conclusion to be drawn from the evidence presents some difficulties. We do not go so far as many writers have done and suggest that there is no relationship between the difficulty of proof of causation and the granting of a right to damages. It seems best, however, to separate the two. There are instances in which the causal connection will be easy enough to prove, some of which already have arisen in litigated cases.[339] In others, present scientific evidence points to a very clear causal connection, as could be true in the case of exposure to radiation during the first few months of pregnancy.[340] In such instances no court ought to lay down the broad proposition that the causal connection never is going to be sufficiently demonstrable to

[337] *Infra* note 360.

[338] See articles listed *supra* note 324. See also text discussion *infra* at notes 392 ff.

[339] Allaire v. St. Luke's Hospital, *supra* note 319; Korman v. Hagen, 165 Minn. 320, 206 N.W. 650 (1925).

[340] *Infra* notes 360, 363.

justify a cause of action. In addition, there is no reason to believe that the rapid progress of the last decade or two in scientific research will be slower in this area than in others. Particularly in radiation cases, surely the present drive for rapid development of atomic science will lead to much greater certainty in the area of causal relationships. The law must remain flexible in order to take account of such developments. If the facts of a particular case present too speculative a causal relationship to submit to the jury, the courts can always handle the problem by withholding the case and directing a verdict for the defendant. Legislatures, if they so desired, could establish a higher standard of proof for such cases.

One answer to the causation argument which ought to be deemed almost conclusive has never been mentioned. If the problem of proof is not too difficult to allow the criminal prosecution of a person for injuring an embryo (not viable), even for murder if the infant lives sometime after birth and then dies, then surely the law should not hesitate to impose some degree of responsibility on the negligent person who causes the same kind of injury. It would be an odd result if our traditional concern to protect the person accused of a serious crime, should be reversed in these cases and the greater protection be given to one charged only with damage liability. If causation cannot be proved in a tort liability case with sufficient certainty to allow a cause of action, surely this kind of speculation ought not to enter the picture when imposition of the death penalty is sought for murder in a criminal case. By the same token, if it is felt just to subject an accused to a criminal trial on the theory that causation can be proved beyond a reasonable doubt, surely we ought to go that far in civil liability cases. At least difficulty of proof should not be a deterrent. This is not meant to suggest that the social policy factors which determine whether to allow an action for invasion of another's interests are the same in each of the cases, but it is to suggest that the causation problem is no different.[341]

Perhaps in prenatal injury cases a higher burden of proof should be imposed, but recovery should not be denied altogether merely because proof of causation in some cases will be difficult.

Another obstacle to recovery was suggested by the court in *Allaire*

[341] On difficulty of causation, see *e.g.*, Amann v. Faidy, *supra* note 319; Valence v. Louisiana Power & Light Co., *supra* note 312; Durivage v. Tufts, *supra* note 312; White, *supra* note 324 at 402-403, suggesting no great increase of cases since allowing recovery. Contributory negligence defenses may call for a different result in some case, *supra* note 338.

v. *St. Luke's Hospital*,[342] *i.e.*, if recovery were allowed it would be unjust where the mother was contributorily negligent or had assumed the risk. This argument should not be used as a reason for denying recovery where there has been no negligence or assumption of risk by the mother and where the defendant's negligence clearly has been proven to be the cause of the injury to the embryo or foetus. If a line should be drawn to immunize the tortfeasor from liability where the mother is negligent, this is no reason to deny recovery in all cases.

Often the courts which allow recovery in prenatal injury cases will "clinch" their argument as did the court in a recent Connecticut case [343] by stating the general principle of the common law that there should be no wrong without a remedy and that natural justice demands that damages be allowed in these cases. This argument really goes to the basic policy question underlying all tort cases: Is this the kind of injury for which the law ought to allow compensation? These are not arguments or reasons for granting recovery. They are merely statements of the basic policy issue of whether or not compensation is to be allowed. Later we suggest that possibly distinctions should be made and lines drawn depending on the type of injury and the surrounding circumstances.[344]

(b) Rights of Next of Kin Under Death Statutes

The theory of some death statutes is to permit the cause of action to survive the death and allow damages to be recovered to the extent that the decedent would have been able to recover for injuries had he lived. These typically are called survival acts. Others, often called wrongful death acts, allow particular surviving relatives to recover damages caused to them by the death itself. It is clear, therefore, that if the particular jurisdiction follows the Massachusetts rule and does not allow a child to recover for prenatal injuries even when born alive, no action can be brought under the survival death statutes. The theory of the wrongful death act logically could still be applied to allow recovery but it seems most unlikely in such jurisdictions and no cases have been found. On the other hand, if the child is born alive and then dies as a result of prenatal injuries inflicted by a negligent defendant, there

[342] *Supra* note 319. See also concurring opinion in Damasiewicz v. Gorsuch, *supra* note 333.

[343] Tursi v. New England Windsor Co., *supra* note 328.

[344] See suggestions *infra* in text at section B4(3).

would be no difficulty under existing survival statutes in those jurisdictions which allow recovery by a living child for prenatal injuries.

If the injured child is stillborn, however, only a few jurisdictions have ruled specifically on the question of whether or not damages can be recovered under a wrongful death act.[345] Some courts have refused to broaden the application of the wrongful death statute when the child is not born alive, although recovery would be allowed if the child lives for a short period after birth.[346] Under the decided cases this is a distinction lawyers must take into account in advising their clients. Harper and James suggest that while this is an arbitrary line, it is perhaps the fairest and most practical place to draw the line."[347] It is arguable that so drawing the line actually is attacking the validity of wrongful death statutes on the unstated premise that tort recovery ought to be for compensation and not for vengeance. It would seem that various philosophies of tort law get badly confused at this point and that perhaps we need a new approach, if necessary by statute, to answer the policy question as to what kind of prenatal injuries should be compensable and to what extent compensation should be taken from the wrongdoer. In formulating this policy it is advisable to take into account the rights of the parents as well.

(c) Rights of Parents Other Than Under Death Statutes

As suggested above, the first case in the common law countries dealing with the problem of prenatal injuries was the Iowa case, *Kansz* v. *Ryan*,[348] which really involved the right of the parent to recover dam-

[345] Delaware, Kentucky, Mississippi, Minnesota, New Hampshire, and South Carolina; *infra* Table of Cases at end of this section. For cases involving wrongful death actions generally, see 10 A.L.R.2d 639 (1950). Many courts have permitted recovery under such statutes where the child is born alive and then dies. See Table of Cases *infra*.

[346] Norman v. Murphy, 124 Cal. App.2d 95, 268 P.2d 178 (1954); In re Logan's Estate, 156 N.Y.S.2d 49 (Surr. Ct. 1956) (letters of administration refused); In re Scanelli, 208 Misc. 804, 142 N.Y.S.2d 411 (Surr. Ct. 1955) (letters of administration refused); Muschetti v. Charles Pfizer & Co., 208 Misc. 870, 144 N.Y.S.2d 235 (Sup. Ct. 1955); In re Roberts' Estate, *supra* note 319 (letters of administration refused). See also West v. McCoy, 105 S.E.2d 88 (Sup. Ct. S.C. 1958), denying recovery and reserving question if born alive. *Cf.* Butler v. Manhattan Ry., 143 N.Y. 417, 38 N.E. 454 (1894) (action for loss of services where injury caused miscarriage of non-viable foetus not maintainable because pecuniary loss is too remote and speculative).

[347] Harper & James 1031.

[348] *Supra* note 315. No English case has arisen. Salmond, Torts 389-90 (11th ed. Heuston 1953); Clerk & Lindsell, Torts 92 (11th ed. 1954) say damage action would not lie; see other foreign cases cited at 234. "Injury to an Unborn Child," 83 Sol. J. 185 (1939).

ages not for the child but for himself. The plaintiff's claim in that case as stated by the court was that the plaintiff was "deprived of offspring by defendant's act." The court said very distinctly that the father could not recover for injury to an offspring except for the possible loss of services, and this had not been requested. The court suggested that a claim for loss of future services would probably be too remote and speculative.

Again, in the *Dietrich* case[349] Holmes made the comment that, "as the unborn child was a part of the mother at the time of the injury, any damage to it which was not too remote to be recovered for at all was recoverable by her. . . ."[350] This is only dictum, but it is a rather clear suggestion that there is nothing by way of theoretical obstacle to the mother's recovery, and that the only limitation would be one of remoteness. Later cases have dealt more specifically with the rights of parents.

The Alabama court in *Snow* v. *Allen*[351] dealt with two aspects of the recovery that a mother possibly may have if her child is killed because of prenatal injuries. The charge was made that the defendant doctor had crushed the skull of the infant while still inside the mother's womb, causing the infant to be stillborn or to die immediately upon birth. The defendant demurred to the complaint and the court said:

> As we see it, the defendant does not properly interpret the plaintiff's complaint as regards the averments as to death of plaintiff's infant. As we construe the complaint, no recovery of damages is sought on account of the death of the child, but for the pain and anguish suffered by the mother on account of its death, occasioned by the negligence of the defendant. If the mother was caused to suffer physical pain by reason of the killing of the unborn child, occasioned by the negligence of the defendant, no one, we assume, will argue that she could not recover in this action for such pain; and, likewise, if on account of the negligent destruction of the child, in its delivery, the mother also suffered distress of mind, a recovery could be had for such mental anguish. This is just what the plaintiff claims in the complaint with reference to the killing of her unborn child.
>
> * * *
>
> However, were we to accept the defendant's construction of the complaint, it would by no means follow that the complaint was subject to any grounds of demurrer assigned

[349] *Supra* note 314.
[350] *Id.* at 17.
[351] 227 Ala. 615, 151 So. 468 (1933).

> thereto. So long as the child is with the mother's womb it is a part of the mother, and for any injury to it, while yet unborn, damages would be recoverable by the mother in a proper case. [Citing Dietrich v. Northampton]. . . .
>
> We are of the opinion that the mother, in an action against the attending physician, may recover, in one and the same action, damages for all injuries sustained by her, by reason of—proximate result of—the negligence of the physician in and about the parturition of the infant, including the death of the infant, before it is severed from the mother, provided, of course, such death was due to the negligence of the physician.[352]

The court in this case seems to be saying that the mother can recover for her own mental anguish arising from the loss of a child and, in addition, can recover for damages to something that was a part of her prior to birth, the unborn child.

In several cases actions for prenatal injuries have been brought by parents to recover for loss of services or for medical expenses, but the courts have denied recovery. They considered the action to be derivative of the child's right to sue and in these jurisdictions the child had no such right; therefore, the parents lost their claims.[353] For example, in *Prescott* v. *Robinson*,[354] a pregnant woman was injured in a highway collision caused by the negligence of the defendant, and she later gave birth to a deformed child. The New Hampshire court, in affirming the trial court which had overruled defendant's demurrer to the complaint, said that it was perfectly natural for a pregnant woman after an injury to experience mental distress arising from the fear of an abnormal birth and that this fear was "proximately caused" by the defendant's negligence. The court then said:

> Her ability to be delivered of a normal and healthy child was jeopardized, and her grief and apprehension before the birth on account of what the probable or not unreasonable effect would be upon the child is not a remote consequence of the alleged negligence of the defendant. It was her right to produce a healthy child; and if by the defendant's negligence her enjoyment of that right was diminished or violated, her mental distress for the unnatural result to be expected was

[352] *Id.* at 618-19.

[353] Stemmer v. Kline, *supra* note 318; Ryan v. Public Serv. Coordinated Transp., *supra* note 318; Nugent v. Brooklyn Heights R.R., *supra* note 319; Rimpa v. Sears Roebuck & Co., *supra* note 318.

[354] 74 N.H. 460, 69 Atl. 522 (1908), approved later in Durivage v. Tufts, *supra* note 312 at 268.

> an element of damage for which she should be compensated, as well as her disappointment at the birth of a deformed child.
>
> [While the mother cannot recover for the injury to the child itself]. . . the mother's anxiety before the birth of the child, in view of the reasonable probability that the defendant's act will cause her to produce an abnormal child, is peculiarly an element of damage to her.[355]

The court also concluded, however, that:

> The fact that the plaintiff will undoubtedly suffer great disappointment during her lifetime, occasioned by her continual observation of her child's deformity and its probable suffering, though in some sense caused by the defendant's negligence, is a misfortune for which the law can afford no compensation in an action for negligence. . . . The deformity of a crippled child and its suffering may be an ever-present cause of disappointment to its parents, and their lives may be made miserable thereby; but they can obtain no redress on that ground against the person whose negligence was the cause of the child's condition.[356]

The court felt that where the act causing the injury is merely a negligent one, compensation for the lifetime of disappointment is too "remote, secondary, and speculative." [357] The mother could recover for losses peculiar to herself, of course, but not for mental anguish after birth.

In general, the right of the mother to sue for her mental anguish resulting from fear of an abnormal child is well recognized, including her physical and mental suffering resulting from the miscarriage itself. In cases which support the New Hampshire distinction, however, she may not recover for the death of the child or for her mental anguish because of the deformed nature of the child after birth, remoteness usually being given as the reason.[358] It also seems to be well recog-

[355] *Id.* at 462.

[356] *Id.* at 464-65.

[357] *Id.* at 465. The same distinction is made in Gagnon v. Rhode Island Co., 40 R.I. 473, 476, 101 Atl. 104 (1917).

[358] Thomas v. Gates, 126 Cal. 1, 58 Pac. 315 (1899); Powell v. Augusta & Summerville R.R., 77 Ga. 192, 3 S.E. 757 (1886); Kansz v. Ryan, *supra* note 315 (suit by husband for deprivation of offspring; dicta to the effect that loss of future services is not a compensable element); Big Sandy R.R. v. Blankenship, 133 Ky. 438, 118 S.W. 316 (1909); Sullivan v. Old Colony St. Ry., 197 Mass. 512, 83 N.E. 1091 (1908); Tunnicliffe v. Bay Cities Con. Ry., 102 Mich. 624, 61 N.W. 11 (1894); Prescott v. Robinson, *supra* note 354; Western Union Tel. Co. v. Cooper, 71 Tex. 507, 9 S.W. 598 (1888); Webb v. Snow, 102 Utah 435, 132 P.2d 114 (1942); Bovee v. Danville,

nized that neither parent may recover for loss of services or loss of prospective earnings of the child or for loss of companionship with the child.[359]

(d) Radiation Cases

There are two decided cases in which prenatal injury was alleged to have resulted from the negligent use of radiation in the treatment of the pregnant mother. In *Smith* v. *Luckhardt*[360] the defendant doctors incorrectly diagnosed the condition of the plaintiff's mother as a tumor and administered six X-ray treatments of forty-five minutes each over a period of four months. The child was born permanently crippled and feeble-minded, developing to the mental age of two years although living to a chronological age of thirteen. The action was instituted for the child shortly before his death. The Illinois Appellate Court dismissed the action on defendant's motion. It cited the *Allaire* case as binding authority that damages could not be recovered for prenatal injuries,[361] although it recognized that there were very good arguments for allowing recovery in such cases. The Illinois Supreme Court has since joined the present majority of jurisdictions which allow recovery.[362]

The other case is *Stemmer* v. *Kline,* decided in New Jersey in 1942.[363] Here again the plaintiff's mother was subjected to X-ray treatment by defendant physician for a tumor which plaintiff alleged could have been identified as an embryo by a complete examination. The plaintiff was prematurely born and described as a microcephalic idiot who could not walk, talk, hear, or see. The jury found that this condition was caused by the X-ray treatments. On appeal the judgment for plaintiff was reversed, ten judges to five, although one of the majority agreed with the dissenting group that the cause of action should be al-

53 Vt. 183 (1880); Malone v. Monongahela Valley Traction Co., 104 W.Va. 417, 140 S.E. 340 (1927); Annot., 145 A.L.R. 1104 (1943); Annot., 10 A.L.R.2d 639, 640 (1950).

[359] *Ibid.*

[360] 299 Ill. App. 100, 19 N.E.2d 446 (1939).

[361] *Supra* note 321.

[362] Amann v. Faidy, *supra* note 319. The court said at 434: "In rejecting the contention upon which the defendant now insists, this court pointed out more than a hundred years ago, 'that if we are to be restricted to the common law, as it was enacted at fourth James, rejecting all modifications and improvements which have since been made, by practice and statutes, except our own statutes, we will find that system entirely inapplicable to our present condition, for the simple reason that it is more than two hundred years behind the age.' *Penny* v. *Little,* 3 Scam. 301, 304."

[363] *Supra* note 318.

lowed for prenatal injuries but joined in the decision reversing the trial court because it admitted evidence which he felt was inadmissible under the New Jersey rules. The court also refused to allow the parents to recover for expenses they alleged were caused by the alleged malpractice because it was dependent on the claim of the injured party, the child; the child having no cause of action, the parents' cause must fail.

There is no reason to believe that these results would be reached, however, in the seventeen jurisdictions which currently recognize a cause of action for prenatal injuries at least in the case of a viable foetus. Viability probably would not be a factor in the *Luckhardt* case because the treatments were given between the fourth and seventh month after conception and this is after the foetus usually is considered viable. It is not made clear in the *Stemmer* case just when the treatments took place, although the third and last one was given just six weeks prior to birth. Actually, the cases of microcephalic idiocy arising from radiation treatment to pregnant women are perfect examples of cases where the viability distinction is harsh and unrealistic. There is some persuasive evidence that sufficient radiation during the first two or three months of pregnancy may cause microcephalic idiocy.[364] If this is so, it is the very case in which recovery should be allowed, if it is to be allowed in any case.

With the rapid expansion in the use of radioactive materials and radiation machines for medical treatment and also for various industrial uses, it is not difficult to predict that the number of radiation cases involving pregnant women will increase. The doctor will have to be careful not only in his use of X-ray treatments in the abdominal area, but also in his use of radioactive isotopes for diagnosis or treatment of other parts of the body. Such uses well may create hazards which will affect the pregnant woman since elimination of radioactive isostopes takes place primarily through the normal elimination channels, in close proximity to the developing embryo. In addition, there will be a problem in the case of women being employed in establishments where it is possible for them to receive, even on a temporary emergency basis, a considerable amount of radiation. While there may be no apparent harm to the mother, there may be injury of the embryo. The harm apparently occurs if there is radiation at any time beginning immediately

[364] Conversations with very competent radiologists confirm this fact though none knew of an authoritative written collection of such cases. Specialists in gynecology now recognize the necessity of minimizing exposure of pregnant women because of genetic damage as well as abortions. N.Y. Times, Oct. 11, 1958, p. C11, col. 2.

after conception. The administrative problem for employers desiring to make use of women in radiation establishments is obvious. Additional cases may arise from accidental exposure of visitors in places where radiation sources are present. When a nuclear accident discharges radioactive material over a well-populated area it is very likely that some women in the area will be pregnant. If they later give birth to deformed children, they may be able to show sufficient causal connection to establish that radiation was responsible. In the light of the clear trend of the cases toward a recognition of the right to recover for prenatal injuries, not only where viable but also regardless of viability, it seems not unrealistic to predict that the viability line will be discarded, at least in cases where causation is clear. If damages for fear of giving birth to a deformed child are permitted, as in several of the cases set out above, this could become a very sizeable problem.

(2) Genetic Damage

Up to the present time no cases have arisen involving a claim for genetic damage. By genetic damage we mean injury manifested in a descendant's abnormality but resulting from injury to the genes or chromosomes of a parent or a more remote ancestor who has been exposed to radiation (or some other force) between the time of the ancestor's conception and the time when he ceases having children. Damage to the parent will be considered in the next section on "sterility." As pointed out later,[365] any force which causes a mutation for practical purposes can be considered as injurious because almost all mutations are deleterious. Scientists seem to agree that exposure to radiation at any time from conception to birth of a child causes genetic damage. There also seems to be general agreement that no matter how small the dose of radiation the effect is a cumulative one, although there is some recent evidence to the effect that there may be less genetic damage if a given amount of radiation is spread over a longer period of time.[366]

In the face of such unanimous opinion and in view of our ever increasing knowledge of the cause and effect of genetic damage it would be carrying the concept of blindfolded justice too far if the law simply refused to recognize that a problem exists. If it should be decided, as a matter of social policy, that it is unwise to allow recovery for genetic damage, it ought to be a decision arrived at after full consideration of all the factors involved, and not on the basis of an ostrich approach

[365] *Infra* discussion at notes 1072-79. See also Chapter I, *supra*.

[366] *Infra* discussion at notes 1080-84.

which assumes that if the problem is not recognized it does not exist. In the present state of development of knowledge about the cause and effect of genetic damage, the causation proof problems which the plaintiffs will face are great, but it is submitted that the question of whether or not to allow genetic damage at all is the first question to be answered. There are two reasons why difficulty of proof is not a satisfactory reason for refusing recovery generally for genetic damage caused by radiation. First, even in the present state of knowledge and in view of the requirements of probability which the law currently employs in tort actions, there will be cases where it is perfectly conceivable that causation can be proved. This will be considered later in the section dealing with proof problems.[367] Secondly, genetics is a developing science. With the great impetus that has been given to research in this area by a recognition of the dangers from radioactive fall-out, it would be most unfortunate if damage recovery concepts were frozen at the present state of scientific knowledge. While the proof problem as it relates to causation in radiation cases cannot be ignored in making this decision, any more than it can in connection with post-conception prenatal injuries, there would seem to be enough evidence already to warrant an assumption that in some cases the causation factor can be proved. If this is true then the law must face squarely the problem of whether or not to allow recovery for genetic damage resulting from negligent exposure to radiation.

In States Now Denying Damages for Prenatal Injuries. From the above analysis of the present attitude of the various state courts on the general question of prenatal injury, it is clear that in most jurisdictions where that question has been answered negatively no recovery will be allowed for genetic damage unless legislation is enacted, or unless the courts regard the problem of genetic damage as calling for somewhat different analysis than has been applied heretofore. The answer in the eight jurisdictions which do not allow recovery for prenatal injuries under any circumstances is perfectly clear—there is no reason to believe that recovery will be allowed for genetic damage because proof problems certainly are more difficult than in post-conception cases.[368] In the other four jurisdictions which incorrectly have been classified by judges and writers as states in which recovery is not allowed for prenatal injuries,[369] the answer is not so clear. The cases decided so far in

[367] *Infra* discussion following note 1079.

[368] See Table of Cases at end of this section.

[369] Nebraska, Oklahoma, South Carolina, Wisconsin. See Table of Cases at end of this section.

in these four jurisdictions involved situations where the injured foetus was not born alive or was not viable; therefore, these decisions give no answer as to what the courts would do if a case were presented where causation was shown, and a child, viable at time of injury, was born alive and lived for some time. For purposes of determining the possibility of recovering genetic damages, we would classify these three jurisdictions with those jurisdictions in which the result is uncertain, although the chances for recovery in these states might be thought to be somewhat less than in states which actually have decided that prenatal injuries are recoverable in some circumstances.

In States Now Allowing Recovery for Prenatal Injuries. Of the seventeen jurisdictions [370] in which recovery has been allowed for prenatal injuries, in predicting what may be done with genetic injuries, account must be taken of certain distinctions. The distinction as to whether the child is dead at birth or lives for a time thereafter would not seem to present any different problems when the injuries are genetic in character. This damage apparently either can be of the kind that causes death of the foetus while still in the mother, or it can manifest itself in children born alive with some abnormality. Conceivably the mutation could be beneficial or at least not harmful, so that no damages should be awarded. We can see no tenable policy distinction to be drawn between pre-conception and post-conception prenatal injury cases so far as deciding whether recovery ought to be allowed for death of the foetus itself. Of the seventeen jurisdictions in which recovery has been allowed, only two have clearly held that viability of the foetus is not important.[371] In most of the other jurisdictions where recovery has been allowed, either the facts of the cases or the language of the court makes it clear the court is allowing damages only when the foetus is viable.[372] To the extent that this remains a requirement for prenatal injuries during the post-conception period it may be assumed that there can be no recovery for genetic damage because by definition this is damage that arises before conception. For the same reason a relaxation of the requirement to one that the child merely be "quick" in its mother [373] will not suffice to permit recovery in a genetic damage case.

Effect of Separate Legal Entity Argument. Most of the argument in the cases and law review discussions on the question of recovery for

[370] See Table of Cases at end of this section.

[371] Discussion *supra* at notes 329-35.

[372] See cases listed in Table of Cases at end of this section permitting recovery.

[373] *Supra* note 333 and suggestion of concurring justice in Hornbuckle case, *supra* note 331.

prenatal injuries deals with the question as to when a child developing in its mother becomes a separate legal entity or "person" for purposes of tort liability. Practically all arguments by law review writers and those courts which have allowed recovery in recent years contrary to the earlier majority view have emphasized the fact that we now know that before birth and even before viability or quickness the embryo has an identity of its own which is, in some degree, separate from its mother's. To the extent that attention continues to be focused upon separate legal entity, there will be no right of recovery for genetic damage. Even with our limited knowledge of the science of genetics, we know it is not until the chromosomes of the mother and father are joined in a fertilized egg that a particular set of genes from each forms what will ultimately become a child. If the irradiated person does not have children or if the mutated genes are not passed on to the offspring at the time of conception, there has been no really important damage to the descendant. It seems very certain, therefore, that conception is a crucial point in determining potential damage. It is not possible to argue realistically, therefore, that there is an entity before conception. Most courts, even in jurisdictions where recovery is allowed for prenatal injuries to viable children born alive, probably will hold that there is no tort because there is no "person."

Scientifically this does not make sense, however, for if the geneticists are right (and they all agree), genetic damage can result from preconception radiation of the parent, and the mutation that results may be passed on to the child and manifest itself as a disabling deformity or organic inadequacy many generations later. In some cases causal connection can be ascertained on the basis of present scientific knowledge; in the future, as our knowledge of genetics increases, undoubtedly proof of causation will be possible in a greater number of cases. To the deformed child it certainly makes no difference whether his deformity was caused by radiation of his parent before conception or of his mother after conception. He lives with the deformity and should or should not be allowed recovery in a damage action on the social policy ground that we can or cannot afford to burden with such damage actions a growing industry so vital to our future, or can or cannot afford to let injured persons suffer uncompensated injuries. The decision should not be on the basis of whether irradiation occurred before or after conception. In asserting this we do not mean to imply that the proof of causation difficulty will be solved easily or that it will be solved at all in the great majority of cases. In those cases where causation

can be shown, however, it is important to answer the question, Should society allow recovery?

In those jurisdictions where the courts, in allowing prenatal injury recovery, clearly have taken note of new scientific developments establishing the separate identity of the embryo, they may follow scientific discoveries one step further and hold that so long as causation can be proved, compensation should be allowed, even though the radiation causing the abnormality occurred before conception. The growth of the law of prenatal injury has necessitated persuading the courts to accept scientific knowledge concerning both the identity of the embryo and the possibility of proving causation.

The Social Policy Considerations. If the next step is taken, however, it should be done only after a full consideration of the social impact of allowing such recovery. Undoubtedly, courts when faced with problems of genetic damage may use the "proximate cause" formula to find that the defendant owes no duty to the unborn. It certainly cannot be a question of foreseeability, because both as to post-conception and pre-conception prenatal injuries from radiation, it is clear that irradiation of either parent in the pre-conception period and irradiation of the mother in the post-conception period foreseeably will cause damage to the potential or actual embryo. Any limitation in the name of proximate cause, therefore, really will be a disguised policy judgment to the effect that negligent defendants should not be held responsible for this kind of injury. It is an arguable position but should be made openly and knowingly, not hidden behind the camouflage of proximate cause or a blanket rule against recovery merely because in many cases the proof problem will be difficult.

Decisions Bearing on Genetic Damage. Only two cases have been found which seem to contain even the remotest implication concerning the allowance of genetic damage. One is the brief comment by Chief Justice Duckworth in his concurring opinion in the *Hornbuckle* case where he asserted that if a baby could sue for injury occurring immediately after conception, as he felt the majority had ruled, "why not allow such suits for injuries before conception, even unto the third and fourth generations?" [374] His remark in this case clearly indicates that he would not allow recovery for genetic damage; rather, he would draw the line at the time when the child becomes quick in its mother.

The other case, *Morgan* v. *United States,*[375] is so remarkably analo-

[374] *Supra* note 332.

[375] 143 F. Supp. 580 (D.C. N.J. 1956).

gous to the genetic damage situation that it is most unfortunate it arose in a jurisdiction (Pennsylvania) in which no recovery is allowed for prenatal injuries under any circumstances. In this case the mother alleged that she was negligently given a blood transfusion "of an improper or unsuitable type" while in defendant's army hospital in February, 1952. In June, 1955, the mother was delivered of a baby boy whose health allegedly was impaired because of the transfusion of improper blood two and a half years earlier. Causes of action were brought for damages to the mother, the child, and the husband and father. The court disposed of the mother's claims on the ground that the two year statute of limitations ran out in February, 1955; the action was not begun until January, 1956. The court's reason for dismissal of the action for damage to the child is not completely clear. It first seemed to state that the statute of limitations also called for the dismissal of the action for damages to the child as well. The court then said:

> When the tortious conduct occurred William Morgan had not yet been conceived. He was then neither a viable foetus nor *en ventre sa mere.* The alleged tort occurred in Pennsylvania. Whether a cause of action accrued to William Morgan is governed by the law of that State.[376]

The court cited the *Berlin* v. *J. C. Penney, Inc.* case in which the Pennsylvania court denied recovery in a prenatal injury situation.[377] Here the federal district court apparently rests its decision on the rule of no cause of action for prenatal injuries. The court concluded that because the claim of the father for injuries to the mother and to the child was derivative, it must fall with the first two causes of action. If this case had arisen in a jurisdiction where recovery is allowed for prenatal injuries, the court would have been forced to decide whether a cause of action for pre-conception injuries is to be permitted and a precedent for genetic damage cases might have been established.

The blood transfusion case is very likely to be the forerunner of many cases that will be brought to the courts as the result of extensive use of radioactive materials. In several accidents workers have been exposed to sufficient radiation to increase substantially the risk of genetic mutation.[378] More significant in number, however, will be those

[376] *Id.* at 584.

[377] 339 Pa. 547, 16 A.2d 28 (1940).

[378] See description of accidents, *infra* Chapter IV. In addition, several persons unknowingly were exposed to significant quantities of radiation when a source was carelessly lost and it was some time before its loss was discovered. BNA, Atomic Industrial Rep. 4:419, 4:444 (1958). The exposures at the Y12 accident were 365, 339, 327, 270,

cases arising from the use of radioactive material or radiation sources for medical treatment,[379] and from the discharge of a large quantity of radioactive material over a heavily populated area. If a substantial reactor burn-up should occur and radioactive material be dropped over a city, the possibility of claims by parents, either for the increased possibility that their children will have deformities, or for deformities that actually show up in children later conceived, is not inconsequential and is a problem not to be dismissed lightly.

(3) Some Suggestions Toward a Solution

The proper solution of the problems that have been suggested in connection with pre- and post-conception injuries from radiation is not easy to determine. A comprehensive attack on the problem should be carried out by a group of lawyers representing all types of interests in tort litigation, with the advice and consultation of scientists and other experts to check the validity of assumptions that lawyers too often blithely (or blindly) make. It may be that atomic energy will open up an opportunity to the legal profession to do a really imaginative and yet practical job in the handling of tort cases, something that will be better than our present hit and miss system with its fabulous recoveries in some cases and its niggardly awards in others, quite out of proportion to the relative suffering in the respective cases. Much of the present system is good and must be retained, but some of it is bad, and atomic energy cases may present the legal profession with the opportunity to try some experiments that will have application in other cases as well. The following ideas and suggestions are presented as a starting point toward a proper solution.

In making these suggestions it is assumed that causation can be proved with reasonable certainty, a problem to be considered later in the section on proof.[380] One other assumption is made, *i.e.*, the injury results from action by the defendant which was not intended to bring harm to the persons injured, either as a typical intentional tort or in

236 and 68 r. Health Physics, Vol. 1, No. 2 at p. 208 (Sept. 1958). See general description of genetic damage, *supra* Chapter I. One study of exposure to radar beams in World War II concluded there was no hazard; N. Y. Times, June 26, 1958, p. 22, cols. 6, 7.

[379] Many of the malpractice cases involve X-rays, and probably could have included such a damage claim. Specialists in gynecology as well as radiologists now recognize the necessity of minimizing exposure of pregnant women. N.Y. Times, Oct. 11, 1958, p. C11, col. 2. *Cf.* Contrary statement reported N.Y. Times, Nov. 23, 1958 p. E9, col. 6.

[380] *Infra* discussion beginning at note 1072.

the sense of wanton disregard of consequences. These assumptions seem fair; for no matter what the system of compensation, the problem of proof of causation and the prevention of fraudulent or purely speculative claims will always be present but are no more bothersome, in some cases at least, than in many other types of damage cases.

(a) Post-Conception Injuries

The common law cases are confusing and the results reached seem inadequate and based upon an uncritical analysis, not only of scientific knowledge but also of the underlying social policy considerations involved. Too often the results indicate a failure to apply the compensation theory we assume in negligence cases generally. They also show a failure to distinguish sharply between the rights of the injured child, the next of kin under death statutes, and of parents for damages other than under the death statutes.

(i) Recovery by Child

If the child is born alive and lives at least until after the trial, recovery should be allowed. Damages should include the *extra* expenses which will be required because of the abnormality and for a period extending through the whole life expectancy of the child determined as of the time of trial, taking into account any shortening of the period because of the abnormality. The compensation theory logically (and correctly) does not permit recovery for the full life expectancy without taking into account the abnormality. Either as a separate item of damages or as an element of the extra expenses award, an amount should be included to provide for *really adequate* rehabilitation to the extent it is possible to correct the defect or provide some substitute for the ability impaired by the deformity.

Determining whether to allow recovery for pain and suffering and mental anguish *of the child* and if so in what amount is somewhat more difficult. Undoubtedly an amount should be allowed to provide for good medical treatment including whatever is available to reduce pain and suffering as much as possible. In many cases, however, nothing should be awarded *to the child* for humiliation and similar mental anguish. The microcephalic idiot who has none of the normal senses cannot suffer this type of injury. In general, a mentally alert child with some other abnormality probably does not suffer from humiliation and related feelings during the first few years. If the child lives long enough and is able to sense humiliation because of the deformity and the defect is such as to

cause the normal person humiliation, a good case can be made for allowing something for mental anguish, but there is much to be said for applying here also the suggestion that recovery for such damages be limited in amount.[381]

In awarding damages to the child who lives, the concern about finding a separate legal entity should be forgotten and the distinctions based on "viability" and "quick" should be eliminated. Except possibly for the difficulty of proving causation, there is no policy justification for such distinctions. If a child has to live with a deformity it matters not to him that it happened before or after he was quick or viable in his mother's womb, as the case may be in a particular jurisdiction. He is now an injured legal entity which should be sufficient.

Even as to proof of causation, in the light of present medical knowledge and techniques, the difficulty is not sufficiently greater in the one case than the other to justify basing a distinction upon this factor. Probably it is more difficult to determine whether the quick or viable condition exists than it is to determine whether the mother is pregnant. If it is felt that the difficulty of proof is such that the danger of spurious, fraudulent, or speculative claims is great, the legislature by enactment or the judge by decision can control this by making the burden of proof somewhat higher, if this is felt to be necessary. Certainly, if the prosecution is allowed to prove causation beyond a reasonable doubt in such cases in criminal suits, there is little reason to deny the plaintiff at least the same opportunity in a tort action.

Perhaps it is not amiss to re-emphasize our position that these damages should be awarded to the child and not to his parents. The necessary accounting and trustee arrangements are available already by common law rule or by statutory provisions.

If the child is stillborn or dies before trial, results under existing doctrines are quite unrealistic in some respects. If stillborn, surely the child gains nothing from an award for mental anguish or pain and suffering. Such an award cannot help the child, but only the survivors. The allowance of damages in several jurisdictions [382] is unjustifiable under a compensation theory. If the child is born alive but dies before trial, recovery for the child's mental anguish or pain and suffering, allowed in even

[381] Plant, "Damages for Pain and Suffering," 19 Ohio St. L. J. 200 (1958). The author of the comment in 22 U. of Chi. L. Rev. 538 (1955) suggests setting an arbitrary limit on recoveries under wrongful death statutes for death of children.

[382] *Infra* Table of Cases at end of this section. Delaware, Kentucky, Minnesota, Mississippi, and New Hampshire apparently permit such recovery even when the child is stillborn.

more jurisdictions,[383] again is unjustifiable because survivors are the only beneficiaries. Any recovery by beneficiaries should be in their own right, not because of the suffering of the child now dead.

To the extent that there were *extra* expenses incurred in delivering or caring for the child until its death, including those for medical treatment to reduce pain and suffering and for rehabilitation efforts, if any, recovery should be allowed. Once the child dies such recovery cannot benefit him but these efforts in his behalf should be encouraged and those who have incurred the expenses should be recompensed by the wrongdoer. Whether the claim is in the name of the now dead child or by the parents, if they incurred the expenses as ordinarily would be the case, is not important; the suggested limits on recovery are.

(ii) Recovery by Next of Kin Under Death Statutes

Application of survival and wrongful death statutes to prenatal injury suits cannot be justified, except possibly in one situation.

Survival statutes are based on the theory that the estate of the deceased should be awarded the amount which the deceased could have recovered, had he lived. Perhaps recovery is justified in the case of property damage but not when the award is for pain and suffering or mental anguish. The deceased's suffering is not lessened by knowledge that some money will pass on through his estate, even assuming the deceased lives long enough to realize the significance of the possibility. If recovery is allowed under a survival act, the artificial argument about whether there is a separate legal entity who had a cause of action must be revived. It also may be necessary to make the artificial distinction between the case where the foetus dies before birth and that in which he survives birth, if only for an instant, since a cause of action can vest in an instant.[384] As applied in non-intentional tort cases, at least in the prenatal injury situation, the results reached under survival acts have more of an element of vengeance or at best of a windfall than of compensation. Nevertheless, applied with strict logic, recovery would be allowed if the death occurs in a jurisdiction which would allow recovery if the child survived the trial and if the child lived for at least a moment, or if the foetus is considered as legally alive even before birth.[385]

[383] Six states; see Table of Cases at end of this section.

[384] See Harper & James 1031.

[385] Connecticut, Louisiana, and New Hampshire. See Table of Cases at end of this section.

Wrongful death statutes generally allow recovery to a specific and limited group of persons who ordinarily suffer financially from the death of a close relative such as a parent or child because they have been deprived of a source of financial support. The Delaware, Kentucky, Minnesota, Mississippi, and New Hampshire courts [386] can assert a possibly tenable, theoretical justification for allowing recovery under a wrongful death statute. Practically speaking, however, recovery is not justified under these statutes either. Certainly no person really begins to depend on a conceived but unborn child, or even on one already delivered and living, until many years later when there is some indication of earning capacity and a desire to support relatives. If the child is handicapped, no such expectations of support should develop. There is no real likelihood of receiving financial support from even a healthy child these days when raising children ordinarily costs much more than they can earn until they are grown and away from home. The uncertainties even then are great. This is considerably different from the position of a spouse or child or even parent who actually has come to expect financial support from a grown father or mother, son or daughter.

The only possible exception to the suggested denial of recovery under death statutes arises in the event a deformity or incapacity resulting from prenatal injuries manifests itself only after the child has grown and accepted support responsibility, and others have depended on such support. Perhaps in this case recovery under a wrongful death statute is justified, although the statute of limitations conceivably could make recovery impossible if the time of the original injury is used to determine when the cause of action arose.

We submit that results under existing death statutes are unrealistic and that a new statute should be enacted to prevent their use in prenatal injury cases. A statute should be adopted fully protecting the injured child, those who incur expenses to help him while living, and possibly those who, not knowing of the incapacity, reasonably have come to depend on the injured child for financial support where the manifestation of the injury is long delayed.

(iii) Rights of Parents

So far as the mother's rights are concerned, the decisions seem fairly satisfactory insofar as they allow recovery for all of her own injuries resulting from the impact, including those arising from the birth and its aftereffects to the extent they are caused by defendant's negligent

[386] *Supra* note 382.

act.[387] If we could start anew we would have serious doubts as to the advisability of unlimited recovery for the mother's mental anguish during pregnancy and after the impact for fear of having a deformed child, unless it manifests itself in some type of recognizable disability to continue normal activities. This problem, however, is not different from mental anguish recovery in other types of negligence actions and perhaps all that can be hoped for is some kind of limitation on maximum recovery in such cases.[388] On the other hand, the arbitrary rule that there can be no recovery for the mental anguish which a mother suffers as she watches over and takes care of a deformed child probably is unfair. Looking at the matter from the standpoint of compensation and rehabilitation, paying her a large sum of money just so she can buy a fur coat or a new house is not justified, but if her mental anguish seriously interferes with carrying out her normal activities, something might be said for a type of recovery which is so controlled that it would have to be used for rehabilitation, including psychiatric treatment if necessary.

To the extent that the parents are put to *unusual* expenses in caring for the abnormal child, they should be allowed to recover a compensatory award, assuming that there is no duplicating award allowed to the child or his estate as suggested in discussing the rights of the child.

The rights of the parents arising from the loss of the expected or already born child are discussed in the next section on sterility and related injuries.

(iv) Conclusions

The one fundamental principle to keep in mind is that while a full recovery should be allowed for all interests injured to the extent money damages can in some way make amends, duplicating recoveries should be prevented. It is important to keep separate the rights of the child *while he is living,* the rights of close relatives in certain exceptional cases, and the rights of parents in their own right but not that of the child; otherwise duplication is likely. Certainly there is a need for changes in survival and wrongful death statutes and development of a whole new approach to granting damages for prenatal injuries.

(b) Pre-Conception Injuries

If the science of genetics develops to the point where causation can be proved, logic would seem to call for recovery for pre-conception in-

[387] See cases discussed *supra* note 358.
[388] *Supra* note 381.

juries on the same grounds suggested for post-conception injuries in radiation cases. The concept of a separate legal entity should not be an obstacle if compensation is accepted as the theory for tort recovery. So long as the defendant is protected against unreasonable claims by placing a substantial burden of proof upon the plaintiff, there is no reason to immunize the wrongdoing defendant from liability for actual injuries which result from his negligence.

There is one problem connected with genetic damage, however, which is much more serious than in the case involving post-conception prenatal injury. The injury from radiation to the embryo in the mother's womb will manifest itself within the lifetime of the child later born. This in itself is a long period of time and presents some serious problems under existing statutes of limitations. In the case of genetic damage, however, these problems are much more serious for such injuries transmit themselves through succeeding generations. Assuming that thirty years is the normal length of a generation in this country, it could easily be 150 or 200 years before an injury manifested itself in the form of a mutation. Such cases, however, do not present the problem in sharpest focus. At the end of so long a period no human defendant will be alive and under the laws of incorporation in most states even a corporate defendant is likely to be legally dead. In addition, proving causation at this late date probably would be impossible for the plaintiff. The case most likely to arise, and the one which should be the basis for legal rules, involves the birth of a child with manifestations of genetic mutation within the same or a second generation. This is not unlike post-conception injuries to an embryo which is later born and lives a relatively normal length of time. The period will be longer but not inordinately so.

The rules suggested for application to prenatal injuries should be extended to cover genetic damage if the manifestations occur within the first or perhaps the second generation.

(c) Common Problems

The statute of limitations problems raised by these cases are common to many, if not to most, radiation injury situations. In most jurisdictions it is necessary that a whole new scheme of limitations be developed to take care of radiation injury cases whether they be post or pre-conception prenatal injuries, or other types of injuries such as leukemia, bone cancer, *etc.* Statutes usually require actions for negligence to be brought within a very short period, *e.g.,* two or three years. If we treat the time of injurious impact as the time when the cause of action arises,

as seems to be indicated in the *Morgan*[389] and *LaPorte*[390] cases, it is clear that genetic damage cases cannot be brought within the statutory period. Most cases will involve radiation exposure more than two or three years before the deformity shows up. Even in post-conception prenatal injury cases many of the disabilities may not appear within the periods of limitation. An example of this would be the occurrence of leukemia which may not show up for several years after birth.

In addition, it seems clear that there is room for substantial improvement in the system of remedies and compensation in tort cases of the character here under consideration. Certainly the atomic energy or radiation injury cases are going to strain our present system very greatly, especially if we are concerned with compensation and not vengeance. It is possible that we may need to adopt principles similar to the splitting of causes of action found in certain European countries, or we may need to adopt some kind of a "wait and see" doctrine for tort cases. Perhaps emphasis should be placed on paying the expenses of rehabilitation and treatment rather than on mental anguish and pain and suffering awards. These suggestions apply generally to radiation cases and will also be discussed later.[391]

One other troublesome problem common to both pre- and post-conception prenatal injuries concerns contributory negligence and assumption of risk on the part of the parent. Prosser in his usual pithy way summarizes the possibility of imputing the negligence of the parent to the minor child in the following language:

> In 1858, in a still more unfortunate English case, it was held that a small child injured through the negligence of a railway company was barred from recovery by the contributory negligence of a grandmother who was in charge of the child at the time. This barbarous rule, which denies to the innocent victim of the negligence of two parties recovery against either, and visits the sins of the fathers upon the children, was accepted in several American states, but is now overruled everywhere except in Maryland, Maine, and perhaps Delaware. The "agency" of the parent to look after the child is of course the barest fiction, and the fear that the parent may profit by his own negligence is now removed by the power of the court to put the proceeds in trust for the child.[392]

[389] Morgan v. United States, *supra* note 375.

[390] La Porte v. U.S. Radium Corp., 13 F. Supp. 263 (D.C. N.J. 1935).

[391] See recommendations *infra* following note 1123.

[392] Prosser 301.

Harper and James are not quite so disturbed but agree that the negligence of the parent should not be imputed to the child.[393]

References to the matter of the mother's negligence are found in a few of the prenatal injury cases. As pointed out before, the possibility of the child suing the mother for her negligence was used by the Illinois court in the *Allaire* case[394] as a reason for denying all recovery for such injuries. On the other hand, in *Rainey* v. *Horn*,[395] the court pointed out that in Mississippi, as in most jurisdictions,[396] a child cannot sue its mother. Another reference is found in the Missouri case of *Kirk* v. *Middlebrook*,[397] this time to a question involving assumption of risk. Both lawyers assumed that the right of action was in the mother and not the infant and the court apparently held that the mother could contract away damage rights arising from injury to the foetus. The language seems to suggest that if the action had been that of the child, the mother could not contract it away. These are all of the references to the question found in the cases. Prosser and Harper and James are not referring to prenatal injury cases in their comments on contributory negligence. Obviously significant differences exist between applying contributory negligence and assumption of risk doctrines to cases of injuries to living children and to cases of prenatal injury.

The first distinction to note is that both the parents (particularly the mother) and the child may have claims. Surely so long as contributory negligence and assumption of risk doctrines are used in negligence cases generally, these should be defenses to any action by the parent for injuries to his interests as distinguished from those of the child.

Whether such defenses arising from the actions of the negligent parent should be applied to defeat the child's own rights against third parties is a somewhat more difficult question to answer; but here again they probably should be applicable, in contrast to the result where a living child is hurt. It does not seem as "barbarous" to apply the defenses to a child still in its mother's womb, or still to be conceived. Even if the injured foetus is born alive but dies within the first five or ten years of his life, recovery from a negligent defendant in effect will help the parents themselves rather than the child for they will be caring for him during this period in almost all cases. Yet the condition was partly the

[393] Harper & James 1270-71.

[394] Allaire v. St. Luke's Hospital, *supra* note 319. See concern suggested by writers in 29 N.Y.U.L. Rev. 1154, 1157 (1954); Note, 35 Va. L. Rev. 618, 626 (1949).

[395] *221* Miss. 269, 281, *72* So.2d 434 (1954).

[396] Prosser 675-76, although he disagrees with the rule.

[397] 201 Mo. 245, 285-86, 100 S.W. 450 (1907).

result of their own contributory negligence. The unborn or unconceived child seems too closely connected with the parents to deny defendants the right to use contributory negligence or assumption of risk as a defense, even if the child lives to a mature age with some serious deformity.

This position is not inconsistent with the argument that the embryo or foetus is a separate entity and should be allowed to recover for prenatal injuries. Separate existence should not govern application of these defenses. The burden of extra expenses and rehabilitation in such cases should be born by the parents, so long as contributory negligence is used in negligence cases generally.

In any event, assuming the parent is advised fully of the risks involved, no rule should be adopted which will embarrass in any way the doctor or the expectant mother or potential parent in deciding to use radiation in the course of medical treatment of the parent, even though this admittedly creates a risk of injury to the embryo or foetus, either directly or because of mutated genes.

TABLE OF CASES—PRENATAL INJURIES

I. States Allowing Recovery Under Some Circumstances

1. If Viable at Time of Injury and Born Alive

CALIFORNIA:

Myers v. *Stevenson*, 125 Cal. App.2d 399, 270 P.2d 885 (1st Dist. 1954) (Injuries during delivery and born alive; specifically provided for by amendment to statute following *Scott* case).

Scott v. *McPheeters*, 33 Cal. App.2d 629, 92 P.2d 678 (3d Dist. 1939) (Injuries at birth and born alive; construing code provision as creating separate existence of foetus for personal injury as well as property rights).

CONNECTICUT:

Prates v. *Sears, Roebuck & Co.*, 19 Conn. Supp. 487, 118 A.2d 633 (Super. Ct. 1955) (Child viable and lived for five days; wrongful death action).

Tursi v. *New England Windsor Co.*, 19 Conn. Supp. 242, 111 A.2d 14 (Super. Ct. 1955) (Viable at time of injury and born alive).

But see: *Squillo* v. *City of New Haven*, 14 Conn. Supp. 500 (Super. Ct. 1947) (Action not allowed); *Marden* v. *Enterprise Industries, Inc.* (unreported) (Hartford Co. # 90013, 1951) (Action not allowed).

DELAWARE:

Worgan v. *Greggo & Ferrara, Inc.*, 128 A.2d 557 (Del. Super. Ct., 1956) (Viable at time of injury and apparently killed before birth; administrator sued for damages).

DISTRICT OF COLUMBIA:

Bonbrest v. *Kotz*, 65 F. Supp. 138 (D.C., D.C. 1946) (Injury at birth and born alive, the court emphasizing that child was viable).

GEORGIA:

Hornbuckle v. *Plantation Pipe Line Co.*, 212 Ga. 504, 93 S.E.2d 727 (1956) (Injury six weeks after conception and apparently born alive; concurring justice saying should have to prove that quick in mother).

Tucker v. *Howard L. Carmichael & Sons*, 208 Ga. 201, 65 S.E.2d 909 (1951) (Injury three hours before birth, nothing being said about being born alive but language leans this way).

ILLINOIS:

Rodriquez v. *Patti*, 415 Ill. 496, 114 N.E.2d 721 (1953) (Injuries while *en ventre sa mere;* controlled by *Amann* case).

Amann v. *Faidy*, 415 Ill. 422, 114 N.E.2d 412 (1953) (Injury while *en ventre sa mere* and born alive court assumes; wrongful death action. Overrules *Allaire* case).

Allaire v. *St. Luke's Hospital*, 184 Ill. 359, 56 N.E. 638 (1900) (Action *not* permitted but overruled by *Amann* case).

Smith v. *Luckhardt*, 299 Ill. App. 100, 19 N.E.2d 446 (1939) (Born microcephalic idiot as result of X-ray treatments of mother from third to seventh month of pregnancy; action *not* permitted on ground controlled by *Allaire* case).

KENTUCKY:

Mitchell v. *Couch*, 285 S.W.2d 901 (Ky. Ct. App. 1955) (Viable child injured and born dead; wrongful death action allowed).

LOUISIANA:

Cooper v. *Blanck*, 39 So.2d 352 (La. App. 1923) (Civil code read as allowing wrongful death action for viable foetus born alive).

MARYLAND:

Damasiewicz v. *Gorsuch*, 197 Md. 417, 79 A.2d 550 (1951) (Born alive and apparently not viable; test apparently is whether is quick).

MINNESOTA:

Verkennes v. *Corniea*, 229 Minn. 365, 38 N.W.2d 838 (1949) (Injury at birth killed mother and foetus; wrongful death action allowed without mention of living even for moment).

Korman v. *Hagen*, 165 Minn. 320, 206 N.W. 650 (1925) (Allowing recovery without considering problem; injury forty-eight hours before birth and born alive).

MISSISSIPPI:

Rainey v. *Horn*, 221 Miss. 269, 72 So.2d 434 (1954) (Injury during delivery and stillborn; wrongful death action allowed).

MISSOURI:

Steggall v. *Morris*, 363 Mo. 1224, 258 S.W.2d 577 (1953) (Viable at time of injury and born alive; wrongful death action allowed).

Buel v. *United Railways Co.*, 248 Mo. 126, 154 S.W. 71 (1913) (Action disallowed but overruled by *Steggall* case).

NEW HAMPSHIRE:

Poliquin v. *MacDonald*, 135 A.2d 249 (N.H. 1957) (Viable at time of injury and stillborn; wrongful death action permitted, provided on remand find that viable).

Prescott v. *Robinson*, 74 N.H. 460, 69 Atl. 522 (1908) (Held mother had no cause of action for deformed child born alive; distinguished in *Poliquin* case).

Durivage v. *Tufts*, 94 N.H. 265, 51 A.2d 847 (1947) (No cause of action for unborn because no medical testimony showing causation; distinguished in *Poliquin* case).

NEW YORK:

Kelly v. *Gregory*, 282 App. Div. 542, 125 N.Y.S.2d 696 (1953) (Injured during third month of pregnancy and born alive; carrying *Woods* v. *Lancet* to before viable).

Woods v. *Lancet*, 303 N.Y. 349, 102 N.E.2d 691 (1951) (Injured in ninth month and born alive; overruling *Drobner* case).

Drobner v. *Peters*, 232 N.Y. 220, 133 N.E. 567 (1921) (Action *not* allowed, overruled by *Woods* case).

Nugent v. *Brooklyn Heights R. R.*, 154 App. Div. 667, 139 N.Y.S. 367 (2d Dept. 1913) (Action *not* allowed but overruled too).

Banas v. *City of Syracuse*, 204 Misc. 201, 125 N.Y.S.2d 490 (Sup. Ct. 1953), *aff'd*, 282 App. Div. 826, 122 N.Y.S.2d 532 (Right to sue recognized but must be brought against municipality within prescribed time; regardless of excuse or inability, cannot be maintained otherwise).

OHIO:

Jasinsky v. *Potts*, 153 Ohio St. 529, 92 N.E.2d 809 (1950) (Injured during eighth month and born alive; wrongful death action allowed).

Williams v. *Marion Rapid Transit*, 152 Ohio St. 114, 87 N.E.2d 334 (1949) (Injury in seventh month and born alive).

Mays v. *Weingarten*, 82 N.E.2d 421 (Ohio App. 1943) (Action *denied* but surely overruled in *Williams* case).

OREGON:

Mallison v. *Pomeroy*, 205 Ore. 690, 291 P.2d 225 (1955) (Viable at time of injury and born alive).

CANADA:

Montreal Tramways v. *Leveille*, [1933] 4 D.L.R. 337 (Viable when injured and born alive; based on civil code provision given broad interpretation).

Smith v. *Fox*, [1923] 3 D.L.R. 785 (Action for prenatal injury will lie but must await birth of child, apparently alive).

2. Not Viable but Born Alive

GEORGIA:

Hornbuckle case, *supra* (Very broad language covering any time after conception; child actually six weeks along).

MARYLAND:

Damasiewicz v. *Gorsuch*, *supra* (Says viability bad test, but suggests when "comes alive" in mother, apparently meaning when "quick").

NEW YORK:

Kelly v. *Gregory*, *supra* (Injury during third month, court saying separability begins at conception).

3. Viable at Time of Injury but Born Dead

DELAWARE:

Worgan v. *Greggo & Ferrara, Inc.*, *supra* (Language indicates administrator of viable infant can sue if does not survive the accident).

KENTUCKY:

Mitchell v. *Couch, supra* (Viable and born dead and wrongful death action allowed).

MINNESOTA:

Verkennes v. *Corniea, supra* (Viable and no mention of being alive after birth; wrongful death action allowed).

MISSISSIPPI:

Rainey v. *Horn, supra* (Death during delivery; wrongful death action allowed).

NEW HAMPSHIRE:

Poliquin v. *MacDonald, supra* (Viable and stillborn; wrongful death action allowed).

II. No Recovery Allowed

1. No Recovery in Any Case

ALABAMA:

Birmingham Baptist Hospital v. *Branton,* 218 Ala. 464, 118 So. 741 (1928) (No death act cause by father for child dying after birth from prenatal injuries, the damages to it, if not too remote, being recoverable by mother).

Stanford v. *St. Louis-San Francisco Ry.,* 214 Ala. 611, 108 So. 566 (1926) (Lived for short time and action for damages denied to it, mother having right to any damages).

Snow v. *Allen,* 227 Ala. 615, 151 So. 468 (1933) (Court said if complaint is interpreted as claiming damages for injury to viable foetus then this item is recoverable by mother, though court reads complaint as for mental anguish for loss of child as well as injury to herself in delivery).

MASSACHUSETTS:

Cavanaugh v. *First Nat'l Stores,* 329 Mass. 179, 107 N.E.2d 307 (1952) (Viable and born alive).

Bliss v. *Passanesi,* 326 Mass. 461, 95 N.E.2d 206 (1950) (Viable and apparently born alive but died soon thereafter).

Dietrich v. *Northampton,* 138 Mass. 14 (1884) (Court assumes that born alive at fourth or fifth month of pregnancy and states that any damages to infant not too remote to be recovered at all can be recovered by mother).

MICHIGAN:

Newman v. *City of Detroit,* 281 Mich. 60, 274 N.W. 710 (1937) (Viable and born alive).

NEW JERSEY:

Stemmer v. *Kline,* 128 N.J.L. 455, 26 A.2d 489 (1942) (Viable and born alive, last X-ray treatment of mother only six months before birth).

Ryan v. *Public Serv. Co-ordinated Transp.,* 18 N.J. Misc. 429, 14 A.2d 52 (Sup. Ct. 1940) (Born alive, time of injury not stated).

PENNSYLVANIA:

Morgan v. *United States,* 143 F. Supp. 580 (D.C. N.J. 1956) (Child not even conceived at time of blood transfusion and under *Berlin* case, *infra,* no recovery in Pennsylvania for prenatal injuries).

Berlin v. *J. C. Penny Co.,* 339 Pa. 547, 16 A.2d 28 (1940) (Apparently born alive, no time of injury given).

Rimpa v. *Sears Roebuck & Co.*, 37 Erie 267 (Pa. C.P. 1952) (Viable and born alive; followed *Berlin* case. *supra*).

Jacketti v. *Pottstown Rapid Transit Co.*, 67 Montg. Co. L.R. 37 (Pa. C.P. 1950) (Apparently born alive but no time of injury given).

Kine v. *Zuckerman*, 4 Pa. D. & C. 227 (1924) (Action *permitted* for viable foetus born alive; presumably overruled by *Berlin* case, *supra*).

Contra: Von Elbe v. *Studebaker-Packard Corp.*, 106 Pittsburgh Legal J. 219 (1958) (Born alive and recovery allowed regardless of inability, although whether non-viable at time of injury not stated.)

RHODE ISLAND:

Gorman v. *Budlong*, 23 R.I. 169, 49 Atl. 704 (1901) (Viable and born alive).

TEXAS:

Magnolia C. C. B. Co. v. *Jordan*, 124 Tex. 347, 78 S.W.2d 944 (1935) (Viable and born alive).

Lewis v. *Steves Sash & Door Co.*, 177 S.W.2d 350 (Tex. Civ. App. 1943) (Controlled by *Magnolia* case, *supra;* viable and born alive).

IRELAND:

Walker v. *Great Northern Ry.*, 28 L.R. (Ir.) 69 (1891) (At least quick and born alive; court deciding that no duty owed by carrier to unborn child since the agents did not know of existence of foetus; a contract case so not deciding trespass case but difficulty of proof question noted by one judge).

2. No Recovery If Stillborn, but Reserving Question If Born Alive

NEBRASKA:

Drabbels v. *Skelly Oil Co.*, 155 Neb. 17, 50 N.W.2d 229 (1951) (Viable but stillborn).

OKLAHOMA:

Howell v. *Rushing*, 261 P.2d 217 (Okla. 1953) (Simply following *Drabbels* case, *supra*, not *Verkennes*, *supra;* born dead).

SOUTH CAROLINA:

West v. *McCoy*, 105 S.E.2d 88 (Sup. Ct., S.C. 1958) (Quick but not viable at time of injury and stillborn. Reserving question if viable and born alive).

3. Recovery Denied If Not Viable, but Reserving Question If Viable When Injured

WISCONSIN:

Lipps v. *Milwaukee E. Ry. & L. Co.*, 164 Wis. 272, 159 N.W. 916 (1916) (Non-viable and court expressly reserves question where viable, suggesting there are "cogent reasons" for contrary rule in that case; born alive).

II. Actions Under Wrongful Death and Survival Statutes

1. Recovery Allowed Under One or Both When Born Alive

CONNECTICUT:

Prates v. *Sears, Roebuck & Co.*, *supra* (Recovery under both).

ILLINOIS:

Amann v. *Faidy*, *supra* (Apparently wrongful death only).

LOUISIANA:

Cooper v. *Blanck*, *supra* (Recovery under both).

MISSOURI:
Steggall v. *Morris, supra* (Apparently wrongful death only).

NEW HAMPSHIRE:
Poliquin v. *MacDonald, supra* (Seems to be survival action).

OHIO:
Jasinsky v. *Potts, supra* (Apparently wrongful death only).

2. Recovery Permitted Even Though Stillborn

DELAWARE:
Worgan v. *Greggo & Ferrara, Inc.*, (Language indicates administrator of viable infant can sue for damages even though stillborn).

KENTUCKY:
Mitchell v. *Couch, supra* (Wrongful death action permitted).

MINNESOTA:
Verkennes v. *Corniea, supra* (Wrongful death action permitted).

MISSISSIPPI:
Rainey v. *Horn, supra* (Death during delivery; wrongful death action allowed).

NEW HAMPSHIRE:
Poliquin v. *MacDonald, supra* (Viable and stillborn; wrongful death action permitted).

3. No Recovery Permitted Only Because Stillborn, Otherwise Allowed

CALIFORNIA:
Norman v. *Murphy*, 124 Cal. App.2d 95, 268 P.2d 178 (1954) (Wrongful death action).

NEW YORK:
In re Logan's Estate, 156 N.Y.S.2d 49 (Surr. Ct. 1956).
Muschetti v. *Charles Pfizer & Co.*, 208 Misc. 870, 144 N.Y.S.2d 235 (Sup. Ct. 1955).
In re Scanelli, 208 Misc. 804, 142 N.Y.S.2d 411 (Surr. Ct. 1955).
In re Roberts' Estate, 158 Misc. 698, 286 N.Y.S. 476 (Surr. Ct. 1936) (Decided before *Woods* v. *Lancet, supra*, but still followed as to stillborn in *Logan's Estate, supra*).

4. No Recovery When Stillborn in Jurisdictions Where No Decisions on Rights If Born Alive

NEBRASKA:
Drabbels v. *Skelly Oil Co., supra* (Viable but stillborn).

OKLAHOMA:
Howell v. *Rushing, supra* (Simply following *Drabbels* case, *supra*, not *Verkennes* case, *supra;* born dead).

SOUTH CAROLINA:
West v. *McCoy, supra* (Quick but not viable at time of injury but stillborn, expressly reserving question if viable and born alive).

c. Sterility and Related Injuries Involving Loss of Children

The type of radiation injury most closely related to genetic damage is impairment of procreative function caused by irradiation of the reproductive organs. Nevertheless, it is a quite separate injury for sterility injures the parent and not future generations. Exposure to radiation possibly will increase so greatly the chances of a deformed child being produced that the potential parent may decide as a matter of conscience to avoid propagating a line of defective descendants. He would feel deprived of procreation powers with the same effect as if he were actually sterile. In either case the question arises as to whether or not compensation should be awarded to a person who has been made sterile by radiation or as to whom the likelihood of genetic damage is so great that he should refrain from having children. The only actual case known to involve solely the claim of sterility caused by overexposure to radiation never was brought to court, for at about the time the suit was to be filed the claimant's wife became pregnant, and the cause of action vanished because of the legal presumption. In general it is believed that sufficient whole body radiation to render a person permanently sterile will prove fatal. Radiation limited to the area of the reproductive organs might not prove fatal, yet might create permanent sterility. Temporary sterility may occur but damages seem so unsubstantial that consideration seems unwarranted.

While no cases exactly in point have been found, the nearest analogies indicate what the courts might do if sterility is proved to have been caused by radiation and to be of sufficient duration to constitute a serious impairment of the victim's power to propagate. The discussion is limited to the inability to have children and is not meant to include the separate problem of impotency.[398]

(1) Decided Sterility Cases

Allowance of Damages for Sterility Caused by Ordinary Physical Injuries. There has been very little discussion of the problem of sterility which does not affect in any way the ability to have sexual intercourse but which does deprive the person, and his or her spouse in the ordinary case at least, of the ability to have children. One of the earliest cases found which deals directly with the question of whether the inability to have children is an element of damages in a tort action is *Denver &*

[398] See Annot., 23 A.L.R.2d 1378 (1952) on loss of consortium of husband or wife. Walker, The Law of Damages in Scotland 585-86 (1955) [hereinafter cited as Walker] doubts recovery should or would be allowed in Scotland or England.

Rio Grande Ry. v. *Harris,* where the plaintiff was injured by a gunshot of an employee of the railway in such circumstances that the attack was a tort. The court said:

> One of the consequences of the wound received by the plaintiff at the hands of the defendant's servants was the loss of the power to have offspring—a loss resulting directly and proximately from the nature of the wound. Evidence of this fact was, therefore, admissible, although the declaration does not, in terms, specify such loss as one of the results of the wound. The court very properly instructed the jury that such impotency, if caused by the defendant's wrong, might be considered in estimating any compensatory damages to which the plaintiff might be found, under all the evidence, to be entitled.[399]

While the court here speaks in terms of impotency it is clear that it is referring also to the inability to have offspring as an element of damage. It is also true that even if this were the kind of assault which justifies punitive as well as compensatory damages, the punitive were separated from the compensatory. The loss of the power of the plaintiff to have offspring was dealt with by the court as part of the compensatory damages. Of course, the case involved what would be termed an intentional tort but the court did not mention this fact in discussing the question of whether or not the loss of the power to have offspring was an element in the damages to be allowed.

An equally distinct statement of the opposite position is found in *Landwehr* v. *Barbas,* arising in New York in 1934. Factually the case is different, but the court considered the same problem. The *per curiam* majority opinion was as follows:

> The loss of opportunity of childbearing, due to physical injuries of a husband caused by the negligence of a third party, has never been recognized as giving a cause of action to a husband or wife against the wrongdoer. There are so many elements of doubt and conjecture in connection with the birth of children that it cannot be said that the wrong is the proximate cause of the loss. If the complaint be construed to mean that because of the injuries the husband has become sexually impotent, the wife has no cause of action.[400]

The dissent was a vigorous one and, after pointing out that the wife's action really was for the loss of consortium, continued:

> We have recognized the right of the wife to recover compensation for the loss of her husband's attentions, caresses, af-

[399] 122 U.S. 597, 608, 7 S.Ct. 1286 (1887).
[400] 270 N.Y.S. 534, 535 (1934).

> fection, exclusiveness; then why not for the loss of her right to motherhood within her marriage contract? Surely this loss transcends all the others. For its loss through the tort of another, she is entitled to such compensation as the law can afford.[401]

The dissenting judge does not state what the "law can afford."

The only case found involving exposure to radiation which deals with the problem of sterility is *McElroy* v. *Frost,*[402] discussed before. In that case the plaintiff was awarded damages in the amount of $29,125 because the negligence of the doctor in treating his scrotum with X-rays resulted in atrophy of the testicles, extensive dermatitis, and a condition which ultimately would develop into a fatal cancer. In describing the injury the court stated that "the effect of the treatment on the plaintiff would be to render him sterile," but said nothing else about damages for sterility, though upholding the verdict.

A large number of cases have dealt with the childbearing ability of women who have been in accidents resulting in injury to the pelvic region. While most of them do not speak in terms of sterility as such, the cases are analogous and pertinent to the extent that the damages allowed include an element for the loss of the ability to have children. An early Alabama case, *Alabama Great Southern R. R.* v. *Hill,* contains an effective presentation of the argument in favor of allowing damage recovery for injury to a woman's ability to have children. The court said:

> The objection to the testimony of Dr. Drennen, to the effect that plaintiff's injuries were of such character as that child-bearing would be thereby rendered perilous to life, is untenable. It may be that she might never have married, even had she not been injured; or that, marrying, she might have had no desire to bear children; or even that, desiring issue, she might not have had any, as is argued by counsel; but these considerations can exert no influence on the question. It is to be assumed that every physical endowment, function and capacity is of importance in the life of every man and woman, and that occasion will arise for the exercise of each and all of them. And to that extent to which any function is destroyed, or its discharge rendered painful or perilous by the wrongful infliction of personal injury, is the party complaining entitled to damages. We can, in other words, conceive of no physical injury, wrongfully inflicted, whether entailing pain only, or

[401] *Id.* at 536.

[402] *Supra* note 148.

> disfigurement, or incapacity, relative or absolute, to perform any of the functions of life, which may not be made the predicate for compensation in damages.[403]

The injury to childbearing functions was only one element, there being other injuries as well as pain and suffering, but the court upheld a verdict for $8,000. If the language of the court is to be taken literally and applied generally it, of course, would support an action for tortious injury to either a man or woman which created an inability to have children.

In a number of other cases the loss or impairment of the ability of an injured woman to have children has been an important element in the damages allowed; for example: (1) $20,000 was allowed to a twenty year old wife whose head was creased slightly by the defendant's negligently fired bullet, resulting in shock, miscarriage, and later an operation causing sterility;[404] (2) also $7,500 to a thirty-five year old wife whose negligently caused miscarriage prevented her from conceiving thereafter without a serious surgical operation to which the court said the woman need not subject herself in order to reduce damages, the court saying, "That the loss of fecundity is a proper element of damage in a personal injury case is undoubted. . . ."; [405] (3) $9,150 awarded a wife injured so as to require a serious operation with inability to do housework, the court saying, "The loss of the power of child bearing is certainly an element of damage to be taken into consideration by the jury, as much so as an injury to any other part of the human body, and the question as to whether or not the injury is the reasonable and probable consequence of the negligent act, is a question of fact for the jury"; [406] (4) awards of $2,500 and $7,500 to husband and wife, respectively, where the wife's genital organs were injured by tortiously caused miscarriage, the sum later being reduced to $1,500 and $4,000, respectively, because there was no evidence that the condition was permanent, the court clearly implying that if there were sufficient evidence the higher amounts would have been approved; [407] (5) $17,500 for wife and $2,500 for husband mainly for sterility of wife caused by wrong blood check,[408] and (6) $15,000 for the wife and $12,500 for the hus-

[403] Alabama Great Southern R.R. v. Hill, 93 Ala. 514, 519, 9 So. 722 (1890).
[404] Empire Oil & Refining Co. v. Fields, 188 Okla. 666, 112 P.2d 395 (1940).
[405] Potts v. Guthrie, 282 Pa. 200, 203, 127 Atl. 605 (1925).
[406] Normile v. Wheeling Traction Co., 57 W.Va. 132, 140-41, 49 S.E. 1030 (1905).
[407] Geller v. Riccuci, 10 N.J. Misc. 239, 158 Atl. 754 (1932).
[408] Berg v. N.Y. Society for Relief, 136 N.Y.S.2d 528, 550 (1954).

band where the baby was born dead from injuries caused by the defendant's negligence, the court saying:

> There can be no doubt at all that there could be a recovery for a result of an accident which might cause sterility, or which might otherwise prevent parents from having children. If, as the result of actionable negligence, a husband or a wife should be so injured that either, in the future could not expect to produce children, surely this would be taken into consideration as an item of damage. It necessarily follows, we think, that when parents are actually expecting the arrival of a child, and they are deprived of the fruition of that great expectation by the actionable negligence of someone else, they may recover from the tortfeasor as an item of damage for that particular loss.[409]

In another group of cases in which the ability to bear children was either impaired or made impossible, substantial recoveries up to as much as $85,000 were allowed, though in these cases the loss or impairment of the ability to bear children either was only mentioned or else the other damages were very serious,[410] and probably would justify the total award without considering inability to have children. Such inability was a major item of damages in the previous group of cases.

On the basis of these cases which deal directly with the loss of ability to have children it seems clear that the majority of jurisdictions will allow recovery for sterility caused either to a man or a woman by exposure to radiation if the exposure is the result of defendant's negligence or if the doctrine of strict liability is applied to his operation.

One should not draw a conclusion on this question, however, without taking into account an equally clear majority view on a closely related question which leads to the opposite conclusion.

[409] Valence v. Louisiana Power & Light Co., 50 So.2d 847, 849-50 (La. App. 1951).

[410] Suburban Transit Corp. v. Malone, 156 F.2d 422 (4th Cir. 1946) (plaintiff, 32 years old, was rendered incapable of bearing children in the ordinary manner and was awarded $33,125); Hider v. Gelbach, 135 F.2d 693 (4th Cir. 1943) (medical testimony was in conflict as to whether plaintiff could safely bear children, but other injuries were present and a verdict of $14,000 was not excessive); Shriver v. Silva, 65 Cal. App.2d 753, 151 P.2d 528 (1944) (3 year old plaintiff suffered, among other injuries, damage to pelvis impairing childbirth and $4,000 verdict was allowed to stand); Melton v. Fraering Brokerage Co., 31 So.2d 884 (La. App. 1947) (second and third degree burns made skin inelastic creating great difficulty in childbearing for unmarried 18 year old plaintiff; $12,000 verdict for suffering, disfigurement, and disability not excessive); Duvall v. T. W. A., 98 Cal. App.2d 106, 219 P.2d 463 (1950) (childbirth would threaten wife's life; husband awarded damages).

(2) Cases Denying Recovery for Mental Suffering from Loss of Child

As pointed out in discussing the damages that parents could recover for injuries to the embryo or foetus resulting in stillbirth, it was stated that almost all cases denied recovery of damages for the mental anguish and grief that the parent suffered after the birth of the child, even though mental anguish of the mother during pregnancy after the injury from fear of death or deformity in the unborn child was a permissible item.[411] The language in an early Texas case states the argument against recovery found in most of the cases:

> We do not think the death of the child before birth and the grief or sorrow occasioned thereby can be an element of damages in this character of suit. If it is made to appear from the testimony that Mrs. Cooper suffered more physical pain, mental anxiety and alarm on account of her own condition than she would have done if Dr. Keating had been in attendance upon her, and the failure to secure his services is shown to be due to the want of proper care on the part of defendant's servants [the telegraph company], whose duty it was to deliver the message, a fair and reasonable compensation should be allowed for such increased pain and mental suffering; but the death of the child, the bereavement of the parents and their grief for its loss can not be considered as an element of damages. Such damages are too remote; they are the result of a secondary cause, and ought not to be allowed to enter into a verdict. This is not an action under the statute by the parents for the death of a child, and if it were, injury to the feelings of the parents could not be a basis of recovery by them.[412]

The Michigan court in *Tunnicliffe* v. *Bay Cities Consol. Ry.* also concluded that the trial court was wrong in allowing the jury to consider as an element of damages the loss of "the society, enjoyment, and prospective services of the child." [413] The court said that the jury should not attempt to compensate for the sorrow and grieving of the mother. An opinion of the New York Court of Appeals in *Butler* v. *Manhattan Ry.* reached a similar conclusion in the same year and stated the objections to allowing such damages in a manner that has caused its opinion to be quoted more frequently than any other. The trial court had permitted the jury to consider damages resulting from depriving the plain-

[411] *Supra* discussion in text at notes 351-58.

[412] Western Union Tel. Co. v. Cooper, 71 Tex. 507, 511-12, 9 S.W. 598 (1888).

[413] 102 Mich. 624, 629, 61 N.W. 11 (1894).

tiff of prospective offspring. The Court of Appeals held this to be erroneous:

> The difficulty of finding any safe basis upon which to estimate the pecuniary damages in such cases, has been frequently adverted to by the courts. Whether the infant would have lived to an age capable of rendering service, and whether the continued life would be a pecuniary benefit or burden, and the numerous contingencies which may affect the value of the life make the ascertainment of such value by a jury, in a great degree, a matter of speculation and conjecture. But where the inquiry relates to the value of the life of a child cut off in infancy, there are some material facts capable of proof, which may be placed before the jury and which afford some aid in estimating the pecuniary loss suffered by parents or other relatives. The age and sex of the infant may be proved, its mental and physical condition, its bodily strength, and generally whether there was the apparent promise of a continued or useful life, or the contrary. The speculation which, in the present case, the jury were permitted to make had not even these safeguards, slight as they are. They were allowed to estimate the pecuniary interest which a husband had in the chance that an embryo, not yet quickened into life, would become a living child. The sex could not be known, and if born alive, the infant might have been destitute of some faculty, or so physically infirm as to have made it a helpless charge. There are no elements whatever upon which a jury could base any conclusion that a pecuniary injury had been suffered by the plaintiff from the loss of the unborn child, and this inquiry should have been excluded from the consideration of the jury as too remote and speculative to form an element in the recovery. Where a wrong has been done from which pecuniary injury has resulted, or where injury is the natural or probable result of a wrong, the injured party is not remediless, although the extent of the injury is not capable of precise proof. The jury in such a case may fix the damages within reasonable limits, as best they may. Actions for defamation or involving recovery for pain or suffering are examples. But where damages claimed are neither the probable result of the wrong nor capable of proof, they cannot be awarded by the jury. It is not in the interest of justice to extend the field of speculation in jury trials beyond its present limits, and to sustain the ruling in this case would go beyond what has been hitherto sanctioned by the courts.[414]

[414] Butler v. Manhattan Ry., 143 N.Y. 417, 421-22, 38 N.E. 454 (1894).

A Missouri appeals court in *Finer* v. *Nichols* stated the matter somewhat differently but also emphasized the speculative character of such damages.

> But though a recovery may be had by the mother to the extent mentioned, the loss of the offspring itself is not to be considered as an injury to her. As the basis of a recovery on the part of the parent for the death of a child by the negligent act of another is the value of the service of the child to the parent during minority, a recovery for the loss of a prospective offspring, it is said, would extend the field of damage into the realm of mere possibility. Of course, the loss of the anticipated society of the prospective child and mere matters of sentiment which attend such misfortunes are too remote for consideration by the courts as a basis for monetary compensation, though the law be humane in its policy and purpose.[415]

While there are some cases which seem to indicate a contrary result,[416] the cases generally still follow the views expressed in the excerpts just set out.[417] Most of these cases, however, were decided before 1940 and the law has been changing generally on the question of damages and particularly as to mental anguish. In 1955 the Washington Supreme Court upheld as not erroneous the instruction, "which included, as a factor of damages, the continuing worry and anxiety of respondent wife up to the time of the trial." [418] contrary to the general rule that mental anguish of the mother because of the condition of the child after birth is not compensable, even though anxiety after injury but before birth is.[419] McCormick states in his treatise [420] that the general rule (in 1935) is to deny recovery for loss of the child's companionship or mental anguish suffered by the parent, though he indicates that Nebraska [421] and Wyoming [422] apparently make the "subtle refinement" of allowing only the "pecuniary loss" sustained by the parents

[415] Finer v. Nichols, 158 Mo. App. 539, 548-49, 138 S.W. 889 (1911).

[416] Cooper v. Blanck, 39 So.2d (La. App. 1923) and Snow v. Allen, 227 Ala. 615, 151 So. 468 (1933), *supra* Table of Cases after prenatal section.

[417] See cases collected 145 A.L.R. 1104, 1106-09 (1943), and 10 A.L.R.2d 639, 640-41 (1950). 4 Sutherland, Damages §1252 (4th ed. 1916).

[418] Fink v. Dixon, 46 Wash.2d 794, 799, 285 P.2d 557 (1955).

[419] See generally discussion of prenatal injury, *supra* previous section. Allowing for anguish before birth, Meeks v. Zimmerman, 223 Ark. 503, 505, 266 S.W.2d 827 (1954), and Champagne v. Hearty, 76 So.2d 453, 455 (La. App. 1954), but denying later anguish, Duncan v. Martin's Restaurant, 106 N.E.2d 731, 734 (Ill. App. 1952).

[420] McCormick, Damages 352 (1935) [hereinafter cited as McCormick].

[421] Dow v. Legg, 120 Neb. 271, 231 N.W. 747 (1930).

[422] Coliseum Motor Co. v. Hester, 43 Wyo. 298, 3 P.2d 105 (1931).

because of loss of the child's companionship, not for mental anguish itself.

When the courts hold, as almost all do, that the sorrow from loss of the prospective child is too remote they are holding that this is an item of damages for which our legal system, as a matter of policy, should not allow recovery. The nature of the loss, however, is exactly the same as in cases where a person loses the physical ability to procreate children (sterility), yet recovery is allowed in the latter situation. The fact that there has been other physical injury to the mother in the sterility cases is not a satisfactory distinction because typically there also is other physical injury to the mother when a miscarriage results in loss of a prospective child. If in one case social policy calls for denying recovery to a parent who cannot have the child he had hoped for, it does in the other case also. Likewise if the policy dictates allowing recovery in one, it does in the other.

(3) Claims Under Death Statutes for Grief, Loss of Society, and Comfort

In analyzing the liability that would or should be imposed for sterility, account also must be taken of another line of cases dealing with a very closely related problem where considerably more authority can be found allowing recovery for loss of the child's society and companionship. These cases arise under death statutes of one kind or another where the decedent is not a minor. The great weight of authority apparently holds that, under death statutes, the sentimental value of the deceased to the next of kin, the grief or mental anguish of the statutory beneficiaries, or the loss of comfort, society, and protection are not proper items to be considered in assessing damages, twenty-seven state supreme courts having decided cases denying recovery for one or more of these items.[423] At the same time, in Virginia, West Virginia, Louisiana, and Florida parents are allowed to recover for their mental pain and suffering resulting from the death of the minor. In Florida recovery for such damages is specifically authorized by statute.[424]

Most statutes say nothing about what losses caused by the death are compensable to next of kin, but most courts limit recovery to pecuniary

[423] Annot., 14 A.L.R.2d 485, 495-500 (1950) lists Arkansas, California, Colorado, Delaware, Hawaii, Illinois, Indiana, Iowa, Kentucky, Maine, Maryland, Mississippi, Missouri, Montana, New Hampshire, New York, North Carolina, Ohio, Oklahoma, Oregon, Pennsylvania, Puerto Rico, South Dakota, Tennessee, Texas, Washington, and Wisconsin.

[424] See Annot., 14 A.L.R.2d 485, 496-97 (1950).

losses such as of prospective support. Loss of companionship—the *only* loss caused by sterility—is not compensable. The most significant cases under the various death statutes are those in several jurisdictions which have allowed the parents to recover for the loss of "comfort, society, and protection." Some of the very jurisdictions that do not allow recovery for sentimental value of the decedent to the next of kin, do allow it for "comfort, society, and protection." The cases, however, do not make it clear just what part protection plays in recovery or what the relationship is to the loss of services and other financial benefits that might be derived from a child. At least seven states have permitted recovery for loss of "comfort, society, and protection." [425] All of these cases are based upon the rights of beneficiaries under some type of death statute, typically wrongful death statutes patterned after the one adopted in England.[426] The statutory language is such as to leave it to the court to decide what type of losses should be considered compensable.

The decision of the Supreme Court of Utah in the relatively recent case of *Van Cleave* v. *Lynch* [427] summarizes rather well the position taken by those courts which have allowed damages under wrongful death statutes. In approving an instruction of the trial court to the jury that "you should also take into consideration the financial loss to the plaintiff of the boy's comfort, society and companionship," the Supreme Court said:

> The theory that a parent should receive compensation only for actual loss of earnings of a child killed by the negligent acts of another, has not only been obliterated by time and social changes, but by sound reasoning. Since a right of action is granted for wrongful death, if mere earning capacity were the criterion for measuring the amount of recovery, then in the case of the wrongful death of a hopelessly crippled child through the negligence of a defendant it could be claimed with some semblance of reason that no recovery at all should be allowed, because the parent bringing the suit would be better off financially as a result of the death by being relieved of the obligation to support one who would always be financially dependent. While children still frequently contribute to the support of their families, their status in society cannot be measured merely in terms of what they are able to do for

[425] *Id.* at 498-500. California, Hawaii, Idaho, Louisiana, Mississippi, Utah, and Virginia.

[426] Lord Campbell's Act, Fatal Accidents Act of 1846, 9 & 10 Vict. c. 93. For a history of this type of statute see Prosser 709-10.

[427] 109 Utah 149, 166 P.2d 244 (1946).

> the financial aid of their parents. In many cases the cost of rearing children far exceeds all possible earning capacity. *Nevertheless children are sought, not for their financial possibilities, but for love, companionship and happiness which transcend all financial considerations.*
>
> In the final analysis there is no actual quid pro quo for wrongful death. The loss of a loved one cannot be measured with any degree of exactness, although the right of action granted for wrongful death provides indemnity only in terms of money. While earning capacity in some cases might be an important element, it is not the only element; and as a relative matter, it may shrink in importance as the age of the person is considered either by reason of greatly advanced age or by childhood when earning capacity is absent. While the instruction given in this case relative to measure of damages is not a model instruction and does not entirely accord with our views, we conclude that there is no reversible error.[428]

The court in no way emphasizes the language "financial loss" found in the trial court's instruction so one is uncertain as to whether this is an attempt to attach a monetary value to the comfort, protection, and sense of security which parents might feel in contemplating the prospect of a child, once he is of age, taking care of them in their old age or in an emergency, or whether it is simply an attempt to equate in monetary terms the sentimental value of the companionship of the children.[429] One gets the feeling in reading the Utah opinion, however, that it is the latter that is being compensated. A $10,000 general and $345 special damages award was upheld although the child was only six years old when killed.

The jurisdiction in which there has been the greatest development in this type of recovery and the rules to govern it is California.[430] Attempts by the California court to place some limit on the recovery for this element of damages have not prevented substantial verdicts for this item alone.[431]

Jurisdictions which do not allow recovery for prenatal injuries because there is no legally recognized injury of course cut off any rights

[428] *Id.* at 161-62. (Emphasis added.)

[429] *Supra* notes 421, 422.

[430] See Annot., 14 A.L.R.2d 485, 499, 500 (1950).

[431] Where deceased was age 5, $18,500 was awarded in Tyson v. Romey, 88 Cal. App.2d 752, 199 P.2d 721 (1948); awards of $5,000 each were made where deceased were 8 months and 6½ years old, respectively, United States v. Guyer, 218 F.2d 266, 269 (4th Cir. 1954); see also Wytupeck v. City of Camden, 25 N.J. 850, 136 A.2d 887 (1957). Walker 582-85, 636, indicates only very moderate awards are given for very young children. See also *id.* at 591-92.

of personal representatives under survival statutes. They also deny recovery to parents or other statutory beneficiaries under wrongful death statutes.[432] The same is true in Nebraska, Oklahoma, and Wisconsin, where courts have held that there can be no recovery by parents under a wrongful death statute when the foetus is born dead.[433] If recovery should be allowed in these three states when the injured foetus is born alive, perhaps a survival act suit would be permitted if the child died before trial. In those jurisdictions where a cause of action has been allowed under the wrongful death statute where the foetus was born dead, the only question raised was whether or not a cause of action existed, and no indication was given of what elements would enter into the recovery if causation were proved.[434] No indication is given as to the permissibility of a survival action.

Some obvious distinctions between the kinds of rights discussed above can be made. It seems quite unrealistic to expect any court to extend any concept of person under the wrongful death statutes to cover the genes in the potential mother or father and the organs in each which produce the gene-carrying material, so there can be no recovery in the name of the child not yet conceived. The theory of a survival type of death statute, that the wrongdoer pay the next of kin what he would have had to pay the deceased had he lived, is different from the right of the parents to recover for the mental anguish or perhaps more importantly the loss of society and companionship of the child. Nevertheless, in the usual case, the next of kin are going to be the parents or other very close relatives. Therefore, anything above the loss of prospective support from the child (which in the case of children under ten surely is minimal in the light of the cost of raising children under modern economic conditions) is really going to be granted on the basis of loss of society and companionship.

If this is true, then the law ought not to reach a different result when the action is brought under a death statute than when it is brought by the parents themselves to recover for the sentimental loss of the society or companionship of the child. Recovery ought to be allowed or denied for this kind of sentimental loss on the basis of social policy, not on the

[432] See Table of Cases *supra* at end of prenatal injury section. Some courts clearly decided this since the actions were based on such statutes where the child died before suit was brought. Others denying an action to a surviving injured child surely would reach the same conclusion.

[433] *Ibid.*

[434] Minnesota, Mississippi, and Kentucky. See Table of Cases *supra* at end of prenatal injury section. For a general discussion of survival and wrongful death statutes and the theories underlying them see Prosser 705-19.

basis of whether or not we can find a separate legal entity in whose name the cause of action can be brought. When an older child dies, recovery may be premised on a real pecuniary loss in the form of expected financial help, but when a small child dies the recovery in reality is for sentimental loss. It is submitted that loss for sterility, aside from pain and suffering attendant on the physical injury causing sterility, in reality is for loss of a prospective child.

(4) Some Suggestions for Revision of the Law of Damages

As suggested before,[435] the law of damages arising from death is badly in need of an over-all revision. The treatment of inability to have children and loss of children is simply another example of how artificial, if not downright absurd, distinctions have become in this area.[436] If parents are permitted to recover for loss of society and companionship, as clearly they are in some of the cases discussed above, then recovery should be allowed when the capacity to have children has been impaired through the negligence of another. On the other hand, if recovery is to be denied in one case, so also should it be denied in the other.

One obvious distinction can be made, of course; in cases of sterility there has been an actual impact on the body of the plaintiff parent, clearly physical in nature even if caused by radiation. This is not true, however, where the loss by way of sentimental value is because of the post-natal death of a child, or even while in the mother's womb so far as the father is concerned. This is also not true for the mother when the child is killed after birth. This distinction might be used by courts in loss of children actions, as it is in cases where mental anguish is allowed where there is physical impact on the plaintiff but not where this is absent. In sterility cases caused by radiation there will be impact, but this is not always true in other cases of inability to have children. In any event it would seem to be an artificial and unrealistic distinction. If anything, parental suffering from loss of society and companionship of an existing child is more realistic and provable than much of the mental anguish for which recovery is allowed in cases where there has been a slight impact.[437] The pain and suffering and loss of society, companionship, and comfort of the child is surely much less remote in these circumstances than in the case where a prospective parent has been made sterile. Yet, if anything, the existing cases would seem to allow recov-

[435] See text discussion beginning at note 382. See also Prosser 719.

[436] See all of the distinctions in Annot., 14 A.L.R.2d 485 (1950). See Prosser 692-93.

[437] See discussion of psychological injuries *infra* at note 594.

ery for sterility but not for the loss of society, companionship, and comfort of the child. If one takes an over-all view of the damage problem, it would seem to make more sense if the law were just the opposite.

One possible additional reason for allowing damages in sterility cases, which is not present where the loss is of a child actually conceived or already born, is the loss of capacity to reproduce. Even this distinction is not a tenable one in most cases. Where the parent is beyond the age of reproduction, which might be the case so far as the mother is concerned, the loss of the child is in effect deprivation of the right to have one's own children. In addition, it is arguable that so far as the companionship of children is concerned, the loss is exactly the same, if not more real, when it concerns a child already born rather than one possibly to be conceived in the future. The only additional damage to the plaintiff in the sterility case is the possibility that this will make the person undesirable as a potential mate in marriage.[438] The possibility of adoption may mitigate even this damage. It sometimes is difficult to arrange adoption legally, of course, but it also may be very difficult to conceive and give birth to a child, not to mention keeping him alive and healthy. Certainly, if any damages are to be allowed at all for sterility they ought to be limited to the factor of decrease in marriage potential and not for loss of potential companionship and comfort of children, unless the law also is ready to grant parents bereaved by the death of an existing child the same kind of recovery.

Whether to allow recovery for loss of companionship of a child, existing or potential, raises a very serious social policy question of whether our society can afford to absorb the economic burden of a loss not only speculative but little assuaged by money. A new hat or a new car seldom has any real effect on as serious an emotional shock as is involved in the loss of children. If recovery is to be allowed for this loss it ought to be allowed in all situations which actually raise the same considerations, and the suggestion of placing some kind of maximum limit, at a very low level, on this element of damages would not be amiss.[439] The lawyer, in predicting what the courts and juries will do in actual cases, however, must not lose sight of the fact that the right to

[438] See Carter, "Assessment of Damages for Personal Injuries or Death in the Courts of Common-law Provinces," 32 Can. Bar Rev. 713, 725 (1954), pointing out when this is an allowable item. Such recovery has been allowed in Scotland, Walker 601, citing cases. Such damages were denied in City of Amarillo v. Rust, 45 S.W.2d 285, 290 (Tex. Civ. App. 1932) on the particular facts, 12 year old girl and only scars, but there was a clear implication that damages might be awarded where impairment is clearer.

[439] See Plant, *supra* note 381.

have children of one's own blood is an interest highly regarded in our society and loss of this interest constitutes an invasion of the body of the plaintiff parent or potential parent. It therefore would not be surprising if courts and juries continued to allow the incapacity to have children, quite separate from the physical damage and pain and suffering involved in the accident causing sterility, as a recoverable item of damage in tort cases and at the same time continue to deny recovery to parents for their mental sufferings, including loss of companionship, where the tort has caused death of an already born child. It is submitted, however, that pecuniary recovery for the death of a child does not fit very comfortably into a compensatory theory of damages.

There should be a considerable increase in such cases with the expanded use of radiation. Exposure of potential parents undoubtedly will occur in such amounts that thereafter in all good conscience they ought to refrain from having children because of the real danger of genetic mutations. There is the additional possibility of sterility itself being caused directly by radiation. Here again radiation cases will give the law an opportunity to take a more comprehensive, over-all look at the varied and conflicting rules concerning damages which have developed in separate types of cases, all in splendid isolation from each other and without adequate realization on the part of the legal profession of the similarity, if not complete identity, of the social factors underlying the various situations. Perhaps the explanation for the lack of cases dealing with the separate problem of sterility is that lawyers have just assumed, as the Alabama court did,[440] that since the power to have children is a normal attribute of human beings, any loss of this power is a compensable injury. This uncritical assumptive type of reasoning is at least partly responsible for the unsatisfactory state of present rules as to damages. A beginning should be made in working out more logically consistent patterns of damage recovery than exist at present. The relationship between sterility, the rights of the parents for loss of children, and causes of action under the death statutes is one of the areas where much more satisfactory analysis needs to be made of the underlying social policy questions involved in defining damages. It fits into the whole pattern of the growing trend of recovery, sometimes in very large amounts, for damages for mental disturbance. Any solutions to problems here suggested should not be worked out in isolation from these other more general problems of mental disturbance. We make the above suggestions as a starting point toward such a study.

[440] *Supra* note 403.

d. Increased Susceptibility to Disease

One of the attributes of a healthy human body is a considerable power to resist disease, though this ability differs among individuals and even within the same individual from time to time under varying circumstances. One of the possible results of overexposure to radiation is a reduction in the ability to resist diseases.[441] Actually, there are two aspects of increased susceptibility to disease, at least in radiation cases.

One is the increased susceptibility to a specific disease such as leukemia, cataract of the eye, or cancer of the bone. As to this type of injury the normal rules of damages provide some answers which are sometimes adequate where the injury or disease appears within the statute of limitations and before trial. Very little has been said even in court opinions, however, about whether or not an increased risk that a specific injury will develop at a future date is a compensable item of damages. The question is, does a present predisposition to a particular disease or injury warrant compensation, and if so to what extent?

The second aspect is even more difficult to handle under existing cases; this is whether or not an increase in *general* susceptibility to all diseases is a compensable item of damages in a tort case. It may prove to be true that as a person accumulates radiation exposure he increases his susceptibility to disease generally by lowering his normal resistance. This latter aspect has escaped the attention of legal writers and court opinions have ignored it almost as completely, probably because it is very unlikely in most cases. It will be present to some degree, however, in most cases involving overexposure to radiation. Some possibly analogous cases and concepts give a little indication of what the courts will do with these two problems when they arise. As is so often the case in tort litigation, damage questions are lumped together into one over-all judgment. Even where individual items entering into the total judgment are enumerated, there usually is no separate treatment by the court of whether the future possibilities are compensable because the court is satisfied that the existing injuries, where serious, justify the verdict and do not call for overruling the judgment as excessive.

(1) Non-Radiation Cases

(a) Cases Involving Recurrence of Existing Injury

Some courts in non-radiation injury cases have considered the problem of a possible subsequent disease or injury not manifested at the

[441] See discussion *infra* at notes 1100-1103.

time of the trial. For example, in *Mooney* v. *McCarthy*,[442] while the court reversed the judgment for the plaintiff because of a problem concerning apportionment between two defendants, it seems to have allowed, as an item of damages, the possibility of a later recurrence of tuberculosis. The court said:

> The evidence regarding her injuries was such that defendant requested the court to charge the jury, in substance, that there was not sufficient evidence upon which they could find that there would be a recurrence of the tubercular trouble and, therefore, if their verdict was for plaintiff, they should not consider such condition as an element of damages, and to its failure so to do excepted. . . .
>
> [The doctor testified that] . . . he had not yet "any positive opinion that it (the disease) has begun to be active, but more a very definite fear that it may begin"; but he testified that such fear was based on his judgment and experience. He testified, too, on cross-examination, that he had no definite evidence that a pulmonary change had taken place, and that whether or not one would was entirely speculation. But in answer to the next question, which was: "Q. It is merely a matter of speculation, she may start getting better any time or start getting worse any time, that is about the way it is?" he modified his previous answer thus: "I would say more a matter of judgment than just a rank speculation.". . .
>
> It thus appears that while some of the doctor's testimony, standing alone, supports defendant's claim, taken as a whole it does not. Although he did not state positively that it was his judgment that there would be a recurrence of the disease, the evidence clearly justified the inference that such was his belief. . . . Undoubtedly the verdict included damages for future disability due to a recurrence of the tubercular condition.[443]

Here the court approves as one item of damages susceptibility to a future specific disease.

Again a lower California court in 1957 upheld a verdict of $2,500 for injuries in the nature of a severe sprain or strain of the muscles in the plaintiff's shoulder and neck sustained when she fell in defendant's building. The court included as one justification for affirmance the statement: "[S]he would have intermittent episodes of muscle trouble for a long time with the probability of its being permanent." [444] Here again, as in the *Mooney* case, the expert testimony as to the likelihood

[442] 107 Vt. 425, 181 Atl. 117 (1935).

[443] *Id.* at 428-29.

[444] Handley v. Capital Co., 313 P.2d 918, 922 (Cal. App. 1957).

of future injury was based on a judgment concerning a physical condition already existing and the possible future injury would be a continuation or recurrence of this same specific injury.

In upholding a $2,500 verdict for the plaintiff the Nebraska court in another recent case said:

> There is evidence that plaintiff suffered a severe cerebral concussion of the brain and that pain, suffering, and disability could normally first manifest itself within a period of years after the accident. There is evidence that plaintiff had an abnormal blinking or twitching of one eye, which the medical witnesses could not rule out as not being caused by the concussion. The evidence shows that plaintiff not only might show manifestations of damage to his nervous system for a period of years in the future, but there was evidence that he in fact was manifesting such damage at the time of the trial.[445]

This could be treated as allowing evidence of only increased future severity of a presently manifested injury.

The Minnesota court in a very recent case also had occasion to consider future injuries not yet manifested and upheld them as an item of damage in the following language:

> While there was no testimony that she was permanently injured, there was substantial opinion evidence to the effect that a disc injury such as she sustained would in all likelihood cause future difficulties and pain; and that, because of the weakened condition which usually remains in the area where such an injury occurs, there was a strong possibility of its recurrence here. . . . Based on such testimony, the trial court charged the jury that plaintiff might recover "for any future pain and suffering * * * which you have found is reasonably certain she will endure in the future." While Dr. Gingold conceded that there was no present indication that plaintiff would suffer a recurrence of the disc injury, his opinion that there was a strong likelihood of recurrence, based upon the history of such cases generally, as well as his testimony with reference to the present arthritic condition of plaintiff, would seem sufficient to justify the instruction complained of.
>
> . . . While he stated on cross-examination that in any particular case, including plaintiff's, he could not say with positive certainty that there would be such a recurrence unless there was an opportunity for closer examination of the injury through surgery, nevertheless it is clear from the sum total

[445] Eden v. Klaas, 89 N.W.2d 74, 81 (Neb. 1958).

> of his testimony that he was reasonably certain there would be a recurrence here.[446]

Here a rather specific future injury could be treated by the jury as one item of recovery. Again, the injury was a recurrent one, not a different one. The damages were awarded, however, for injuries that would manifest themselves later; recovery was allowed for likelihood or increased susceptibility.

(b) Cases Involving Injury of a Type Different from Current Injury

In a Nebraska case, *Schwarting* v. *Ogram*,[447] a $15,000 judgment was upheld as not excessive and one of the items of damages was a prediction of a future injury that had not yet become apparent but which might result from injuries to the head. The court did not discuss the question of the validity of including this future development but did point out in justifying the verdict:

> . . . [I]t was testified that, as a result of these conditions, traumatic epilepsy will develop, all as a result of this accident, and that this condition is permanent and cannot be cured; that the trouble with her ear is due to a change in the brain tissues that has come from a contraction of the scar formed at the basal skull fracture. One physician testified that she is progressing towards traumatic insanity.[448]

This is approval of a specific future injury, not increased susceptibility to diseases generally. The future injury was only one item of damages among several.

In a case involving a severe burn to a metal worker through a fellow worker's negligence, the North Carolina court said:

> It is assigned as error that the court permitted the physician to state that the character of the plaintiff's wound was such that a sarcoma, or eating cancer, was liable to ensue. We recognize the general rule that an expert physician testifying to the consequences of a personal injury should be confined to probable consequences, but in this instance we do not think the physician indulged in pure speculation. . . . The word "liable" is defined as "exposed to a certain contingency more or less probable." . . . The word was used by the witness in the sense of probable, and was doubtless so understood by the jury.[449]

[446] Derrick v. St. Paul City Ry., 89 N.W.2d 629, 633-34 (Minn. 1958).
[447] 123 Neb. 76, 242 N.W. 273 (1932).
[448] *Id.* at 87.
[449] Alley v. Charlotte Pipe & Foundry Co., 159 N.C. 327, 330, 74 S.E. 885 (1912).

Here a specific future disease was one of several items of damage, but the evidence was allowed and probably influenced the jury somewhat in determining the amount of the award.

In both the Nebraska and North Carolina cases the holdings go further than the previous ones in that the future injury was not just a recurrence of an existing injury but rather was of a new kind.

(2) Radiation Cases

In two of the cases discussed in connection with breach of the standard of conduct the courts apparently included as an item of damage the future possibility of cancer occurring as the result of X-ray injury. In the case of *Gross* v. *Robinson,*[450] the Missouri appeals court said that the testimony of the expert witness that an X-ray burn ". . . would probably become malignant," was properly considered. Likewise in *McElroy* v. *Frost*[451] the supreme court approved evidence indicating that the X-ray burns of the plaintiff's testicles ultimately would develop into a cancer of a fatal type.

One other case involving radiation burns has dealt with the possibility of a future disease. In *Coover* v. *Painless Parker, Dentist*[452] the California appellate court upheld the verdict of $10,250 for damages resulting from X-ray burns caused by overexposure during dental X-ray photography. The defendant contended that the amount was excessive among other reasons because the evidence admitted as to the possibility of future development of cancer was wholly conjectural. The court said:

> While the actual condition of cancer may have been conjectural and uncertain, the record contains positive evidence that a condition actually exists which makes this dread disease much more likely. We think this *predisposition* in itself is some damage, and when caused by the wrongful act of another it is an interference with the normal and natural conditions and rights of the other, which must be held to be a real and not a fanciful element of damage. *The necessity of constantly watching and guarding against cancer,* as testified to by the physician, is an obligation and a burden that the defendant had no right to inflict upon the plaintiff.[453]

[450] *Supra* note 159 at 121.

[451] *Supra* note 148.

[452] 105 Cal. App. 110, 286 Pac. 1048 (1930).

[453] *Id.* at 115. (Emphasis added.) See also O'Connell v. Westinghouse X-Ray Co., 16 N.Y.S.2d 54 (1939), reversed on contributory negligence grounds, 24 N.Y.S.2d 268 (1940), reversed and remanded for trial 288 N.Y. 486 (1942).

This is the only radiation case found which seems clearly to have considered the justification for allowing recovery for predisposition only and then allowed recovery, because the courts in the *Gross* and *McElroy* cases merely mention the evidence of predisposition and approve its admission without discussion. In each case the amount awarded apparently was fully justified by other very serious injuries.

In all three cases the future injury was a specific one, cancer, but in a real sense it was not a recurrence of an existing condition. On the other hand, it was a development from an existing compensable injury, the X-ray burn.

In none of the cases discussed did the court consider how probable or certain a future injury must be to justify recovery.

(3) The Standard of Proof Required to Prove Future Injury

The doctor's testimony in the *Coover* case included the following answer to a question as to whether or not Mrs. Coover might be in danger of a cancerous growth:

> I do not say that she has a cancerous growth, she does not, but a cancer *may develop* on this area—it is common. . . . On this senile skin not infrequently develops new growths, little neoplasm, warty growths, and from these warty growths, the carcinoma develops; sometimes that is a year, sometimes it is two years—sometimes it is three or four years before they develop.[454]

The doctor was allowed to testify as to a condition that only "may develop" but the opinion does not indicate that the court was giving serious consideration to how probable the occurrence of the future injury must be.

Two other cases involving future injuries give some indication of how certain proof of the future injury must be. One is *Light* v. *Foreman*,[455] decided rather recently in the sixth federal circuit. The court upheld a $51,500 verdict against an objection that the plaintiff doctor had testified to the "loss of earning ability at some time in the future when appellee would become unable to continue his present employment because of injury to the first sacral nerve root, which would probably become worse over a period of years and cause complete inability to work." Against defendant's objection that such damages must be

[454] *Id.* at 113-14. (Emphasis added.)
[455] 238 F.2d 817 (6th Cir. 1956).

shown with "reasonable certainty" the court said that the witness's testimony could not be treated as a conjecture, and "The fact that it dealt with future probabilities does not make it incompetent."[456] The court's ruling allows evidence of a specific future injury disability to be considered by the jury.

The Louisiana appeal court in *Guillory* v. *Lemoine* apparently approved the lower court's allowing of about $2,500 of the verdict because of the severe fracture of the skull which "*might* [emphasis added] cause trouble in the future." The expenses had been $1,911 and the award of $2,500 was considered sufficient by the trial court since it felt that "there is very little, if any, permanent disability."[457] Perhaps the court is approving reducing the amount of recovery proportionate to the degree of certainty that the injury will occur.

A much less liberal attitude in a non-radiation case was expressed by the Vermont court in *Howley* v. *Kantor,*[458] where the plaintiff's witness, a doctor, testified that an abnormal growth in plaintiff's left breast was caused by the blow and stated that in his judgment, taking the situation as found on physical examination, it would "run about eighty per cent cancerous." The doctor also testified that "as it stands it may be one as well as the other," and "what it is at this stage is pure speculation." The court held that it was erroneous to refuse the defendant's request to charge the jury that the evidence was not sufficient to justify a finding that cancer existed and that they should not consider it as an element of damages.

> To support such a claim, the evidence must be of such a character that the jury can find that there is a reasonable certainty or a reasonable probability that the apprehended future consequences will ensue from the original injury. Consequences which are contingent, speculative, or merely possible are not entitled to consideration in ascertaining the damages. . . .
>
> The record before us does not disclose any opinion of the medical witness as to the probable future development and result of the plaintiff's breast condition. His answer, "run about eighty per cent. cancerous," does not have the effect claimed for it. The witness did not say that in his opinion the chances are eighty per cent. that the growth is cancerous, but, rather, as is clearly indicated, that from his experience and the history of other cases injury to the breast producing tumor developed about eighty per cent. cancerous.[459]

[456] *Id.* at 818. The two cases cited for the latter proposition do not really support the conclusion.

[457] 87 So.2d 798, 802 (La. App. 1956).

[458] 105 Vt. 128, 163 Atl. 628 (1933).

[459] *Id.* at 133.

This clearly is denying recovery for the predisposition to cancer, contrary to the suggestion in the *Coover* case. It seems to be placing the emphasis upon whether or not the cancerous condition actually exists at the time of trial.

The test apparently applied by the courts in these few decided cases is similar to that applied in determining whether to allow the jury to consider future pain and suffering as an element of damages for physical injury. There has been a considerable difference of opinion among courts in the United States as to whether, in considering future pain and suffering, the test should be one of "reasonable certainty" or "reasonable probability," there being a thousand opinions dealing with the point.[460] It surely is fair to question whether the difference between reasonably certain and reasonably probable has any significance for a jury, the distinction being rather subtle at best. The application of this same test in predicting *future injuries* (not pain and suffering) is well illustrated in a recent New Jersey opinion in *Budden* v. *Goldstein.*[461] The case involved a hernia, negligently caused by the defendant, and the expert testimony included speculation as to what possibly might happen when a person had a hernia, some of the possibilities, though not likely, being fairly serious. The court felt that the testimony allowed too much speculation.

> In the admeasurement of damages, it is well known that no recovery can be allowed for *possible* future consequences of an injury inflicted by a wrongdoer. . . . In order for suggested future results to be includible as an element of damage, it must appear that they are reasonably certain or reasonably probable to follow. . . .
>
> The *A. L. R.* annotation, *supra,* indicates that many of the authorities throughout the country use the expression "reasonably certain" or "reasonable certainty" as the test and consider "reasonably probable" or "reasonable probability" inadequate and erroneous; others accept the latter statement. Our cases do not seem to have dealt specifically with the question of whether the two have the same significance in relation to *quantum* of proof, and so may be used interchangeably. It seems to us that in a resolution of the conflicting interests involved, reasonable probability is the just yardstick to be ap-

[460] Annot., 81 A.L.R. 423 (1932), a long annotation listing at least 1,000 cases on the problem, not all of which have been read by the present authors. For a recent case on pain and suffering, see Denco Bus Lines v. Hargis, 204 Okla. 339, 229 P.2d 560 (1951), where the court said it could award for such future pain and suffering "as may be established by the evidence." (at 342).

[461] 43 N.J. Super. 340, 128 A.2d 730 (1957).

> plied. Basically, our view comes down to this: a consequence of an injury which is possible, which may possibly ensue, is a risk which the injured person must bear because the law cannot be administered so as to do reasonably efficient justice if conjecture and speculation are to be used as a measure of damages. On the other hand, a consequence which stands on the plane of reasonable probability, although it is not certain to occur, may be considered in the evaluation of the damage claim against the defendant. In this way, to the extent that men can achieve justice through general rules, a just balance of the warring interests is accomplished.[462]

A similar result was reached in a recent Wisconsin case where the doctor testified, "All I can say is there is a possibility." The court said that to justify the assessment of damages for future permanent disability "it must appear that such continued disability is reasonably certain to result from the injury complained of." [463]

(4) Conclusions

(a) When a Specific Injury Is Feared

Although few decisions have dealt specifically with predisposition caused by radiation, it may be predicted with some assurance that, where a specific type of injury such as leukemia, cataract, or bone cancer can be predicted as resulting from a specific exposure to radiation, there will be recovery, at least if there is expert testimony indicating either a reasonable certainty or a reasonable probability of occurrence. The existence of other present compensable injuries should not be required although none of the cases found involved *only* future injury. There would seem to be no justification for applying the stricter standard of proof that is generally applied to the mental disturbance or mental anguish cases where the courts have been so concerned with the possibility of fraudulent claims. If the future injury is of a physical rather than mental nature, and likelihood of occurrence is proved by competent medical testimony as to probability, the usual rule of "more probable than not," used in negligence cases as to present injuries, should apply. If reasonable probability, or perhaps the stricter test of reasonable certainty, indicates that something higher than eighty per cent certainty is demanded (as apparently required in Vermont),[464] this puts an unreasonable burden on the plaintiff. Unless the law is to adopt

[462] *Id.* at 346-47.

[463] Kowalke v. Farmers Mutual Automobile Ins., 88 N.W.2d 747, 756 (Wis. 1958).

[464] See Howley v. Kantor, *supra* note 458.

some insurance scheme whereby the defendant is charged in accordance with the probability he has created, even if it is less than fifty per cent, as is suggested in the discussion of proof of causation,[465] then in the case of potential future injuries it might be better to adopt simply the preponderance of probability as the test.

The one other possibility is to adopt the idea suggested in the *Coover* case, that damages could be awarded for an existing predisposition to a future injury, the assumption being that the amount of damages would be greater or less as the predisposition to the future disease or injury is greater or less. The difficulty with all of the existing tests is that they inevitably either lead to windfalls for those plaintiffs who are awarded damages but do not develop the injury or disease later on, or unfairly penalize other plaintiffs where the likelihood of future injuries is not great but the injury actually does develop. This is inherent in our present system of damages, where recovery is based on an all-or-nothing philosophy, and a line must be drawn somewhere between one hundred per cent certainty and one chance in a billion.

(b) When Future Injury Is Only Increased Susceptibility to Disease Generally

All of the cases discussed above deal with the possibility of a specific injury occurring in the future. They in no way indicate whether recovery would or should be allowed where the possibility is not the development of some specific injury or disease but is simply the reduction of the ability of the body to fight off diseases in general, whether it be the common cold, pneumonia, or any other disease, common or rare, communicable or not. The *Coover* case [466] is not authority for recovery for this item of damages. It dealt with the predisposition to a specific injury, *i.e.*, development of cancer in the area which had suffered the X-ray burns. In addition, the likelihood of such development was great, according to the testimony, possibly even sufficient to satisfy the reasonably probable or reasonably certain rule. The language of the Nevada court in *Murphy* v. *Southern Pacific Co.*[467] is probably in the same category as that found in the *Coover* case. The plaintiff's leg was hurt in a train accident and varicose veins later developed in his leg. The jury found that the varicose vein condition resulted from the leg

[465] *Infra*, recommendations discussion following note 1123.
[466] *Supra* note 452.
[467] 31 Nev. 120, 101 Pac. 322 (1909).

bruises and awarded $7,500 damages. In upholding this verdict the court said:

> So, if a physical injury, the result of negligence, leaves the *constitution* of the injured person in a broken and shattered condition, creating an increased susceptibility to *a particular disease,* and that disease follows, although after a considerable lapse of time, and death results from it, the person or corporation inflicting the injury may be liable, if, in the opinion of the jury, the injury, and the sickness and debility following it, concurred in and contributed to the attack of the particular disease which finally carried the injured person off.[468]

The court, however, here speaks of the "constitution" of the plaintiff, apparently referring to the general condition of health rather than a particular part of a body such as injured skin as in the *Coover* case.

In allowing a $4,000 verdict to stand, the Arizona court in *Coppinger* v. *Broderick* [469] held that future pain and suffering of the injured person was a proper item of compensation and said:

> The apprehended future consequences of an injury, in other words, should be reasonably certain. They are seldom or never suspectible to anything like absolute accuracy of calculation. From their very nature, they must be measured by a rule more or less flexible. The injuries may be so serious as to indicate that the person injured will suffer pain the rest of his life, and yet the restorative processes of nature may in an unexpectedly short time heal the wounds. The injuries, on the contrary, may seem trivial, but *progressively undermine the constitution* of the injured person.[470]

The court at the end of its opinion concluded that the jury's verdict was not excessive in the light of the evidence and said, "That her general health was affected and that she will probably suffer throughout her life as a result of the blow and shock seems evident." [471] Here again the court speaks of the "constitution" of the injured person and of her "general health." No reference is made at all to a specific injury that might result.

A similar kind of reference to the general effect on health is found in *Foster* v. *Donora Southern R. R.*[472] where the federal district court found $25,000 not excessive since the residual pain would call for

[468] *Id.* at 126, quoting from 1 Thompson, Negligence §154 (1901). (Emphasis added.)
[469] 37 Ariz. 473, 295 Pac. 780 (1931).
[470] *Id.* at 476. (Emphasis added.)
[471] *Id.* at 479.
[472] 144 F. Supp. 297 (D.C. Pa. 1956).

treatment over an extended period of time and there is evidence "sufficient to support the conclusion that plaintiff's pain will continue for the remainder of his life, with a strong probability of his *physical condition deteriorating.*"[473] The court here again seems to be accepting deterioration in general physical condition as an item of damages which will support a very substantial verdict.

The case of *Caylor* v. *Virden*,[474] decided by the Court of Appeals for the Eighth Circuit perhaps is pertinent here. The plaintiff had been forgotten by the doctor and stayed under the treatment machine for three and one half hours instead of the fifteen minutes that should have been the maximum period. He got panicky and stumbled out of the room after falling off the table when no one answered his calls for help. The court concluded that the jury was justified in saying that he may have received a physical injury while he was under the X-ray machine, not just mental anguish and shock. He had testified that "Everything made me nervous and I was just nervous and everything bothered me. I don't know how to explain how I knew I was nervous nor how the nervousness demonstrated itself."[475] The court considered this testimony sufficient to justify the denial of defendant's motion for summary judgment. In its opinion the court said:

> The mere fact that plaintiff may not have been able to explain the nature of his alleged injury is not, we think, proof that he suffered no physical injury. He was apparently a well, robust man when he was placed on the operating table with this X-ray machine trained on the growth on his cheek.[476]

In other words a general deterioration in health was sufficient to support a verdict for the plaintiff.

Along the same line is language found in *Alley* v. *Charlotte Pipe & Foundry Co.*, referred to above.[477] This was a case in which the testimony was to the effect that plaintiff's wound was such that a cancer was likely to ensue. The court also said:

> We think the evidence competent also as tending to prove acute mental suffering accompanying a physical injury. The liability to cancer must necessarily have a most depressing effect upon the injured person. Like the sword of Damocles, he knows not when it will fall.[478]

[473] *Id.* at 298. (Emphasis added.)
[474] 217 F.2d 739 (8th Cir. 1955).
[475] *Id.* at 743.
[476] *Ibid.*
[477] *Supra* note 449.
[478] *Id.* at 331.

These cases do not specifically hold that increased susceptibility to disease is a recoverable item. They do, however, indicate recovery is permissible for the kind of mental suffering likely to accompany the possibility of a future injury when there has been overexposure to radiation.[479]

Taken as a whole, the cases discussed indicate that evidence of increased susceptibility to a specific disease (and perhaps to diseases generally) is at least admissible provided the necessary degree of certainty is shown. While none of them deal specifically with the question of a motion to strike such evidence, the opinions lead one to conclude that such a motion should be denied. The cases also fail to indicate whether a specific instruction to the jury permitting them to consider such an injury as a separate item of damages is permissible, but statements by the courts in many of the opinions makes it fairly clear that this is permissible.

One general caution, however, should be kept in mind in considering these cases. Many hold that such evidence does not invalidate a verdict of a substantial amount without holding specifically that it is permissible to consider it anything but a make-weight in granting general damages. Nevertheless, the general tenor of many of the opinions is such as to indicate that a substantial award can be made for increased susceptibility as a separate item of damages at least if a specific future injury is shown.

Until more is learned about the scientific aspects of the matter, it is impossible to predict what a court will do when presented with the claim of a person whose overexposure to radiation increases his chances of future disease. If such overexposure should mean that he will be twice as susceptible to common colds or other virus infections, or will be twice as susceptible to pneumonia or some other serious disease, should his present predisposition be a recoverable item of damages? If not, the future injury will likely not result until the statute of limitations precludes his right to sue the defendant,[480] certainly a most unfair result from the plaintiff's standpoint.

On the other hand, to allow full recovery for future injury when the chances are only fifty or seventy-five per cent is unfair to the defendant if the future injury actually does not arise. As to this problem, however, the radiation cases present nothing more unrealistic or unjust than those cases in which the future possibility of pain and suffering or

[479] See, *e.g.*, the Benjamin Zawacki case, *infra* Chapter V at section I 2 (7).
[480] *Infra* note 1038.

physical injury is allowed as a collateral item to damages for existing injuries. This again demonstrates that we need to re-evaluate our damage solutions in tort cases and develop a scheme which handles the probability question more adequately.[481]

e. Shortened Life Span

Another injury that can result from overexposure to radiation is a shortening of the life expectancy of the person so exposed, a type of injury closely related to decrease of resistance of disease. In many cases the contracting of a disease that a person otherwise might not have suffered may either cause death itself or sap some of the body's vital energy causing death at an earlier age than otherwise would be the case. The radiation problem has somewhat different dimensions, however, for there is responsible scientific opinion to the effect that one almost can equate the number of days, weeks, or years that a man will lose from his normal life span to the amount of radiation exposure he has had.[482] It even is asserted by some that every exposure to radiation reduces the life span to some extent, and that its effect is cumulative so that if a person is exposed negligently to radiation he has enough respectable scientific opinion at the present time to go to the jury on the question of whether he has lost a week, month, year, or decade from his life. When these cases are brought to court, will recovery be allowed for this type of injury? On this question there is more authority than for some of the other injuries previously discussed.

In analyzing the problem account should be taken of several different possibilities, although courts seldom have done so. A person may be exposed to sufficient radiation to cause death almost immediately, although this is rather unlikely.[483] More likely, in the case of exposure to a lethal dose of radiation, is death within a period of a few weeks during which time the prospective decedent, if told the facts, would be perfectly aware that he was going to die. In this case it would be almost inevitable that death would occur before trial to recover damages for the injuries. A case that will arise much more frequently is that in which the amount of irradiation is sufficient that experts could testify with some degree of certainty that the person exposed would live a shorter life by days, weeks, months, or years, depending upon the

[481] *Infra* recommendations following note 1123.

[482] *Infra* discussion at notes 1085-93.

[483] *Supra* Chapter I at section C 4. A recent accident at Los Alamos caused the death of a worker in less than 48 hours. BNA, Atomic Industry Rep. 5: 74 (1959).

amount of radiation received. In deciding what recovery to allow, if any, a court should take account of the possible distinction between (1) the economic loss in the form of lost wages which the injured would have received had he not been overexposed, and (2) the damages which he should be allowed because something of considerable value to him, *i.e.,* his expectation of continued life, has been taken away. As to wages lost a difference should be made perhaps between recovery for (a) diminution in wages earned while he lives and (b) the wages lost for the period after his death but which he would have earned had his life not been shortened. One other most important set of distinctions must be kept in mind, *i.e.,* the differences between the damages to be awarded to the injured party in his own right, those damages due his estate under the survival statute, and those to his beneficiaries in their own right under the typical wrongful death statute aimed at compensating persons who were dependent on and could reasonably expect to be supported by the injured party. Actually, the courts do not always seem to have kept these distinctions in mind.

In the following analysis, however, unless the contrary is mentioned specifically, each case discussed deals with the element of shortened life span *as separate from any other item of recovery,* although this element may be awarded as only one item among many. Recovery in some cases may be allowed for shortened life span under a survival statute, but in each case it includes a separate item for shortened life unless otherwise indicated. Sometimes suit has been brought by the victim but he dies before trial, and sometimes death has occurred immediately after the accident but the victim is considered to have a cause of action which survives. In none of the cases cited as supporting recovery for shortened life span is recovery for this element made a substitute for lost wages or medical expenses during the period of survival or for pain and suffering during this period. Neither is recovery for losses by beneficiaries under wrongful death statutes affected by a shortened life span award, except where this is clearly indicated in a few cases.

The most frequent shortening of life span injury arising from overexposure to radiation is a reduction of a few months or years in the normal life span, *e. g.,* the victim will now die at 65 instead of 67, assuming nothing else happens. The overexposure causes premature ageing. Most of the decided cases deal with situations in which the shortening is much greater than this but it is essential to analyze what the cases say about shortening of life as a separate item of recovery for it is a difference in degree only.

With the advent of extensive use of radiation it seems important to look at this subject and determine what relief should be afforded to various interested parties. It would seem that the difficulty will be particularly acute in radiation cases because the shortened life span may be the only item of compensable injury, thus differing from the usual personal injury action in which ordinarily there will be physical damage of a nature sufficiently ascertainable to justify a substantial award quite aside from the loss of enjoyment of a full life. Particularly when the injury leads to the possibility of future pain and suffering, which is a compensable item in most jurisdictions,[484] the significance of allowing recovery for the mere loss of life expectancy has not been too important. If such expectancy becomes the only substantial item of damage, however, it will then become extremely important. While in some ways the subject involves metaphysics and religion more than it does the law, nevertheless, the legal question certainly will be raised more often in the United States than heretofore, and the law will have to make a decision as to whether or not to allow recovery for such an invasion of the human body. In any event here again is exemplified the great need for a thorough and comprehensive re-evaluation of our old concepts of damage recovery in tort cases. The confusion in results reached in the cases also exemplifies the great significance of really determining what our theory of damage recovery is to be.[485]

The subject has been one of fairly recent development and most of this development has taken place in England and Canada. For this reason it seems important to observe what some of the Commonwealth countries have done with it before looking at the relatively few cases that have arisen in the United States.

(1) English Cases

There is a considerable difference in theory between the English and Canadian approach to the matter of damages for shortened life span and that followed by the courts in the United States. Nevertheless, in terms of practical consequences in dollar awards in damage actions the difference in result may not be so great as the difference in theory would seem to indicate.

The first English case squarely dealing with damages for reduced life

[484] *Infra* discussion beginning at note 982.

[485] Jaffe, "Damages for Personal Injury: The Impact of Insurance," 18 Law & Contemp. Prob. 219, 221 (1953) says, "[T]he crucial controversy in personal injury torts today is not in the area of liability but of damages."

expectancy is *Flint* v. *Lovell*[486] decided in 1935. The plaintiff, seventy years old, was injured in an automobile accident. The trial court found that for his age he was a man of vigor and vitality, with a life expectancy before the accident of seven or eight years, that he was in excellent health, yet that, as a result of the injuries, he probably would die within a year. The trial court was clear that the plaintiff had lost the prospect of an enjoyable, vigorous, and happy old age which medical testimony showed might have gone on for a number of years. £4,000 damages were awarded for the loss of these years. On appeal to the Court of Appeal, Lord Justice Greer held that "under the rules as to measure of damage laid down in *Hadley* v. *Baxendale* the plaintiff's claim to damages on the ground that his life would be shortened was one on which he is entitled to succeed."[487] Lord Justice Slesser also found no reason why the shortening of life should not be considered in the assessment of damages, but Lord Justice Roche felt that evidence of shortening of life should be permitted only for the purpose of showing the seriousness of the injuries; consequently, the award of £4,000, he thought, was excessive and should have been limited to £3,000. Roche's view was never followed in England, but it bears a striking similarity to the American rule. As an interesting collateral fact, it may be noted that three years later, in another case,[488] the House of Lords was informed that plaintiff Flint was still living, contrary to the prediction of his expert medical witnesses.

For a short time after *Flint* v. *Lovell*[489] was decided it was not clear whether recovery for shortened life span was dependent upon the injured person being aware of the fact his life expectancy had been shortened and also upon his being alive at the date of the action. In *Rose* v.

[486] [1935] 1 K.B. 354 (1934). Smith, in his article, "Psychic Interest in Continuation of One's Own Life: Legal Recognition and Protection," 98 U. of Pa. L. Rev. 781, 790 (1950), asserts that the point was involved in an earlier case, Phillips v. London & South-Western R.R., 5 Q.B.D. 78 (1879). The trial court in the Phillips case at 80 instructed the jury that "an active, energetic, healthy man is not to be struck down almost in the prime of life, and reduced to helplessness with every enjoyment of life destroyed and with the prospect of a speedy death, without the jury being entitled to take that into account, not excessively, not immoderately, not vindictively, but with the view of giving him a fair compensation for the pain, inconvenience and loss of enjoyment which he has sustained. Then, after you have considered what sum you think it is right to award on that ground, the next head which you have to consider is the amount of expense which he actually incurred." The Court of Appeal in discussing the instruction as a whole made no comment on these specific words, but the issue was not really raised by defendant's counsel.

[487] Flint v. Lovell, *supra* note 486 at 359.

[488] *Infra* note 490 at 854.

[489] *Supra* note 486.

Ford,[490] however, the House of Lords rejected both requirements. A healthy twenty-three year old woman was seriously injured because of the defendant's negligence and died four days after the accident in spite of the amputation of one of her legs in an attempt to save her. During the four days she was either unconscious or in a coma which made it impossible for her to understand her condition. No objection was made to the awarding of £300 damages to the father and mother as statutory beneficiaries under the wrongful death act. In addition, however, as administrator the father claimed damages for pain and suffering, loss of the leg, and loss of normal life expectancy which he claimed were preserved by the survival statute. The trial court allowed £500 for pain and suffering and for loss of the leg but refused to award damages for shortened life expectancy on the ground that since she was not aware of her condition she could not have suffered mental anguish from concern over an early demise. The Court of Appeal found that the pain and suffering and the loss of a leg warranted only nominal damages, £20 and £2, respectively, since she died so soon after the accident.[491] Two of the three judges denied recovery for shortened life span, one on the ground that at common law there could be no damages for death and the other on the additional ground that where death ensues before action is brought the civil damage remedy is merged in the felony charge. The three judges agreed that if damages were to be awarded for shortened life expectancy the amount should be £1,000. The basis for computing this amount was not stated. The House of Lords upheld the Court of Appeal as to the £22 awarded but held that £1,000 should have been awarded for shortened life span.

Lord Atkin saw no justification for the argument that the action merged in the felony.[492] He further held that the right to recover for shortened life span did not depend either upon surviving until the date of the action or upon awareness by the victim that she would die prematurely. He felt that the loss was capable of being estimated in terms of money but expressly reserved opinion as to how it should be computed, indicating that some troublesome questions were involved:

> How the damages are to be calculated is a question which this House has not to decide. . . . Whether the rich man's life has greater potentialities of pleasurable enjoyment than the poor man's, and what consideration should be given to physical weaknesses other than those caused by the accident and

[490] [1937] A.C. 826.
[491] Rose v. Ford, [1936] 1 K.B. 90 (1935).
[492] *Supra* note 490 at 835. See also opinion of Lord Wright at 846.

> not affecting the duration of life I prefer to consider when, if ever, the points are raised.[493]

Lord Roche agreed with the others that the cause of action arose immediately upon suffering the injury and the survival statute preserved this cause of action to the administrator of the estate of the deceased. He also recognized the difficulty of determining the amount of damages to award:

> I regard impaired health and vitality not merely as a cause of pain and suffering but as a loss of a good thing in itself. Loss of expectation of life is a form in which impaired health and vitality may express themselves as a result. In such a loss there is a loss of a temporal good, capable of evaluation in money though the evaluation is difficult. . . .
>
> Nevertheless, it is this question of the assessment of damages which gives me more anxiety than any other part of this case. . . .[494]

All of the Lords agreed that the loss of the leg and pain and suffering warranted only nominal damages since the loss lasted only two days. Otherwise, said Lord Wright, she would be getting double damages since recovery was permitted for loss of life expectancy. He was not concerned with the argument that such a reduction put the defendant "in the paradoxical position of being entitled to plead in mitigation of damage that he had not merely maimed but killed the plaintiff." [495] Apparently the importance of this argument was nullified by granting damages for shortened life span.

After this decision it was settled in England that there could be recovery for shortened life as a separate item of damages, at least when the injured party died before trial or could prove death was rather imminent. What remained to perplex the courts was the question of how much damages, *i.e.*, what is the pecuniary value of lost years? One aspect of this matter was the significance of plaintiff's state of mind regarding his loss of years of life. In *Roach* v. *Yates*[496] the plaintiff, thirty-three years old, became a hopeless invalid and mentally unbalanced as a result of injuries sustained in an automobile accident. The trial judge recognized the applicability of *Flint* v. *Lovell* and *Rose* v. *Ford* but awarded only £2,200 general damages on the ground that if the plaintiff could speak on the matter, he would prefer to have his life

[493] *Id.* at 834-35.
[494] *Id.* at 859.
[495] *Id.* at 846.
[496] [1938] 1 K.B. 256 (1937).

shortened as much as possible. This was held to be error because a judge or jury may not consider the plaintiff's desire for life after the accident, but should consider only whether the length of life which he would have been entitled to anticipate had been diminished by the accident. Thus, the total award was increased to £6,542, of which £2,000 was for future nursing and similar expenses, and £542 was for lost wages and expenses to date of trial. The rest was for pain and suffering, loss of expectation of a happy life, and future lost earnings.[497]

In *Morgan* v. *Scoulding*,[498] plaintiff's decedent, twenty-three years old, was killed *instantly* in an automobile accident and defendants argued that no action vested which could pass to the father under the wrongful death act or to the father as administrator under the survival act. £1,000 was awarded for loss of life expectancy under the survival act, the court holding that the gist of the action was not the death but the negligence and injury which, as soon as it occurred, gave rise to a cause of action for shortened life span. In such a case, the court reasoned, the only real effect of the death was to enable the court to see clearly to what extent the life expectancy had been shortened. £300 was awarded also under the wrongful death act for loss of expected support.

The House of Lords was finally called upon to consider the size of awards being granted by the lower courts for shortened life span. In *Benham* v. *Gambling*,[499] it reduced the damages from £1,200 to £200 for the loss of life expectancy of a two and a half year old child who died on the same day as the automobile accident that caused the injuries. The action was by the administrator under the survival act, no claim being made under the wrongful death act. The analysis of the problem made by Lord Simon who wrote the opinion for the House is worth setting out at length:

> . . . The present appeal raises the problem of the assessment of damage for "loss of expectation of life" before this House for the first time, and it is indeed the only issue with which we are now concerned.
>
> . . . Since the child was unconscious from the moment of the accident till his death, there could be no claim for pain and suffering, and the only question, apart from funeral expenses, was that of damages arising from the diminution of the child's expectation of life.[500]
>
> In the first place, I am of the opinion that the right conclu-

[497] *Id.* at 264, 267, 269.
[498] [1938] 1 K.B. 786 (1937).
[499] [1941] A.C. 157 (1940).
[500] *Id.* at 162.

sion is not to be reached by applying what may be called the statistical or actuarial test. Figures calculated to represent the expectation of human life at various ages are averages arrived at from a vast mass of vital statistics; the figure is not necessarily one which can be properly attributed to a given individual. And in any case the thing to be valued is not the prospect of length of days, but the prospect of a predominantly happy life. . . .

The question thus resolves itself into that of fixing a reasonable figure to be paid by way of damages for the loss of a measure of prospective happiness. Such a problem might seem more suitable for discussion in an essay on Aristotelian ethics than in the judgment of a Court of law, but in view of the earlier authorities, we must do our best to contribute to its solution. The learned judge observed that the earlier decisions quoted to him assumed "that human life is, on the whole, good." I would rather say that, before damages are awarded in respect of the shortened life of a given individual under this head, it is necessary for the Court to be satisfied that the circumstances of the individual life were calculated to lead, on balance, to a positive measure of happiness, of which the victim has been deprived by the defendant's negligence. If the character or habits of the individual were calculated to lead him to a future of unhappiness or despondency, that would be a circumstance justifying a smaller award. . . . [T]he test is not subjective and the right sum to award depends on an objective estimate of what kind of future on earth the victim might have enjoyed, whether he had justly estimated that future or not. Of course, no regard must be had to financial losses or gains during the period of which the victim has been deprived. The damages are in respect of loss of life, not of loss of future pecuniary prospects.

The main reason, I think, why the appropriate figure of damages should be reduced in the case of a very young child is that there is necessarily so much uncertainty about the child's future that no confident estimate of prospective happiness can be made. . . . I see no reason why the proper sum to be awarded would be greater because the social position or prospects of wordly possessions are greater in one case than another. Lawyers and judges may here join hands with moralists and philosophers and declare that the degree of happiness to be attained by a human being does not depend on wealth or status.

It remains to observe . . . that, stripped of technicalities, the compensation is not being given to the person who was injured at all, for the person who was injured is dead. The truth, of course, is that in putting a money value on the pro-

> spective balance of happiness in years that the deceased might otherwise have lived, the jury or judge of fact is attempting to equate incommensurables. Damages which would be proper for a disabling injury may well be much greater than for deprivation of life. These considerations lead me to the conclusion that in assessing damages under this head, whether in the case of a child or an adult, very moderate figures should be chosen. . . .
>
> . . . I believe that . . . the proper figure in this case would be 200*l.*, and that even this amount would be excessive if it were not that the circumstances of the infant were most favourable. In reaching this conclusion, we are in substance correcting the methods of estimating this head of loss, whether in the case of children or adults, which have grown up in a series of earlier cases . . . and are approving a standard of measurement which, had it been applied in those cases, would have led, at any rate in many of them, to reduced awards. I trust that the views of this House, expressed in dealing with the present appeal, may help to set a lower standard of measurement than has hitherto prevailed for what is in fact incapable of being measured in coin of the realm with any approach to real accuracy.[501]

After *Benham* v. *Gambling* a marked reduction in the size of awards for loss of life expectancy was discernible. In one case involving two deceased sailors, one thirty-nine and the other nineteen and a half years old, awards of £350 and £500, respectively, were granted under a survival type of statute, the judge noting that the measure of damages should not "vary with the number of years of the allotted span which may be said to lie in front of the deceased persons."[502] By 1950 it could be said that "£500 is generally recognised as the maximum sum recoverable . . . even allowing for the depreciation . . . of the pound sterling."[503]

In 1953, in *Harris* v. *Bright's Asphalt Contractors*,[504] £500 was awarded a plaintiff who was thirty-five years old at the time of the accident, thirty-seven at the date of the trial, and who had a life expectancy, as reported by a medical witness, of between six months and two years.

[501] *Id.* at 165-68.

[502] Bishop v. Cunard White Star, Ltd., [1950] 2 All E.R. 22, 25 (P. D. & A. Div.). The court held that if the difference in amounts were based on different life expectancies the lower court was in error but assumed the lower court based it on other differences not described. An award was also made for each death under the wrongful death act.

[503] "Assessment of Damages in Fatal Accidents," 100 L. J. 312 (n. s.) (1950).

[504] Harris v. Bright's Asphalt Contractors, Ltd., [1953] 1 All E.R. 395 (Q.B. Div.).

The court computed damages on the basis of an eighteen month expectation. Plaintiff was permitted to recover wages lost for the time he would remain alive only and not for the period when it was expected that he would be dead. Loss of earnings after death, however, may "be considered under the item of damages for loss of expectation of life, in the sense that they are one of the elements which indicate that a person earning a reasonable livelihood is more likely to have an enjoyable life. . . ." [505] £500 was granted for shortened life expectancy in consideration of plaintiff's age, prospects, and wages which showed that he would not have been forced to live in penury. In addition to this amount, however, £5,000 was allowed for past and prospective pain and suffering based on the eighteen months of life left.

These cases make it clear that English courts recognize loss of normal life expectancy as a separate element or, as the English say, head of damage. Whether the injured party dies simultaneously with the injury, shortly thereafter, or is a living plaintiff expecting to die at an earlier than normal date, is immaterial. To avoid duplication of damages, however, he may not recover for pain and suffering or loss of wages for a period extending beyond his death, expected or actual.[506] For a time, substantial awards were granted under this item, but at a word from the House of Lords reductions followed.

No adequate guide has been developed for the trial courts in Great Britain by which the loss may be translated into monetary terms. Actually little guidance can be afforded; and while the *Benham* case lists certain elements that may not properly be considered in evaluating lost years, no helpful indication is given as to what should be considered. Of course this is not a new problem confronting those who assess damages. The same criticism may be made of any award not based on compensation for pecuniary loss. Pain and suffering and psychic injury are analogous situations where "guesstimates" are made.

(2) Canadian Cases

In a 1937 case, *Stebbe* v. *Laird*,[507] the court accepted without question the proposition that damages may be awarded for loss of expecta-

[505] *Id.* at 402.

[506] This was made clear in Rose v. Ford, *supra* note 490; Roach v. Yates, *supra* note 496; and Harris v. Bright's Asphalt Contractors, Ltd., *supra* note 504.

[507] [1938] 1 W.W.R. 173 (K.B. Manitoba 1937). In an earlier case $600 was awarded for shortening life span of man destined to die of cancer anyway, but leg fracture cut off 1 to 1½ years. McGarry v. Canada West Coal Co., 2 Alberta 299 (1909). Plaintiff lived through judgment but not appeal. Amount went to his estate.

tion of life. The case involved an eleven year old child who was injured by an automobile and died nine days later without regaining consciousness. The administrator of her estate sued for damages under a survival statute. Because of the unconscious state of the child, no recovery was permitted for pain and suffering or injury to health. No claim was made for lost wages. The only element of damages, therefore, was compensation for shortened life. The court stated that nothing could be awarded for lost wages or inability to support dependents because those are items to be recovered under a wrongful death act not as a part of damages for shortened life span. To determine the quantum of damages, the court turned to the English decision of *Rose* v. *Ford*.[508] In its discussion of the difficulty of making an award, the Canadian court said:

> . . . [T]o fix a money value for years taken from another person's life cannot be done with any degree of accuracy. The factors which enter into making life worthwhile are so numerous, so uncertain, and may vary so much from time to time, that the task is beyond the wit of man. Some may think that good health is important; yet many great and useful men have suffered physically a large part of their lives. Riches in themselves do not bring happiness; indeed they often destroy the value of life. . . . I make these few observations merely for the purpose of showing the great difficulties in making an assessment in such a case as this. It is very largely conjecture and speculation. The one thing that is in some sense certain is the number of years by which the life has been cut short. This would seem to be the important factor. . . .
>
> The result of *Rose v. Ford* . . . is that *prima facie* every life is of temporal value. . . .
>
> . . . If there is any distinction, it is that the child in this case had perhaps larger opportunities for a full, happy life, and was deprived of several more years of her life than Miss Rose was deprived of.
>
> . . . I am unable to see why the plaintiff should receive less than the plaintiff did in *Rose v. Ford*.[509]

The court granted $5,000 damages and placed emphasis on the number of years by which the life had been shortened.

In the period before the English decision in *Benham* v. *Gambling*[510] was handed down, $2,000 was granted the estate of deceased, a thirty year old deaf mute.[511] The recovery was for shortened life span and was

[508] *Supra* note 490.
[509] *Supra* note 507 at 185-86.
[510] *Supra* note 499.
[511] Riehl v. Condy, [1939] 1 W.W.R. 152 (C.A. Manitoba).

permitted under the survival statute. No recovery was allowed under the wrongful death statute for he supported no one. Some time later, and after the House of Lords had set the standard for computing damages in England, a smaller award of only $1,500 was granted under the survival act for pain and suffering and loss of life expectancy in accordance with the principles laid down in *Benham* v. *Gambling,* taking into account the depreciation in value of money since that case was decided.[512] In addition, £6,000 was awarded to the wife under the wrongful death act for her loss of support. Deceased was sixty-six years old, slightly deaf and died sixty-six days after the accident. Apparently the court assumed that the principles of the English case should be followed in Canada.

The manner of applying the *Benham* case was treated by the Court of Appeal for Manitoba, however, in *Anderson* v. *Chasney.*[513] Deceased, a five year old boy, died of suffocation caused by a sponge left in his nasal area after an adenoids operation. The action was brought by the administrator of the child's estate under the survival statute. Adamson, J. A., criticised Lord Simon's rejection of the use of the statistical method for estimating the prospective length of life. He felt that this method is better than guesswork and is the only one used by insurance companies and government agencies. He also asserted, contrary to Lord Simon, that it was not necessary to establish that the person was destined to have a happy and prosperous life, saying:

> Happiness does not determine the value of a life. Happiness is very largely a matter of disposition. There are many happy people whose expectancy of life is not of great value. Many people in mental institutions are said to be happy. Many people living busy, useful, valuable lives are not happy. . . . Ambition and work may make a life valuable and yet may not bring happiness. I reject the hedonistic philosophy of life as a standard by which to value a life.[514]

Adamson proposed two measures that could serve as guides: the "quality" of the life—whether to the deceased, his family, or society—and the anticipated length of that life. In case of a child, the estimate, he realized, was more difficult because quality is less certain; therefore, one might use the expectancy of quality based on an average for the country in which he lived. He felt that:

> There is, too, a difference between the value of life in England and in Canada. In Canada we take it for granted—and I

[512] Pash v. Registrar of Motor Vehicles, [1949] 1 W.W.R. 225 (K.B. Manitoba).
[513] [1949] 2 W.W.R. 337 (C.A. Manitoba).
[514] *Id.* at 366-67.

> think, properly—that an average child of five years has prospects for a long, satisfactory and valuable life. I am unable to value such a life at a mere £200, which is nothing more than nominal.[515]

In contrasting loss of limb with loss of life (Lord Simon having said that the former would demand greater compensation), Adamson pointed out:

> Presumably, if the boy were to have lost both legs, he [Lord Simon] would allow him substantial and reasonable compensation for being deprived of a full life. Yet when he loses his life, the compensation is to be something nominal! I am unable to endorse the dictum that it is "cheaper to kill than to maim" to the extent of giving only nominal damages for killing.
>
> In *Benham v. Gambling,* a most pessimistic view of the prospects and value of lives of English children has been taken. The values in *Rose v. Ford* are more in accordance with Canadian standards. We in Canada are, and can with justification be, optimistic both as to the length and quality of the life of a young person.[516]

In the case of children, the judge concludes, a good yardstick to use in computing damages for shortened life is the sum the parents have spent in rearing the child, which is roughly $1,000 a year. He therefore would have awarded $5,000 for this element of damage, but a majority of the court thought that $3,000 was sufficient. Coyne, A. J., agreed with Adamson that although the *Benham* judgment was entitled to respect, it was inappropriate to Manitoba, was not binding, and should not be followed.

According to these cases, appellate courts in England and Canada had approved two different tests for use in computing damages for loss of life expectancy. In England, the standard was the *average* happy life, with the admonition that the award must be moderate; in the province of Manitoba, usefulness, past history, and future prospects may be considered, with no restriction as to the maximum amount.

The later case of *Rodzinski* v. *Modern Dairies Ltd.*[517] involved injuries to a thirty-three year old married man, who had not been steadily employed and who had spent a great deal of time in prison on various charges. The injuries resulted in his becoming a paraplegic. The court stated that it concurred in the view of the *Anderson* case with reference

[515] *Id.* at 367.
[516] *Id.* at 369.
[517] [1949] 2 W.W.R. 456 (K.B. Manitoba).

to the statistical or actuarial method of estimating prospective length of life.[518] Since no evidence on this point had been presented, the court took judicial notice of the fact that a thirty-three year old man was likely to live twenty-five or thirty-five years longer.

The principles in both cases, the court felt, justified taking into consideration the circumstances of plaintiff's life up to the time of the accident.

> It is a fair assumption, I think, that he was living the kind life he wished to live, and that it was the kind of life that made him happy. But it was a life of crime and laziness.
>
> * * * * *
>
> I am satisfied that judging by his past life, which is all I have to go on, but taking into consideration the possibility—remote, I fear, in this case—of a reformation, the quality and usefulness of his life based on the average for the country in which he lives was not such as to justify me in assessing damages under this head at any substantial sum. I feel I cannot allow more than $1,000.[519]

An additional $4,000 was awarded for lost earning power. Over $30,000 was granted for pain and suffering, past and prospective. The court apparently ignored the principles established in England and adhered to those expressed in the *Anderson* case, although it was able to find other reasons for keeping the life expectancy award at a "moderate" figure.

The following year, in *Maltais* v. *Canadian Pacific Ry. Co.*,[520] the court for the province of Alberta had to choose between the *Benham* and *Anderson* cases. The plaintiff's wife was killed instantly in a collision between a car and a train. She was forty-one, the mother of three boys, and helped with the farm chores. Damages were sought under both the wrongful death and survival acts. The *Anderson* case was followed in determining damages under the survival act. The principles applicable in Manitoba were equally applicable in Alberta. The court repeated the arguments and views presented in the *Anderson* decision and concluded that, in the absence of special circumstances, a useful and happy life of average duration would be assumed. Damages were fixed at $5,000 for loss of normal life expectancy. In addition, $2,500 was awarded under the wrongful death act to dependent husband and two children for losses to them resulting from the woman's death.

[518] *Id.* at 465.
[519] *Id.* at 466-67.
[520] [1950] 2 W.W.R. 145 (Sup. Ct. Alberta).

In 1953 the issue of computing damages for loss of life expectancy was presented squarely to the Canadian Supreme Court. The court followed the English House of Lords.[521] The deceased, twenty-three years old, engaged to be married, and receiving a good salary, died shortly after an automobile accident but was in a coma during the intervening period. The trial judge awarded $10,000 for loss of life expectancy under the survival act, basing his judgment on the *Maltais* and *Anderson* cases. This award was reduced by the Court of Appeal to $7,500. On appeal to the Supreme Court, that tribunal recognized that differences existed between England and Canada, but felt that "they may be taken into account without departing from the ratio of the House of Lords decision (. . .) in *Benham* v. *Gambling*." [522] Apparently this court held the same fears as to excessive damages as those which prompted the House of Lords to order moderate awards. A $7,500 judgment was permitted to stand but only because it had already been reduced and because appellate courts generally should not interfere too much with money judgments. It was stated expressly, however, that the trial court's award was too high.

Following the Supreme Court decision, there was a marked reduction in Canada in the amount of damages assessed, just as had been the case in England after the House of Lords pronouncement. In one case [523] $2,500 each was granted for a husband and wife killed in an automobile accident, the decedents having been fifty-six and fifty-four years old, respectively. The awards were made to the administrator for each of them under the survival act. No claim was made under the wrongful death act. In another,[524] $2,500 was awarded under the survival act for shortened life span to the estate of an eighteen year old boy, fatally shot in a hunting accident. In this latter case, the court discussed the development of the law in Canada relating to awards for shortened life span, and concluded that the principles enunciated by the House of Lords must be applied—*i.e.,* the awards must be moderate. $4,000 was awarded under the wrongful death act to a surviving mother and sister as damages suffered because of loss of expected support. Her recovery under the wrongful death act was reduced by the amount of her recovery under the survival act.

Today, no real distinction exists between the law of England and

[521] Bechthold v. Osbaldeston, [1953] 2 Can. Sup. Ct. 177.

[522] *Id.* at 180.

[523] Bryce v. Northland Greyhound, Inc., [1954] 11 W.W.R. (n. s.) 672 (Q.B. Manitoba).

[524] Joyce v. Bartlett, [1954] 12 W.W.R. (n. s.) 665 (Q.B. Manitoba).

that of Canada. Both recognize as a separate item of damage the loss of life expectancy. Both award moderate amounts based on how happy the prospective life would have been. As a matter of fact, the basis seems not too important, as the amount of damages in all cases apparently will be approximately the same, and all must be quite moderate.

(3) Other Commonwealth Cases

Several Scottish cases have involved situations in which damages for shortened life span apparently were involved, but there is no actual holding either accepting or rejecting the English rule. As early as 1885, in *M'Master* v. *Caledonian Ry.*,[525] reference was made to this element of damages as possibly justifying an award for damages objected to by defendant as being excessive. A sixteen year old boy, employed as an ironworker, was injured and sued for damages, but he died before the trial. His father continued the action and the jury awarded £400. The defense claimed that since he had died the only award should be for his "losses" before death and an amount for pain and suffering while he survived. The Lord President stated that he was not satisfied that this necessarily was the limit of damages. He stated that he did not mean to give any very decided opinion but that the death suggested various considerations:

> If it had been foreseen that the man was to die very shortly after the occurrence of the injury, or very shortly after the time when the trial was to take place, there may be a question whether he would not have been entitled to damages for the shortening of his life. And so it may be a question whether his executor, as now representing him, is not entitled to damages for that very same thing, it being now ascertained beyond all dispute that his life was shortened in consequence of this injury. But I am rather disposed to think upon the whole that the jury were entitled in a great measure to take this matter into their own hands, and so long as they did not do anything very extravagant that their verdict should stand. . . .[526]

All but one of the other Lords writing opinions agreed that the amount should not be reduced because of the intervening death. The other opinions, however, seemed to be based on a theory of survival of the action which the deceased himself would have had if he had not died, and

[525] [1885] 13 Sess. Cas. 252 (Scot. 1st Div.). Smith, *supra* note 486 at 791, cites M'Enaney v. Caledonian Ry., [1913] 2 Scots L.T.R. 293, as another example but the award seems to be based on pain and suffering, unless "patrimonial loss" is to be interpreted as meaning shortened life span. Walker 611, apparently so interprets it.

[526] *Id.* at 254.

perhaps were allowing a large verdict for pain and suffering and some lost wages, rather than for shortened life span.

An earlier case [527] perhaps indirectly recognizes such a cause of action, but the clearest recognition of a separate right for shortening of life span seems to have been made by the Lord Ordinary in the Court of Sessions in *Reid* v. *Lanarkshire Traction Co.*, decided in 1933, prior to the first English case.[528] The Lord Ordinary said that if the decedent "had been pursuing the action he would have been entitled to put before a jury evidence to prove that the effect of the accident would inevitably be to shorten his expectancy of life, and the jury would be entitled in assessing damages to take that evidence into account," [529] indicating that the victim's mental anguish from anticipating the earlier death is the basis of compensation for shortened life span. The Court of Sessions found that the damages awarded to the executrix were sufficient but that the theory of the Lord Ordinary was incorrect because there need not be proof of mental anguish or conscious suffering, although "the weight to be given to this element must be moderate." [530] In upholding the award of £300, Lord Sand indicated very clearly how difficult is the measurement of this item.

> . . . In China, I understand, it is possible to purchase a suicide for a comparatively modest sum. A man who is justly suspected of a capital offense will get another man who is entirely innocent to commit suicide and leave a written confession. The suicide cannot enjoy the money himself, but it gratifies him,(. . .) to have the money to leave to his family. Now the thought occurs, if, instead of making a bargain of this kind, the one party mortally injures the other, why should he get off more cheaply? Why should the other not get as much for his life thus violently taken as he would have been willing voluntarily to accept?
>
> On the other hand, I recognize that this reasoning is inapplicable to Europeans by any strict analogy. Damages cannot be assessed upon the basis of how much would this man have taken for his life. Still there is something in it which I confess puzzles me once it is conceded that a man is entitled to compensation for the shortening of his life. But the matter is so hedged with metaphysics that, were I charging a jury, I think I should be disposed to be content to tell them that the short-

[527] Neilson v. Rodger, [1853] 16 Sess. Cas. 325, 327-28 (Scot 2d Div.), where Justice Hope said a claim for shortened life is personal to the victim and does not pass to the executor of his estate after he dies.

[528] [1934] Sess. Cas. 79 (Scot, 1st Div.), [1933] Scots L.T.R. 187.

[529] *Id.* at 81.

[530] [1934] Scots L.T.R. 54, 56.

> ening of life was an element which they were entitled to take into consideration in measuring the damage suffered by the deceased, and to leave it to them, without any strict analysis of the content of the idea, to assess the damages, contenting myself with warning them that the weight to be given to this element must be moderate, and that they must not consider what price the man would have put upon his life.[531]

In a 1952 Scottish case,[532] a child of three was very seriously injured and her life expectancy was reduced to two or three years. The jury awarded £4,000 to cover all items of damages. The report does not indicate what weight the jury could give to the shortened life span but clearly refers to the fact of shortened life expectancy. It is possible to argue, as does one Scottish author, that "It is not apparent to what extent, if at all, loss of expectation of life affected the award. It [the court] may have diminished the sum which might otherwise have been awarded under other heads." [533] He concludes "It is not clear from any Scottish case whether this head of damages has yet been fully accepted in respect of a living pursuer." [534]

The Scottish author then generally discusses damages for shortened life.

> Consideration should not be given to the fact that the pursuer is prevented from earning wages over the period between the date of his death and the date to which he would reasonably have lived but for the accident, though such notional earnings are one of the minor elements indicating that a person earning was more likely to have an enjoyable life. Like pain and suffering loss of expectation of life is independent of financial position and station in life and must be assessed without regard to these factors.
>
> It should be observed that there will be over-compensation if damages are given both for loss of wages in respect of being prevented from working for the normal period of working life, and for loss of expectation of life. The two are inconsistent.[535]

A modified use of shortened life span was also permitted in a 1948 South African case.[536] The plaintiff's counsel stated that while he claimed no specific sum for shortened life he did claim that the general

[531] *Id.* at 56.
[532] Fisher v. Mitchell, [1952] Scotts L.T.R. (Notes) 58.
[533] Walker 583.
[534] *Ibid.*
[535] *Id.* at 584.
[536] Goldie v. City Council of Johannesburg, [1948] 2 So. Afr. L.R. 913.

recovery, which includes pain and suffering, loss of health, and loss of amenities of life, should be increased because of the prospect of an abnormally early death. Ettlinger, A. J., held that this was proper, but in accordance with the English cases, the amount of general damages should not be "materially enhanced," because of shortened life span.[537]

In addition to the increase in general damages permitted because of the shortened life span, a sum was awarded for lost wages during not only the period of life expectancy after the accident but also for wages that would have been earned during the full life expectancy before the accident shortened it. This is contrary to the limitation on recovery for wages imposed by the English court five years later in *Harris* v. *Bright's Asphalt Contractor's Ltd.*[538] The English court held that wages that would have been earned during the full life expectancy before the injury should not be included in determining damages. Ettlinger, for the South African court, said:

> In so far as loss of future earnings is concerned, this would *prima facie* be the present value of the anticipated loss of earnings during the period of the prospective life the plaintiff would have had but for the wrongful act. This is what the plaintiff, or his estate, has lost and this is in my view the basis for computing what he should receive by way of compensation. In this regard I would refer to the decision in *Roach* v. *Yates,* (1936 1 K. B. 256) in which this view of the position seems to have been accepted.[539]

The court did reduce the allowance for future earnings by the amount it would cost him to maintain himself,[540] but any recovery for these lost wages is directly contrary to the English view and that expressed by the Scottish author. They take the position this amounts to double damages.

(4) United States Cases

Apparently the Connecticut Supreme Court in *Murphy* v. *N. York & N. Haven R. R.*[541] decided the first United States case dealing with this problem of shortened life expectancy as separate from claims of beneficiaries for economic loss caused by a wrongful death. The plain-

[537] *Id.* at 923.

[538] *Supra* note 504.

[539] *Supra* note 536 at 921.

[540] Approved 70 S.A.L.J. 399 (1953), except the writer would only allow what plaintiff would have saved—all of his spending, not just maintenance expenses, should be deducted.

[541] 30 Conn. 184 (1861).

tiff was the administrator of the estate of a decedent, a six year old child, who was killed instantly when hit by a train negligently operated by an employee of the defendant. The court upheld the lower court judgment for the plaintiff (the amount of damages not being mentioned) against an argument that since the child was killed instantly there could be no cause of action because there could have been no injuries suffered by the deceased; there was no cause of action to survive. The court said:

> The intestate's right of personal security has been wrongfully invaded, and that is distinctly alleged as the cause of action. In both cases the law attaches an injury to such a wrongful act.
>
> But aside from this inference of law, it is alleged in the declaration that the blow was so violent as to produce the death of the intestate. And is this no injury? If to take one's liberty or one's property without justification is an injury, how much more is the taking of human life? The elementary books, in speaking of absolute rights, classify them thus:— 1st. The right of personal security; 2d. The right of personal liberty; and 3d. The right to acquire and enjoy property. If these rights are valued in this order of preference, then every man of common understanding would at once pronounce it absurd to hold it is no injury to a person to take his life, while it is to strike him a light blow. Such a distinction is not worth talking about, and has no foundation or existence in the law, as it has none in common sense.[542]

The court held under the *Connecticut* survival statute that the cause of action accrued to the administrator even though the death was instantaneous. The rationale of this decision apparently has been followed in subsequent Connecticut cases, including in one case the allowance of $6,000 where the decedent was killed instantly through the defendant's negligence,[543] and in another case, $3,500 when the injured party died, though the defendant claimed that it was unjust to allow recovery since the proceeds under the laws of inheritance would go to the husband and son "whose negligence was the sole cause of the injury."[544] This line of Connecticut cases apparently is unique in the United States and has been ignored both by courts and most commentators.[545]

[542] *Id.* at 187-88.

[543] Mezzi v. Taylor, 99 Conn. 1, 120 Atl. 871 (1923). The court said the cause of action is "after death with an enlarged right of recovery for ensuing death." (at 7).

[544] Davis v. Margolis, 108 Conn. 645, 649, 144 Atl. 665 (1929).

[545] Smith, *supra* note 486, discusses the 1861 case but no mention is made of it in what little has been written on the subject in American sources: Annot., 97 A.L.R. 823

All of the decisions by other supreme courts in the United States hold that damages for shortened life span as a compensable injury in and of itself are not allowable although the estate may be allowed to recover lost earnings during the full period of normal life expectancy. The line between proper and improper use of such evidence was drawn by an *Illinois* appellate court in *Krakowski* v. *A., E. & C. R. R.* The trial court allowed the plaintiff, who was injured in a train accident, to prove a shortened life span as well as loss of wages and pain and suffering. The appellate court in reversing held:

> By the foregoing, it is clear that appellee is not entitled to recover any damages under the law for loss of any portion of his life, nor for any earnings he might be supposed to make, if living, in that part of his life lost by reason of his injuries. After reconsidering this case, however, we are convinced that appellee was entitled to the benefit of the evidence in question to show the extent of injury, his consequent disability to earn a living, if any, for the time he shall live, and his bodily and mental suffering, if any, which will result from such injuries. Other jurisdictions hold this to be the law and our Supreme Court seems to sanction the same doctrine, when there is evidence, as in this case, that death is reasonably sure to follow as a result of such injuries.[546]

Several cases have been decided by the *Indiana* court. In 1897 in *Richmond Gas Co.* v. *Baker*[547] an eighty-five year old plaintiff was injured in a gas explosion in his home and the jury was instructed that it could include a sum for shortening of life expectancy. The Supreme Court of Indiana decided that the instruction was erroneous, holding that, while evidence of shortened life span might be used to determine the extent of the injury including the inability to earn a living and mental suffering, there could be no damages for the loss of life itself, since, "The value of human life cannot, as adjudged by the common law, be measured in money. It is, besides, inconceivable that one could thus be compensated for the loss or shortening of his own life."[548] The court disallowed the award of $4,600 and ordered a new trial. In two

(1935); 131 A.L.R. 1351 (1941); Comment, 33 Ill. L. Rev. 967 (1939); 22 U. of Chi. L. Rev. 505 (1955); Conway, "Damages for Shortened Life," 10 Ford. L. Rev. 219 (1941); Hannigan, "Recent English Decisions in Damages for Injuries Ending in Premature Death," 18 B.U.L. Rev. 275 (1938). McCormick 339 mentions the survival statute in Connecticut as the sole remedy in death cases.

[546] 167 Ill. App. 469, 472-73 (1912). *Cf.* T. W. & W. Ry. v. Baddeley, 54 Ill. 19, 23-24 (1870).

[547] 146 Ind. 600, 45 N.E. 1049 (1897).

[548] *Id.* at 609.

later cases [549] the same distinction between using such evidence to measure the extent of the injury and using it as a separate item for compensation was followed. In a later case involving a living plaintiff the Supreme Court followed the *Richmond Gas Co.* decision and added:

> It is true that a consideration of the nature and extent of the injuries may lead indirectly to some consideration of their probable effect, but the jury should not be told to award damages to an injured party for the years taken off his own life by his injury.[550]

Nothing in the case indicates the other elements of damage claimed, except for nursing care.

In *Maine* the only authoritative decision was rendered by the federal courts in a case in which the victim received a skull fracture and was unconscious for about five days until his death. Under the survival statute his widow sought compensation for his estate for curtailment of his life expectancy, computed as thirteen years before the accident, alleging that he was deprived of the right and pleasure of growing old gracefully and enjoying the amenities of life. The wife already had recovered under the wrongful death statute for her loss of future support. The court held that, in the absence of any Maine decisions, the federal court could not create a new right since there were no American cases following the English law on the subject. The court indicated its own attitude, however, when it said, "where the injured person never regains consciousness, it seems a thin distinction to say that the executor cannot recover for the death, but can recover for the shortening of the life expectancy. All one ever does in killing a person is to accelerate the moment of his death." [551] The court indicated, however, that recovery could be had for medical expenses and property damages.

In 1953 a similar view was expressed by the federal court in *Massachusetts* in *O'Leary* v. *U. S. Lines Co.*[552] The case involved injury to a longshoreman on a vessel in Boston. He died before trial and the plaintiff brought an action under the wrongful death statute and also under the survival statute. The claim under the latter statute was for pain and suffering, medical expenses, lost time from work, and "general damages" for "loss of the enjoyment of the amenities of life, . . .

[549] Cleveland, C. C. & St. L. Ry. v. Miller, 165 Ind. 381, 74 N.E. 509 (1905) (injury to person still living at time of trial); Muncie Pulp Co. v. Hacker, 37 Ind. App. 194, 76 N.E. 770 (1906).

[550] Lake Erie & Western R.R. v. Johnson, 191 Ind. 479, 483-84, 133 N.E. 732 (1922).

[551] Farrington v. Stoddard, 115 F.2d 96, 101 (1st Cir. 1940).

[552] 111 F. Supp. 745 (D.C. Mass. 1953).

a material diminution of his normal life expectancy, . . . [and] a shortening of his life." [553] The court, in denying recovery for the shortened life expectancy said that there was no Massachusetts decision allowing a claim for loss of expectancy as an item of damages distinct from mental anguish from fear of an early demise and there was no indication that the state would adopt the English view. The court also gave three reasons why it believed that the Massachusetts courts would deny recovery: (1) another provision of the Massachusetts statute prescribed that damages for the death of another should be assessed with reference to the degree of culpability, and that to allow recovery for loss of expectancy would be to base it upon the degree of damage rather than culpability; (2) the English rule had not proved entirely satisfactory as indicated by the practice of allowing only small flat sums; and (3)

> . . . [T]he English rule is set in a context where duplication of damages is much less likely than it would be in Massachusetts. In England, survival damages, awarded, e.g., for shortening of life or pain and suffering, are deducted from recoveries of relatives under the English death act. . . . In this Commonwealth, however, survival damages, including suffering from the fear of loss of life, are in addition to damages recovered by relatives under the Massachusetts wrongful death statute.[554]

Nevertheless, evidence of shortened life span is permissible for some purposes in Massachusetts. In *Choicener* v. *Walters Amusement Agency* [555] the court used the following language:

> He rules, in substance, that if they found on the medical testimony that the accident shortened the life of the deceased and also found upon the facts and the reasonable inferences to be drawn therefrom that he was aware or believed that the condition from which he suffered before the accident was aggravated, intensified and increased, and that because of the collision death might be hastened, they could take into consideration his apprehensions, fears and consequent mental suffering so caused.[556]

[553] *Id.* at 746.

[554] *Id.* at 747.

[555] 269 Mass. 341, 168 N.E. 918 (1929). *Cf.* Fournier v. Zinn, 257 Mass. 575, 576, 154 N.E. 268 (1926) (claim for personal injuries by living plaintiff—evidence of shortened life "was relevant").

[556] *Id.* at 343.

The victim brought the cause of action for personal injuries but died before trial and his administratrix was substituted. No action was brought under the wrongful death statute.

In 1943 the *New Hampshire* Supreme Court was faced with a case[557] in which the defendant utility company had trespassed upon the plaintiff's land before condemnation proceedings had been started. The plaintiff sought damages for trespass to real estate and for mental suffering and the loss of health. He died during the pendency of the action and his executrix continued the action under the survival statute and added an item for the loss of his life. The court held that the decedent's loss of life entitled his estate under a survival statute to recover for his loss of earning capacity only, but that such had not been claimed in this case.

> Beyond that loss the law gives no recovery for causing death in an action brought before death. . . . In the nature of things one may not himself receive compensation for the wrongful loss of his right to live, and claim for the loss cannot be an asset of his estate in any fair view of the compensatory principle of allowable elements of damages. While allowance for bodily and mental suffering is granted as in justice imposed on a wrongdoer, the estimate must be within the bounds of justice. To allow for the enjoyment of continued life would mean an entrance into a boundless field of arbitrary assessment, for which no policy of the law exists. . . . It is sometimes said that a wrongdoer is better off in causing death than in causing severe and lasting injury without death. If this may be considered in the balance of adjustments in social relations, it does not serve to outweight the reasons which bar allowance for damage on this account.[558]

Although the case did not involve a claim for damages for shortening the life on behalf of the deceased, an argument used by the *Michigan* Supreme Court in 1867[559] suggests an interesting argument that also could be made against allowing recovery for shortened life span. The court, not mentioning any of the other American cases, said:

> To the cultivated and enlightened mind, looking at human life in the light of the Christian religion as sacred, the idea of compensating its loss in money is revolting, and it can only become reconciled to such an idea by the strong necessity which has grown out of the new modes of travel and business

[557] Ham v. Interstate Bridge Authority, 92 N.H. 268, 30 A.2d 1 (1943).
[558] *Id.* at 275-76.
[559] Hyatt v. Adams, 16 Mich. 180 (1867).

> in modern times, by which great numbers are compelled to trust their lives to the skill and vigilance of the servants of corporations, and others in similar positions of responsibility —a state of things which seemed to call for a remedy which should make railroad corporations, steamboat managers, and parties to whom others are compelled to trust for safety, more sensible of their responsibilities, and more careful to secure a high degree of vigilance in protecting the lives entrusted to their care, and at the same time afford relief for cases of great individual hardship, which might otherwise be suffered by those dependent upon the person whose life may be lost. . . . And it will be fortunate in the future if it shall be found that habituating the public mind to the idea of pecuniary compensation for human life has not tended to weaken its safeguards, and to render it less sacred in the popular estimation.[560]

The objection most commonly stated in the American cases, however, against allowing recovery for loss of expectancy is the great uncertainty of standards used in measuring the damages and the discretion it gives the jury in tort cases. This attitude is forcefully, if somewhat extremely, stated by Conway in his article written in response to the English cases. He says:

> But now in England there is bestowed upon judges and jurors an added foresight which approaches the supernatural. Necromancy and crystal-gazing seem to have been sanctioned in the law. Judges and jurors are to be veritable fortune-tellers. They may forecast one's future state of happiness and, in addition, express its value in terms of cash, with the sole condition that they be not too liberal.[561]

Regardless of the reason given, it is clear from the above cases that, except for Connecticut, in those United States jurisdictions which have spoken there can be no recovery for shortened life span as a separate item of damages, although evidence of such shortening is admissible in some jurisdictions for proof of (1) the extent and seriousness of the injury, (2) inability or decreased ability to earn a living, and (3) bodily and mental suffering, the latter presumably caused by the prospect of an earlier than normal demise.

On the other hand, the general rule in the United States is that lost earning for the whole period of the injured person's normal life expectancy before the accident is recoverable apparently often without

[560] *Id.* at 191-92.

[561] Conway, *supra* note 545 at 228-29.

recognition that no living expenses will be incurred after death, but damages for pain and suffering are computed on the basis of the plaintiff's expected life span at the time of trial, after the injury.[562]

(5) Some Suggestions Concerning Compensation for Shortened Life Span

(a) Comparison of Results under British and American Views

Actual results reached under the British and American views may not be nearly as far apart as the principles upon which recovery is allowed would seem to indicate. A shortening of life expectancy under the British view is a separate item of damage apart from loss of wages and pain and suffering. The victim does not need to be conscious of his loss. In addition, though, there has been but little discussion of damages for loss of wages in the English opinions. Those discussions which have dealt directly with the subject have awarded damages under this head only for the period of life that is to be expected after the injury, in other words, only for the shortened period of life.[563] Recovery under a survival statute may reduce any recovery under the wrongful death

[562] The following are some of the cases supporting this view: Prairie Creek Coal Min. Co. v. Kittrell, 106 Ark. 138, 153 S.W. 89 (1912); Murphy v. National Ice Cream Co., 114 Cal. App. 482, 300 Pac. 91 (1931); T. W. & W. Ry. v. Baddeley, *supra* note 546; Hughes v. Chicago, R. I. & P. Ry., 150 Iowa 232, 129 N.W. 956 (1911); Scott v. Chicago, R. I. & P. Ry., 160 Iowa 306, 141 N.W. 1065 (1913); Borough v. Minneapolis & St. L. Ry., 191 Iowa 1216, 184 N.W. 320 (1921); Thordson v. McKeighan, 235 Iowa 409, 16 N.W.2d 607 (1944); Daniell v. Boston & Maine R.R., 184 Mass. 337, 68 N.E. 337 (1903) (slightly different rule for breach of contract where damages awarded on basis of how long plaintiff could have performed his duties in a thorough, honest, and businesslike manner and for this purpose evidence of probable length of life is admissible); Fournier v. Zinn, *supra* note 555; Choicener v. Walters Amusement Agency, 269 Mass. 341, 168 N.E. 918 (1929) (jury could consider apprehensions, fears, and consequent mental suffering caused by earlier expectation of death); Howell v. Lansing City Elec. Ry., 136 Mich. 432, 99 N.W. 406 (1904); Olivier v. Houghton St. Ry., 138 Mich. 242, 101 N.W. 530 (1904); Crecelius v. Gamble-Skogmo, Inc., 144 Neb. 394, 13 N.W.2d 627 (1944); West v. Boston & Maine R.R., 81 N.H. 522, 129 Atl. 768 (1925); Alberti v. N.Y., L.E. & W.R.R., 118 N.Y. 77, 23 N.E. 35 (1889); Magee v. City of Troy, 48 Hun. 383, 1 N.Y.S. 24 (1888); Jones v. Eppler, 266 P.2d 451 (Okla. 1954); Maher v. Phila. Traction Co., 181 Pa. 391, 37 Atl. 571 (1897); Richardson v. Spokane, 67 Wash. 621, 122 Pac. 330 (1912). See Comment, 22 U. of Chi. L. Rev. 505 at 509-10 (1955), and McCormick 341-43.

[563] Roach v. Yates *supra* note 496; Harris v. Bright's Asphalt Contractors, Ltd., *supra* note 504. The South African court, however, allowed lost wages to be recovered for the full life expectancy without deduction of the amount it would be cut short by the injury.

statute.[564] In the United States the courts have refused to allow shortened life span as a separate item of damage but they allow compensation for lost earning capacity for the full life expectancy unaltered by the accident (apparently without deduction for maintenance expenses that will not be incurred because of the early demise), although again as in the English cases there has been little discussion of the problem. Actually, considering the flat, rather moderate sum established in England for measuring damages for the shortened life span it is very likely that the injured Englishman recovers less in money award than does an American (unless he is retired), who theoretically is given no recovery for shortened life span. As suggested by one writer:

> Neither the English nor the American solution appears to be theoretically justifiable. The British courts may be correct in recognizing that there is a loss of years off the plaintiff's life which is not compensated for either by damages for economic loss or for pain and suffering. However, there has been no good explanation put forth as to why this circumstance demands compensation. . . .
>
> If the American courts, on the other hand, are correct in rejecting loss of life expectancy as a separate item of damages, they appear inadvertently to overcompensate the plaintiff for his future economic loss. Recovery for wages lost during years which the plaintiff will not be alive ignores the simple fact which is recognized by our death and survival statutes: a dead person's maintenance involves no expense. To give a plaintiff full wage recovery is to give him (and indirectly his beneficiaries) a windfall. The plaintiff has not only been cut off from years of pleasure, but years of expense as well. This difference between a living and a dead plaintiff is readily recognized by those decisions which limit recovery for pain and suffering to those years the plaintiff will actually live.[565]

Undoubtedly there is a natural appeal in the British view which allows some kind of compensation for death, the ultimate injury to a human being.[566] Certainly it is true that even American courts allow money awards to be made for other than economic and physical losses; *e.g.*, recovery is allowed for mental suffering or anguish as well as for physical pain, and some courts allow recovery for a reduced ability to enjoy the niceties of life because of some physical injury.[567] In these

[564] *Supra* notes 498, 521.

[565] Comment, 22 U. of Chi. L. Rev. 505 at 510, 511 (1955).

[566] Smith, *supra* note 486 at 795-803. He makes an impassioned argument for recognizing that death takes away the most precious thing we have.

[567] *Ibid.* But see denial in Hogan v. Santa Fe Trail Transp. Co., 148 Kan. 720, 85 P.2d 28 (1938).

cases, however, the award is made to a living person for his own benefit and not to others after his death. Certainly the determination of the value of life to a man who has just lost it borders on the metaphysical. The difficulties involved in this metaphysical concept are stated so pungently, if somewhat unfairly, by an editor of the Economist (London), that the statement bears repetition here.

> As the duty of valuing lives in this way will almost certainly present itself more and more often so long as the law remains in its present admirable state, we have in the hope of being helpful to His Majesty's Judges and to the juries on whom the work of valuation will fall, given serious consideration to working out a "state of happiness" index number, which will be published as soon as certain minor difficulties have been overcome. In the meantime, we have drawn up a provisional schedule of life values according to occupations, on which the authorities may base themselves till the index number is ready. The judicial directions, fortunately, are clear and unambiguous. We have to value life as a whole without taking into account wealth, social position, or earning capacity, but concentrating on the question of how far the life lost was a good thing, an amenity—how far the dead person was likely, if he had lived, to pass his life in rest and quietness. Money and social position do not count, and to the legal personal representatives a dead tramp, if he was happy before he died, is a better investment than a wealthy but worried stockjobber. The issue, it will be seen, is simple, and it remains only to express the result in sterling, to which end we venture to submit to their Lordships for their future serious consideration a few valuations of dead folk according to their occupation and their respective enjoyment of rest and quietness:—

	£	s.	d.
A High Court Judge	100,000	0	0
A Commissionaire..	10,000	0	0
A Ministry of Transport Official.. ..	10,000	0	0
An Editor of *The Economist*..	10	0	0
A Motor Car Underwriter in the present condition of the law..	0	0	10

These figures can, of course, be taken only as a basis and will need to be weighted for individual cases in different ways. For example, in a British Court of Law regard must surely be had to the relations of this world and the next; and evidence must be heard as to whether the deceased person was likely to find himself better or worse off after his decease. For if the continuance of life is only a postponement of a future

> life, the value to himself of a man's life here must depend partly on what it is that is being postponed. If, therefore, we had evidence that a deceased civil servant had been a very good man, orthodox in his views and impeccable in his private life, we should be inclined to knock 50 per cent. off the valuation and give his legal representative £5,000 instead of £10,000. And *vice versa,* if the plaintiff could prove the deceased to have been a very bad man we might raise the damages to £20,000. A judgment from the House of Lords on this aspect of the law will be eagerly awaited. In the meantime, both the legal profession and the personal representatives of the deceased persons may face the future in confident anticipation of a satisfactory harvest.[568]

As the British courts themselves have recognized, it probably becomes even more difficult when a child, an unemployed person, a hopelessly insane, or an unconscious person is the one whose life expectancy has been shortened.

One further consideration is important in comparing the British and American results. The distinction drawn by most American cases between denying recovery for shortened life span, but admitting it as evidence to show the extent and seriousness of the injury itself is of questionable practical significance. It does not escape the notice of the courts that evidence of shortened life span may affect the jury in unexpected ways. It is certainly possible to argue that a plaintiff who introduces such testimony may have reason to fear that a lower verdict will be reached because his period of pain and suffering will be diminished to the extent that his life expectancy has been shortened. One court held that the admission of such evidence, even though error, could not be prejudicial to the defendant. The court said:

> The reason why this is true is obvious. If it had any effect at all it would have been to reduce rather than increase the amount of plaintiff's recovery since while plaintiff was entitled to his pecuniary loss based on his life expectancy before the injury, the recovery for future mental and physical suffering would depend upon expectancy in his injured condition.[569]

If this be an accurate estimate of the effect of such evidence a defendant might even consider offering it to reduce the recovery for pain and suffering, which is generally assumed today to be the cause of the large amounts being awarded by juries.[570] Yet it is open to question

[568] Quoted from "Is Life a Boon?" 14 N.Z.L.J. 65 (1938).

[569] Crecelius v. Gamble-Skogmo, Inc., *supra* note 562 at 402.

[570] Plant, *supra* note 381.

that a defendant would be acting wisely in introducing such evidence. Although it may not be considered by the jury as a separate element of damage, surely such evidence might sway the sympathy of the jury and cause it to give a higher judgment on the other items. The technical rules of law included in instructions to juries are interesting to lawyers and much discussed in law school courses, but what happens when these instructions and the evidence are taken by the jury into the privacy of the jury room may be something quite different from the desires of the lawyers and judges.[571] From the defendant's point of view, once evidence of shortened life span is admitted, an instruction that it may not itself be the basis for an award as a separate item of damage would be no assurance that it would not have this effect as a practical matter.

(b) Effect of Wrongful Death and Survival Statutes

An additional difficulty is created by the existence of death statutes, both wrongful death and survival. All American jurisdictions have some type of statute creating a special cause of action for a wrongful death, usually in the form of the original English Lord Campbell's Act. The theory of these acts is to recognize that the death may have caused pecuniary losses to survivors closely related to the deceased, *i.e.*, those who received financial support from him. Recovery usually is dependent upon a showing of some beneficiary of this class who actually has suffered loss of support and, in theory, the amount of the recovery generally is unrelated to the injuries suffered by the deceased.[572]

The typical survival act is based upon a different policy. The common law rule was that the cause of action in tort died with either the plaintiff or defendant if death occurred before judgment. Survival acts have been adopted in every American jurisdiction to preserve at least some causes of action such as injury to personal or real property and even other non-personal injuries. About half of them also provide for survival of personal injury actions and these are the ones of concern in considering damages for shortened life span.

The theory of recovery under this typical survival act is quite different from that of the wrongful death statute. Recovery by the personal representative or administrator of deceased's estate is permitted to the extent that decedent would have had a cause of action. This is deriva-

[571] See Kalvin, "The Jury, the Law, and the Personal Injury Damage Award," 19 Ohio St. L. J. 158 (1958).

[572] See Prosser 710, 713-16; Harper & James §§25.14 *et seq.*

tive action, dependent upon the rights of the deceased and the amount recovered becomes a part of his estate.[573] Recovery under such statutes would include damages for pain and suffering, medical expenses, and loss of earnings during the interval between injury and death.

In some jurisdictions recovery can not be had under both statutes but in many jurisdictions which have both types of statutes, the theory of recovery under each being different, there are two causes of action and recovery under one does not preclude recovery under the other. In many cases this means that the same beneficiaries will recover under the wrongful death act and also under the survival statute since the persons who take the estate of the deceased often are the same close relatives protected by the wrongful death statute. The duplication is even more obvious in those jurisdictions which allow the estate to recover under the survival statute for loss of earnings during the full life expectancy of the deceased without regard to the injury inflicted by the defendant, often as pointed out before, without deduction for the maintenance costs that the victim would have incurred and which, therefore, would have reduced the amount left in his estate.

The existence of both statutes in one jurisdiction has created real difficulties for the courts and the result has been something less than logical and just in many situations.[574] To apply the dictates of these statutes and the common law tort rules and to reconcile the results of cases in which the estate of the deceased is suing with those in which the beneficiaries under the wrongful death acts are seeking recovery, and both with the rights of the victim himself while he still lives, without unduly modifying the "plain meaning" of the legislative language is too much to ask of any court. What is needed is a reconsideration of the whole matter.

(c) A Suggested Reconsideration of the Rule of Damages

Our first conclusion in reconsidering what rules should be applied to recovery for shortened life span is that there is little justification for becoming involved in a deep philosophical concern with man's psychological welfare (important as this is), at least so far as he might contemplate what he will be allowed to recover if he should be killed. The

[573] Prosser 708-10.

[574] See objections and criticisms of Duffey, "The Maldistribution of Damages in Wrongful Death," 19 Ohio St. L. J. 264 (1958). See also Carter, *supra* note 438, particularly at 760-61.

problem is one of deciding what kinds of interests should be recognized by a pecuniary award in an action arising from an unintentional tort. Lawyers and judges should not try to answer questions best left to theologians.

A reconsideration of this area of the law of damages should take account of two basic factors: (1) the rights of a person while he is still living to recover for mental anguish suffered by him, including possibly his suffering as he contemplates a shortened life expectancy, but not for the death or shortened life itself; and (2) the rights, if any, of survivors who might have expected something from the deceased if he lived his normal number of years. Whatever the type of statute and whatever the form of action, these would seem to be the two potential elements of damages that should be considered.

(i) Recovery When the Injured Party Dies Before Judgment

In considering the rights of the injured party himself, it is important to draw a distinction between the case in which he dies instantly, never recovers consciousness, or dies relatively soon after the accident (probably within the period between the accident and trial), and the case in which there is no other injury except an ascertainable shortening of the life span with no real danger of death in the immediate future, as so often will be the situation in radiation exposure cases.

When the injured party dies before judgment or settlement of the claim, it seems quite unrealistic under a survival statute to hold that the death itself is an item of damages, so far as the deceased is concerned, and survives under the statute. The injured person who dies can in no way enjoy such compensation, except possibly in the form of psychological satisfaction of being able to pass assets on after death. In the case of instantaneous death, or death before consciousness is regained, even this is non-existent, and the law ought to recognize that any such recovery is in effect simply a recovery for the beneficiaries or heirs and, in some states, creditors.[575] Notwithstanding possible theological assertions of some religions to the contrary, it would seem best that the legal rules be based on the philosophy that "you cannot take it with you," at least as to assets of a pecuniary nature. This would not be inconsistent with most western religions since they do not consider wordly goods of any particular value in any life hereafter. The law should not go further. If this view be accepted, the English rule allow-

[575] McCormick 340.

ing an absolute right of recovery for loss of life expectancy even where the injured person dies instantly or is not aware of the shortened life span and therefore can suffer no mental pain and anguish as he contemplates an earlier than normal demise is incorrect.

(ii) Recovery When Injured Party Survives but Has Shortened Life Expectancy

A different situation is presented, however, when the injured person survives the trial but has a shortened life expectancy. To the extent that the law recognizes that there should be recovery for injury to psychological interests of the injured party himself, and there is a considerable growth of legal recognition of this right in many areas, then the recovery ought to be adjusted to the particular case and applied only to allow compensation for the mental anguish suffered by the injured because of his concern about his shortened life span. If a money award is to be given for injury to such psychological interest, there ought to be both proof that the injury to this interest actually occurred, and also a reasonable relationship between the money awarded and that needed to purchase services or enjoyment having a reasonable relation to the value of the period cut off the man's life. Under this heading it might even be possible for such a person to recover enough to allow him, during his shortened life span, to take a trip toward which he had planned and saved. Though this example may be too extreme, this would be the kind of interest which, though psychological, ought to be recognized as sufficiently tangible for monetary compensation to be made. Probably much more realistic from the standpoint of helping the injured party would be a greater liberalization in the recovery allowed for medical expenses so that a program of rehabilitation, including mental therapy if needed, could be utilized fully to make the remaining years of life as enjoyable as is reasonably possible. This suggestion would reject the English practice and also would call for modification of the rigid American rule under which recovery has been denied in the jurisdictions which have passed upon the question. Compensation would thus be allowed for the mental disturbance to the person who knows his life span is being shortened. This would not extend the law substantially beyond present practices in cases in which the injured person lives and makes a claim, not for shortened life span, but for a lessening of desirable enjoyable activities during his normal life span because of some physical injury. As pointed out before, this kind of right has already been recognized in many jurisdictions including

some which have denied recovery for shortened life span as such.[576] If psychological interests are recognized in these cases, so also should they be when shortened life span is involved. There is no reason, legal or moral, however, for carrying this item beyond the grave, the indignant rejection by the Connecticut court of such a barbaric distinction notwithstanding.[577] The material aspects of the recovery certainly do not pass beyond the grave to the best of our knowledge but go to the surviving kin or other beneficiaries. Since this is true, the award should be justified under the theory of our wrongful death acts.

It is recognized that this suggestion seems to be in conflict with the theory of the typical survival statutes that whatever cause of action the victim had, his estate keeps after his death. The suggestion made would permit recovery for damages to the injured victim, including any mental disturbance, pain and suffering, and loss of enjoyment of life generally, only if he survives judgment; if he does not, recovery would be denied to his estate. We do not mean to suggest that contracts and other property rights, including the right to recover for destruction of property, should be wiped out upon the death of the injured party. These rights are capable of being measured in monetary terms and seem to be a legitimate part of the estate of the deceased, should he die before trial. Survival statutes are aimed at preserving this kind of right. It is submitted that there is no justification, however, for adding to the estate of the deceased an item for damage to his psychological interest, which so far as this world is concerned is now gone, and is rather unimportant in the next if we can believe the experts.

Any monetary awards that are given in such a case usually go to the survivors who would recover under a wrongful death statute. If death ensues before trial or settlement, recovery should be awarded only to the survivors protected by the death statutes for loss of expected support. The concern in cases awarding monetary compensation should be with the living and not with the dead. Any recovery for invasion of psychological interests ought to be resolved between the defendant and the injured party and the amount keyed to compensating him, not the survivors. The logical time to determine this is at the time of the trial, which usually will be long enough after the injury so that it will be known whether the injured party is going to live for a reasonable period of time beyond the injury. In any event, in most cases it will make a clear-cut distinction between the amount to be awarded to the injured

[576] See cases like Hogan v. Santa Fe Trail Transp. Co., *supra* note 567.

[577] *Supra* note 541. See also Prosser 709.

party for damage to his peace of mind, and the amount to be awarded to the persons who have lost expected financial support because of the death or serious shortening of life expectancy of the injured person. Their interests are of quite a different nature.

In any event, if the victim survives judgment, having proved that he will die one, ten, fifteen, or twenty years prematurely, but a considerable period after the trial, his recovery should not include lost wages, expenses, or pain and suffering and mental anguish for the period between his expected premature death and the life span he would have enjoyed but for the accident. In many cases of radiation exposure in which only a few years are cut off of life expectancy, there may be no decrease in earning capacity and no pain and suffering and probably not much, if any, mental anguish, premature death being so long delayed. The period cut off actually may be non-earning years, after retirement, unless retirement plans begin to take account of premature aging. Any award of damages to the surviving victim should take account of the mitigating factors.

(iii) Recovery by Dependents for Lost Support

Recovery by persons normally included as beneficiaries in wrongful death statutes should be determined on the basis of support they could have expected from the deceased had he lived his normal life. Under this approach, a determination must be made of what these beneficiaries would have received from the decedent had he lived, taking into account, of course, the maintenance costs of the decedent during the period of his normal life expectancy. It should take account of the fact that in most radiation cases only a few years should be taken off the end of the victim's life at a time when all of his dependents, except for his wife and perhaps other disabled relatives should have no longer expected any financial support. In such cases no recovery should be allowed for dependents. It would be best to postpone such determination until the victim actually dies.

(d) Advantages and Disadvantages of the Recommendations

The proposed separation of the damage rights of the injured party and of any dependents who lose financial support because of his actual or expected early demise should help make possible a fairer determination of how much damages to award to whom. The injured person, if

he lived until judgment or settlement, would recover the type of damages now allowed, such as for pain and suffering, medical expenses, lost wages (during his reduced life span only), *etc.*, but all damages should be limited to what is suffered during the period he now is expected to live in his injured condition. If he dies before judgment, the length of his life is now definitely known instead of estimated and other than expenses actually incurred during his life, all recovery should be for lost support by dependents. The result would prevent recovery for shortened life span itself, contrary to the Connecticut and English Commonwealth view. It also would prevent recovery of lost wages for the full period of normal life expectancy allowed in some American jurisdictions which purport to deny recovery for shortened life span.

On the other hand, it would permit a separate determination of the rights of surviving dependents whose recovery should then not be affected in any way as to amount because the injured person also may have recovered. Realistic amounts should be awarded to such dependents. There is no reason to carry over into a determination of their needs the great uncertainties that are involved in deciding how much to allow the injured party for his pain and suffering and his mental anguish caused by contemplating an early demise. Any psychological interests of the injured victim which have been invaded should be measured by the time he actually lives or is expected to live. The needs of survivors have no logical policy relationship to this amount. Their recovery should be determined in accordance with their reasonable expectations of support after their benefactor's death.

The result suggested probably could be achieved if courts were willing to interpret somewhat more liberally common law and death statute damage rules but this perhaps would involve a certain amount of judicial legislation in some states. It would be better if a statute were enacted recognizing the interrelationship of the rights of the injured victim, his estate, and his dependents as now protected under most wrongful death statutes. The result would be more consistent with the general theory of compensatory damages in unintentional tort cases where life span has been shortened by a defendant who fails to meet the required standard of conduct but who should not be punished so that others can receive a windfall.

Administration of these suggestions will present some difficulties. Juries will have difficulty keeping separate the different items of damages but probably less difficulty than they now have when they are told

not to allow recovery for shortened life span, although they may consider it in determining how seriously plaintiff has been hurt, and also are told to estimate his wages during his full life expectancy. The separation should help differentiate the various elements of damage on a more logical basis. It would permit findings of fact on specific items of damage.

Another difficulty arises under our suggestions if the injured person lives until after judgment but his expectation of further life is very short. Under these circumstances should the dependent beneficiaries of a wrongful death statute be allowed to have a further cause of action? If so, when does it arise—at the same time as the injured party's right or only after he dies? A related difficulty arises if there is an ascertainable shortening of life span but the victim is expected to live for as many as forty or fifty years. This is very likely to happen in radiation exposure cases. Who should be counted as beneficiaries and how much should they be allowed to expect from the victim had he lived?

One writer has made the ingenious suggestion that the injured party should recover his own losses and also those of potential beneficiaries at his death, all in one action.[578] He would be allowed to recover the total amount on the theory that if he dies it then will be passed on to the persons he wanted to protect anyway. The alternative would be to allow a separate action for loss of expected support by the beneficiaries who could sue if he died. The writer objected to this alternative because "[t]his not only makes it impossible to ascertain the recipients, but also leaves the court without the base for calculating the rewards."[579] His suggestion, however, involves the same difficulty he was trying to avoid. Determination of the beneficiaries and of the amount of support they could expect is just as difficult no matter who brings the cause of action.

Our suggestion would be to adopt what might be described as a "wait and see" doctrine—allow the beneficiaries a separate cause of action under a wrongful death theory, to arise *at the time the injured plaintiff dies, not before.* Any statute of limitations problem could be handled simply by holding that the cause of action does not arise until the death occurs. Difficulties arise from the possibility of disappearance, death, or bankruptcy of the defendant, but these seem not nearly so objectionable as guessing who the beneficiaries will be, how long they will live, and how much support they would have received from the

[578] 22 U. of Chi. L. Rev. 505, 512 (1955).
[579] *Ibid.*

deceased during the time of his normal life expectancy. Our suggestions involve the lesser evil.

The most important difficulty arising if the action by death beneficiaries is postponed until the actual death of the victim is that it may delay actions for many years, twenty or more being perfectly possible. This does create a very serious concern, not only as to whether or not the insurance coverage of a defendant will be continued for this period of time for the particular injury (or other funds if insurance does not cover the injury), but also as to preservation of the evidence surrounding the original injury.

Several possibilities for alleviating this problem to some extent can be suggested. One is to adopt an arbitrary period, for example ten years after the date of injury. If the injured person lives for ten years perhaps it is fair to assume that the beneficiaries' pecuniary losses and expectations of support have been reduced to a sufficiently low order that the law should ignore them. This should take care of all but the most unusual case as to child beneficiaries but may not be satisfactory for spouses who are dependents. It may be a fair compromise even then, however, since in most states today they recover nothing under wrongful death statutes if the decedent survives until after judgment in his own action for tort damages.

Another possible solution to the problem of a long delayed but accelerated death is to limit the recovery of death-act beneficiaries to those cases in which the deceased himself has recoverd damages from the defendant which would mean that the initial cause of action itself has been brought within the period of the statute of limitations, and that the basic facts of the defendant's liability for the accident would have been established. The fact that beneficiaries probably would not have participated in the original trial presents the matter of binding parties by a judgment in which they did not participate. The whole cause of action is such, however, that in a real sense it is dependent on the right of the injured party to recover if he survives. Only because of a statute especially concerned with such beneficiaries do they have any cause of action at all. It does not seem arbitrary, therefore, to condition the right to recover under the wrongful death act on establishment by the deceased himself of a right of recovery for his own injuries based on the defendant's negligence, even though the amount of damages is determined on a different basis in the two cases. The only difficulty with this suggestion will be when the only recoverable damage is shortened life span, and our recommendation is that the victim not be allowed recovery for this item. In such case perhaps he or the beneficiaries

should be forced to sue soon after the exposure to establish the defendant's liability. Under the usual statute of limitations this situation would arise under these suggestions only if the injured person lives longer than at least a year and more typically two or three years after the injury occurred.

A difficulty still exists if the defendant is willing to admit liability, at least in a compromise situation, and settles the claim with the injured plaintiff. If the two causes of action, for the injured plaintiff and for the injured beneficiary, are separated as suggested here, there is the question of how to determine the amount of damages and the persons to whom recovery should go for the premature death with consequent loss to the group of beneficiaries protected by the wrongful death statute. Here again settlement of their rights and preservation of any award could be entrusted to the injured plaintiff on the assumption that he will make it available on his death anyway.[580] On the other hand, the rights of beneficiaries could be kept separate and recovery delayed until the injured party dies, again with an arbitrary time limitation of a decade or so, if a longer period is administratively unsound or at least unsatisfactory to the insurance companies. One other possibility is to guess who the beneficiaries will be at the time the victim is expected to die and allow settlement with them, with appointment of a guardian for those not yet in existence or underage, if this seems necessary. Our recommendation is that the settlement be with beneficiaries separately or with their guardians *ad litem*.

If the two interests are separated, the rule that any action of beneficiaries under wrongful death acts is lost if the injured plaintiff lives until he has recovered judgment would be changed.[581]

(e) Conclusions

Shortening of life expectancy cases are certain to result from exposure to radiation according to present scientific theory. Present damage theories as applied to this subject must be re-evaluated. Under existing rules results often will be unjust because the cases are likely to be of the kind that gives the most trouble under existing law. The proper solution should be determined before too many cases arise. Lawyers and their clients should see that a comprehensive and fair statutory scheme is enacted.

[580] This seems to be an assumption approved in a somewhat different way by the writer of the comment in 22 U. of Chi. L. Rev. 505, 512 (1955).

[581] See Annot., 39 A.L.R. 579 (1925); Annot., 99 A.L.R. 1091 (1935); 22 U. of Chi. L. Rev. 505, 513 (1955); and arguments pro and con in Southern Bell Tel. Co. v. Cassin, 111 Ga. 575, 36 S.E. 881 (1900).

f. Other Types of Damages

In addition to the items of damages already discussed, certain others involving some psychological or emotional disturbance features may arise in radiation situations. They are sufficiently different from the most closely analogous problems arising in the usual tort case to warrant brief mention.

(1) Inability to Continue in Nuclear Work

One of the situations that may arise is the exposure of an individual to the maximum permissible level of radiation beyond which there exists a serious risk of injury, although as yet there are no observable disabling physical manifestations. This most likely would happen in connection with employment in nuclear activities, and also could occur in other tort liability situations. For example, a nuclear physicist or engineer through the negligence of a doctor might be exposed to sufficient radiation to make it unwise for him to continue to work in an environment where he is exposed regularly even to small doses of radiation, or where there is a chance of an accidental exposure of significant proportions. A similar problem could arise in connection with an accident which discharges radioactive material over a populated area and exposes to a fairly high level of radiation, a nuclear engineer, who at that time, is not engaged in his occupation. The amount of exposure could be such that there would be no present physical disability and hence no injury in the ordinary sense. Yet, if this person is to take normal advantage of his experience and training, he must work in situations where somewhat greater than normal risks of exposure to radiation are involved. If it is inadvisable for the worker to continue in his chosen field, can he recover damages for the inability to do so, or can he recover for the necessity of changing occupations which may mean undertaking a long period of training in an educational institution and perhaps an additional substantial period for practical experience?

It is generally agreed that in any suit for compensation for personal injury, one of the elements of damage is impairment of earning capacity.[582] There are many cases in which this item has been allowed,[583]

[582] Harper & James 1316 ff.; McCormick 299 ff. See also 15 Am. Jur., Damages §88 (1938).

[583] See, *e.g.*, Birmingham Elec. Co. v. Cochran, 242 Ala. 673, 8 So.2d 171 (1942); Barger v. Jimerson, 130 Colo. 459, 276 P.2d 744 (1954); Moe v. Alsop, 189 Ore. 59, 216 P.2d 686 (1950); Trombetta v. Champlain Valley Fruit Co., 117 Vt. 491, 94 A.2d 797 (1953). Cases are usually found in West Digest System under key number Damages 38.

but the recent case involving Maureen Connolly, the famous young woman tennis champion, illustrates as well as any the willingness of courts to sustain a very substantial award by the jury for loss of earning capacity, in this case for $95,000.[584] Her injury prevented her from continuing her tennis career from which she could expect, on the basis of actual offers for the coming year, anywhere from $30,000 to $75,000, if she would turn professional. While the award included present pain and suffering and possible future suffering from the loss of blood supply to her foot, it is clear that the major item of recovery was for the loss of expected earnings. In upholding the jury's verdict as not excessive, the court said:

> Loss of earning power is an element of general damages which can be inferred from the nature of the injury, without proof of actual earnings or income either before or after the injury, and damages in this respect are awarded for the loss of ability thereafter to earn money.[585]

Where there is a present observable injury to the plaintiff in cases of overexposure to radiation, it would seem clear that one of the items of damages which the jury could award would be lost earning capacity, if the radiation of the plaintiff actually makes it impossible for him to earn as much after the accident as before. This kind of situation would seem to be covered by the general rule, although the measurement of this item is difficult.

In all of the cases decided up to the present time there has been an actual, present physical impairment which to some extent observably reduced the ability of the plaintiff to carry out with former ability the job he had been doing before the accident. No case has been found dealing with a situation in which recovery was allowed for lost earning capacity simply because it would not be wise from the standpoint of plaintiff's health to continue the work for which he had been trained.

Under the language ordinarily used by the courts in defining the term "personal injury," it would not be difficult in radiation cases to find that a person who has been irradiated even to a small degree has received an "injury." An early Massachusetts opinion defines "injury" about as well as any:

> In common speech the word "injury," as applied to a personal injury to a human being, includes whatever lesion or change in any part of the system produces harm or pain or a lessened

[584] Connolly v. Pre-Mixed Concrete Co., 49 Cal.2d 483, 319 P.2d 343 (1957).
[585] *Id.* at 489.

> facility of the natural use of any bodily activity or capability.[586]

This broad definition of injury literally covers a person who has been exposed to any significant amount of radiation, because present scientific opinion holds that even small amounts of radiation either destroy body cells or at least reduce their ability to divide and replace themselves.[587] This might serve as the necessary injury upon which to base the item of impaired earning capacity.

The difficulty with accepting this analysis is that, in awarding damages for impairment of earning capacity resulting from "personal injury," the statements of the courts have been made in cases in which there was an observable impairment of a physical function which itself created a physical disability to continue activities previously carried on by the plaintiff. From this it certainly could be argued that "personal injury" means that which is itself compensable in a tort action, aside from the lost earning capacity. Therefore, such cases are not direct support for recovery where there is no disability in the ordinary sense and where the only significant loss that can be measured in pecuniary terms is the lost earning capacity resulting from the necessity of changing professions in order to avoid the health danger created by further exposure. The presence of an actual physical impact and some impairment of bodily functions, however, will give a court the necessary foundation to support an action for lost earning capacity, if it feels some physical injury to the plaintiff is a necessary prerequisite to allowing such recovery. Actually the policy question is the same whether or not we find a presently observable change in bodily functions, so long as it is found that no further work in the nuclear energy area should be carried out by the particular plaintiff. The question really is: As a matter of social policy, should recovery be allowed in such cases? So stated, it is difficult to justify denial.

The only cases found which are in any way closely analogous to the situation here posed are the allergy cases arising in connection with workmen's compensation claims.[588] In *Arkansas Nat'l Bank of Hot Springs* v. *Colbert,* the Arkansas Supreme Court affirmed the commission's award for a "disability" arising from dermatitis caused by contact with nickel and carbon, and also approved the modification of the award by the circuit court to make the disability a "permanent, total

[586] Burns's Case, 218 Mass. 8, 12, 105 N.E. 601 (1914), cited in 1 Larson, Workmen's Compensation §42.11 (1952) as the best definition of "injury" found.

[587] *Infra* note 1090.

[588] See Larson, *supra* note 586 at §41.60.

disability." [589] The claimant had worked many years as a cashier for business houses and finally for the employer bank for whom she was working at the time the dermatitis became acute. The condition finally forced her to resign. The court found that the allergy was caused by "dust" coming from the nickels and from carbon paper and that this made it a disabling injury from an occupational disease within the terms of the workmen's compensation act. The court stated that the act should be liberally construed, provided compensation was to be paid to an employee actually disabled. The court upheld the finding of permanent disability even though the dermatitis seemed to clear up completely when the claimant stayed away from coins and carbon paper. Yet, whenever she returned to a setting where these were present the dermatitis reappeared.

A similar result was reached in *LeLenko* v. *Wilson H. Lee Co.*, where a linotype operator developed dermatitis from an allergy to the antimony coming from the molten metal used in the linotype operation. Here again this allergic dermatitis was held to be an "occupational disease." [590] This apparently is a usual result in compensation cases, though it must be remembered that frequently such awards are made on a more liberal basis than if similar questions are raised in ordinary tort cases.[591] If the inability to continue work in a given profession is proved, however, there seems to be no reason why it should not be a compensable injury under tort rules as well. The effect on the worker will be the same in either case.

The *LeLenko* case did not deal specifically with the problem of alternatives open to the claimant to earn a living in some other occupation but the statement of facts is such as to permit this assumption. In the *Colbert* case the court was faced with a specific argument by the employer that since the claimant was "an unusually intelligent woman, with a pleasing personality, she should be able to secure remunerative employment in some other business or profession." [592] The court answered this argument by showing that there was no finding in the testimony that she could secure such employment, and that there were very few occupations open to women, especially of her age and training. It seems to be true that where compensation is claimed for loss of earning capacity in the ordinary tort case the defendant has the right to reduce the amount of the award by the amount that the plaintiff could reasonably or

[589] 209 Ark. 1070, 193 S.W.2d 806 (1946).
[590] 128 Conn. 499, 24 A.2d 253 (1942).
[591] *Supra* note 588.
[592] *Supra* note 589 at 1074.

actually earn during a period of less than total disability and most jurisdictions follow the same rule in workmen's compensation cases.

The ordinary worker whose job does not require any very special technical training or extensive education surely will be treated like the truck driver or seamstress whose foot injury made it difficult to continue the same occupation but does not really decrease substantially the ability to perform a similarly remunerative task.[593] There will certainly be employment of this sort in atomic energy and under such circumstances this element of damages can be minimized.

The problem may not be nearly so simple for an experienced nuclear engineer who has had as much as seven or more years of college training preparing him for his career. It may be that such a person could find an administrative position where his exposure to radiation would be nil and which would be just as remunerative. It is also possible that such a person could return to college and pursue another profession if he were willing to spend the necessary time and effort to earn a graduate degree. His age might seriously prejudice his chances to make a name for himself and to get an equally rewarding position. The only fair conclusion would seem to be, therefore, that such injuries be compensated, even though no presently observable physical injury has manifested itself. There is no reason, however, to go as far as the court did in the *Colbert* case in allowing this kind of injury to be treated as a total disability. Aside from the expense to society it would seem poor social policy to encourage a person so injured to remain idle instead of finding other types of employment. His age, training, and experience and the feasibility of shifting profession of course should be taken into account in determining if he will be able to find an equally remunerative job. The period of time required to prepare for a new occupation and the money lost while attaining an equal position should be included.

Our conclusion, therefore, is that recovery for the type of injury here posed should be allowed even though there is no presently manifested injury. This assumes that there has been proof of the fact that the plaintiff has received exposure up to the point where it is not safe for him to continue in work where the risk of exposure to radiation is somewhat greater than normal.

[593] 4 Restatement, Torts §924 (1939); McCormick 308, n. 40 and cases there cited. See Trombetta v. Champlain Valley Fruit Co., *supra* note 583, where a $50 a week truck driver could not show loss of earning capacity from a $10 a week job he took, partly to satisfy his obligations to his father. For workmen's compensation rule see 2 Larson, *supra* note 586 at §§57.53, 57.61, 58.00.

(2) Psychological Injuries

Because the general public's introduction to radiation injuries has been through atomic bombs, beginning with the destruction of Nagasaki and Hiroshima and continuing to the present concern about fall-out from the nuclear tests, atomic energy and radiation have a fearful connotation for most people. Added to this is the fact that the science is of relatively recent development and is mysterious to the layman because radiation cannot be felt, seen, heard, or tasted. This is the very situation where the psychological reaction of a person who has been or thinks he has been irradiated probably will assume rather great proportions. The whole problem of mental or emotional disturbance is one that has given the courts considerable concern and the movement certainly is in the direction of giving greater recognition to this type of injury as more is learned about the workings of the human mind.

For the purpose of discussing radiation injury cases as they involve mental disturbance, the present state of the law can be fairly summarized as follows:[594] (1) Where there has been an actual physical impact on the plaintiff by a force set in motion by a negligent defendant (and the impact need not be at all substantial),[595] recovery may be allowed for mental disturbances, such as fright, pain, suffering, and similar types of mental anguish.[596] (2) While in some jurisdictions it is still necessary to find a physical impact of some kind,[597] the trend in recent cases clearly is in the direction of allowing recovery for mental disturbance where there is no physical impact, so long as the mental disturbance manifests itself in some physically observable way, such as a traumatic neurosis.[598] (3) If the only psychological injury is one that could not

[594] See generally Prosser 176-82; Harper & James §18.4, and articles listed by each. See particularly Smith & Solomon, "Traumatic Neuroses in Court," 30 Va. L. Rev. 78, 164 (1943); Smith, "Relations of Emotions to Injury and Disease: Legal Liability for Psychic Stimuli," 30 Va. L. Rev. 193 (1944).

[595] *E.g.*, see Porter v. Del., Lack. & W.R.R., 73 N.J.L. 405, 63 Atl. 860 (1906) (dust in plaintiff's eyes). See cases collected in Smith & Solomon, *supra* note 594 at 164 and Appendix A at 159. See also Prosser 178-79, n. 7-12.

[596] Prosser 178; Harper & James 1032. See particularly, Alley v. Charlotte Pipe & Foundry Co., *supra* note 449, where the fear was danger of cancer; Kimbell v. Noel, 228 S.W.2d 980 (Tex. Civ. App. 1950) (same).

[597] Prosser 178-79; Harper & James 1032-34. See statement of the New York rule in Hugo v. Wade, 160 N.Y.S.2d 534 (1957).

[598] *Ibid.*: *e.g.*, Williams v. State, 126 N.Y.S.2d 324 (1953) *aff'd* 134 N.Y.S.2d 857 (1954) (fright from threats of convict who escaped because of defendant's negligence); Colla v. Mandella, 1 Wis.2d 594, 85 N.W.2d 345 (1957) (fear from possible impact with defendant's truck, citing Prosser 178-79, Harper & James 1033-34); Sutton Motor Co. v. Crysel, 289 S.W.2d 631 (Tex. Civ. App. 1956).

be reasonably foreseen if the plaintiff were a person of average constitution, including average emotional stability, the defendant has not breached the required standard of conduct and, therefore, is not negligent and not liable. If the defendant, however, acted unreasonably with respect to the average person, he will then be liable for all of the results that flow from this action, even though the plaintiff can be shown to have been peculiarly vulnerable to this kind of psychological stimulus.[599] This is similar to the "thin skull" cases in which damage more severe than would have been expected results from defendant's negligence because the plaintiff was peculiarly susceptible to injury from this kind of force.[600] Whether or not the defendant was negligent in the action from which psychological injury results is to be tested by a person of average constitution;[601] and in determining if the plaintiff's fears were reasonable under the circumstances, the test is what a reasonable layman in a similar situation would have thought and done, not what a scientist would know to be the actual danger.[602] (4) Where the only result of defendant's negligence is mental disturbance without any accompanying physical symptoms, there is general agreement that recovery is not allowed.[603]

Here again radiation exposure situations will call for a reexamination of the underlying assumptions of damages rules; for it is apparent that there has been a lack of clarity in analysis, certainly on the part of courts, and it would seem even on the part of legal writers. There has not been sufficient recognition of the real need for relating and reconciling the rules controlling breach of the standard of conduct, those controlling the kind of recompensable injuries flowing from negligent actions, and those

[599] Smith, *supra* note 594 at 256-61. The cases cited clearly support the conclusion drawn.

[600] 2 Restatement, Torts §461 (1934); Smith, *supra* note 594, particularly at 260, n. 200. See, *e.g.*, Owen v. Dix, 210 Ark. 562, 196 S.W.2d 913 (1946); Nelson v. Black, 266 P.2d 817 (Cal. App. 1st Dist. 1954); Sterrett v. East Texas Motor Freight Lines, 150 Tex. 12, 236 S.W.2d 776 (1951); Oliver v. Yellow Cab Co., 98 F.2d 192 (7th Cir. 1938); Offensend v. Atlantic Ref. Co., 322 Pa. 399, 185 Atl. 745 (1936); dicta of Judge L. Hand in Pieczonka v. Pullman Co., 89 F.2d 353, 357 (2d Cir. 1937): "We do not forget that if a victim is so susceptible that the tort starts up a disease, or exacerbates his suffering, as it would not have done in the case of a normal man, he may recover in full, no matter how unlikely the result." See also Coover v. Painless Parker, Dentist, 105 Cal. App. 110, 286 Pac. 1048 (1930) for item of nervousness from X-ray burns.

[601] Smith, *supra* note 594 at 259.

[602] *Id.* at 265. *Cf.* Ferrara v. Galluchio, 176 N.Y.S.2d 996, 152 N.E.2d 249 (1958), in which $5,000 was awarded for severe cancer-phobia because of the possibility of cancer developing.

[603] Prosser 180; Harper & James 1031-1032; Smith, *supra* note 594 at 227-28.

which determine the persons protected when somewhat unusual results follow, particularly in psychological injury cases.

Applying the above principles to radiation situations, even in those jurisdictions which require impact before there can be any recovery at all, it would not be difficult to show scientifically that irradiation has a physical impact on the exposed person.[604] In those jurisdictions which do not require a physical impact the problem does not arise. If existing rules are applied with strict logic, whatever mental anguish would be suffered by an average layman when told that he had been irradiated would be a compensable injury even though in fact there was no basis in scientific knowledge for fearing a noticeable physical consequence from the amount of radiation received. Yet this would actually be quite like a case in which the only real impact on the victim is a psychological one, the very case in which under existing case law recovery would be denied.

Moreover, if the scientific conclusion that impact from radiation causes some kind of physical injury is accepted, then, applying existing rules with strict logic, mental anguish would be compensable even if the victim exposed had an unreasonable fear of injury. The mental anguish is a permissible item of damages when there is impact and at least some physical injury. There would be a finding of breach of duty owed by the defendant to the plaintiff which caused a physical injury, although not one the plaintiff would feel other than psychologically.

If there is a purely psychological injury (in the sense that scientists feel there is no real risk from the small amount of radiation received) but some laymen reasonably might fear injury in spite of scientific opinion, the present writers feel that recovery should be denied so long as there are no real physical manifestations resulting from the fear itself. Even under existing rules, if there are actual physical manifestations of the fear such as some kind of traumatic neurosis, then the injury suddenly becomes more acceptable to the law and recovery may be allowed. Also, if there is actual physical impact, recovery is allowed for even unreasonable emotional reactions. On the other hand, if there is only a disturbance of mental tranquility, and we assume that a minor irradiation is not an impact, then laymen who reasonably fear for their future health would not be allowed recovery.

It is submitted that these conclusions amount to an illogical mixture of the "thin-skull" doctrine with psychological injury principles. It becomes somewhat ridiculous to use the average layman to determine whether or not the defendant was negligent, but any neurotic layman

[604] *Infra* note 1090.

to test the extent of injuries. At least where radiation levels are low so that the impact really is only a psychological one, perhaps the standard used in determining negligence ought to be whether or not the defendant was negligent in the sense that the radiation released might cause a person of average mental stability to have fear and concern for his future health. Liability for mental disturbance should not be determined by whether or not the defendant was negligent in the sense that he created an unreasonable risk of *physical* harm of a kind which did not actually result. The rule of recovery should not be changed when the damage question is reached. There should be no allowance for harm resulting from the fact that the exposed person is peculiarly neurotic. When courts assert that a negligent wrongdoer can be held liable for all of the injuries which are the proximate result of defendant's negligent action, using the "thin-skull" philosophy, they are *assuming* the answer to the question that should be faced and answered on the basis of social policy.

A recent California appellate decision well illustrates the kind of results that can follow from mixing the "average person's reaction test" to determine breach of duty, and the "thin-skull liability for all consequences test" to govern the extent of damages. In *Nelson* v. *Black*[605] the plaintiff's neck was injured slightly when his truck was hit in the rear by defendant. The injury seemed quite minor at the time. Shortly after leaving the scene of the accident he noticed that his neck was hurting badly and went to his doctor. Over a period of months he had symptoms of serious pains and headaches that were hardly attributable to the initial jolt and injury to his neck. The jury found for the defendant, but the appellate court reversed, stating that under the evidence the plaintiff should recover since the defendant's medical expert testified that the pain and suffering were real, even though they were not caused by the injury itself but because of a psychoneurosis under which plaintiff was suffering at the time of the accident. The court said:

> It is admitted that the collision actually occurred and even if plaintiff suffered no actual physical injury as a result of the collision the effect on his nervous system testified to by defendant's only witness on the subject was none the less compensable.[606]

In so holding, the court very clearly was assuming that the only reason for the suffering and pain was the "pre-existing quality of the emotional

[605] *Supra* note 600. See also as possibly involving such neurotic injuries, Flood v. Smith, 126 Conn. 644, 13 A.2d 677 (1940), apparently applying the "thin skull" doctrine whether the preexisting condition is "physical or nervous."

[606] Nelson v. Black, *supra* note 600 at 819.

stability of his personality." The court then stated the usual rule that the tortfeasor must take the person whom he injures as he finds him and even if this includes susceptibility to greater than normal damage the defendant still is not exonerated. The court said that in California this rule applied even in cases where the susceptibility was caused by mental instability.

A similar case is *Purcell* v. *St. Paul City Ry.*[607] in which the plaintiff suffered a miscarriage allegedly from fright resulting when the car on which she was riding seemed about to collide with another cable car, although it did not actually do so. The court said that so long as there was a physical manifestation of admittedly only mental shock (no impact) there still could be recovery.

> In such a case, though there comes, as an intermediate cause between the negligence and injury, a condition or operation of mind on the part of the injured passenger, negligence is nevertheless the proximate cause of the injury.[608]

Although proximate cause often is referred to as the reason for decision in these cases, it really is little more than a conclusion that social policy dictates that this particular type of injury should or should not be compensable. The policy question should be faced squarely and a decision made as to whether or not this kind of recovery should be allowed. It was reasonable in *Nelson* v. *Black* to expect or foresee an injury to the plaintiff's neck if his car was bumped sharply from the rear. It is not reasonable to foresee that a particular plaintiff will be a psychoneurotic person who from such a slight impact will suffer unusually severe reactions. One wonders whether it is socially justifiable to conclude under these circumstances, because an unusual risk of one kind is foreseeable, that another kind of damage should be compensable. In this sense the *Nelson* case differs from the *Purcell* case, because many persons on the cable car undoubtedly had real fear of impact, although actually none took place. The fear undoubtedly would be normal to any person, not just to an especially neurotic one. Therefore it might be said that it was reasonably foreseeable that there would be a psychological shock from the impending accident. Even in the *Purcell* case the application of the "thin-skull" rule where the only impact is a mental one seems somewhat questionable, since it can be argued that the only reason there was any damage was because of the special condition of one of the passengers. In one sense it is always foreseeable that anybody

[607] 48 Minn. 134, 50 N.W. 1034 (1892).
[608] *Id.* at 139.

who comes within the line of force negligently set in motion by the defendant may have some special condition which will make the injuries particularly damaging. Whether or not to allow recovery for the particular injuries as a matter of social policy cannot be answered by this kind of foreseeability because the result is always foreseeable by hindsight, and in most cases can be foreseen ahead of time if a person is imaginative enough and thinks of enough possibilities.

In analyzing the policy question involved in radiation cases in which mental disturbance occurs several different situations must be considered. First, some cases will involve actual physical injuries of a compensable character resulting from the physical impact of the radiation. Other cases will arise in which a physical symptom manifests itself and is very real to the victim but has not been caused by the physical impact of radiation and is rather the result of the psychological reaction of the victim. Still others will occur in which the only manifestation is mental anxiety and loss of general peace of mind. The latter can arise both when there is other physical injury and when there is none. One must remember also that the uninformed average person as well as the seriously neurotic may experience a psychological reaction leading to real physical symptoms in situations in which a scientist would feel that there was no danger of actual physical injury from radiation exposure. It also is true that preventing fraudulent claims for psychological injuries is not easy. The decision as to whether or not to allow recovery in any case, however, should turn on the question of what damages society should charge to a person who has acted negligently in some respect and who is handling a substance of great social value but which presents some risks of injury.

If actual recoverable physical injury results from irradiation, the *Nelson* case rule would permit full recovery for all physical manifestations of psychological origin no matter how neurotic and unreasonable the disturbance was. This is an unwarranted extension of the "thin-skull" cases and should not be carried over into the psychological reaction cases. Such claims in radiation cases are likely to arise and recovery should be permitted only if a person of normal emotional stability would have suffered the injury.

If a person using a radiation source is negligent, he should be held accountable for any *physical* injury it causes, even to the person unusually sensitive to radiation. This is the "thin-skull" situation. It is submitted that this result should not be applied where the *only* injury is because of purely psychological reactions. The courts could hold, though they should not, that there has been physical impact which killed a few

cells; they should treat them as purely psychological injury cases. If so, the person who is unusually neurotic will not be allowed to recover under existing case law.

The most difficult case of all is that in which the layman of normal emotional stability would suffer anxiety if he reasonably feared he had been exposed to radiation and its serious consequences, even though the nuclear expert would feel confident that the person should not be concerned. Under the *Purcell* case, recovery for any physical symptoms would be permitted. Applied to the case of an accident in which many persons are seriously exposed and many others just slightly, and it is impossible for the public to know who was exposed to what extent, a tremendous number of claims could arise. If recovery for psychological injuries is permitted, this would prejudice the possibility of compensating fully those with actual physical injuries who also have a claim against available funds. Allowing recoveries for purely psychological injury to all persons frightened in this situation seems doubtful social policy.

If some radiation in excess of permitted levels is released but not enough to result in physical harm so long as it is not repeated, it may be questionable policy to allow recovery for all who as a part of the uninformed public reasonably fear some physical result. The standard of conduct required of the non-negligent operator is purposely set very low so that an accumulation over a period of years will not cause injury. It may be negligent to release any more than this amount but if it happens only once no real harm can result. Perhaps recovery should be denied for even physical symptoms resulting from the public's uninformed psychological reaction to news that excess radiation has been released. The alternative is to be sure the public does not know of the incident but this is worse social policy because it may prevent a person with a legitimate claim for a physical injury from knowing that a particular source of radiation may be responsible. So long as the exposure was not intentionally caused, even though the defendant has been negligent, it seems questionable social policy to allow recovery to a large number of persons or to a single person simply because he fears injury rather than actually experiencing it, real though his symptoms may be to him.

(3) Lost Business Profits and Proximity of Atomic Installation

Most of the lost business profits cases that will arise because of release of nuclear radiation should create no unique problems for the courts.

The problems in this area are not easily resolved and the answers are not clear for all cases, but there is adequate analysis available.[609] For the most part atomic energy cases will fit into the present pattern of rules concerning damages.

In general the courts have been reluctant to allow recovery for lost profits where a business is interfered with and is damaged solely because of the negligence of the defendant rather than because of intentional action on his part. On the other hand, as discussed above, if persons have been injured physically, loss of earning capacity is a compensable item;[610] and when personal property or realty has been damaged so as to prevent its use in carrying on business operations, a recovery for the lost value of the use of the property is permitted, at least to the extent of normal profits, although a particularly profitable arrangement may not be compensated.[611]

Many cases can be found in which a general statement is made to the effect that a destruction or interruption of a business, or an injury to a business operation, caused by the wrongful act of another is a proper element of damage.[612] The cases do not depend on whether the action was in tort or contract, but nearly all involve what might be called intentional interference, although there are a few in which the loss was caused by negligence. The proof of the amount of profits lost, whether past or anticipated, is not always easy and the burden of proof, of course, is on the plaintiff.[613] Some courts hold that anticipated profits are sufficiently certain to permit recovery only if they are derived from an established business, not a new one.[614] Most of the cases involved losses because of physical injury, and where the operation of an atomic energy facility actually causes damage to the property of the business by radioactive fall-out, there is no reason to apply any different rule than in other kinds of cases. The results should be the same.

One somewhat unique situation may arise, however, from the use of

[609] See discussions in McCormick §§28-30; Prosser §106, particularly at 732-35; Harper & James §§6.10, 6.11, 25.3.

[610] See discussion of lost earning capacity, *supra* note 582 ff.

[611] See discussions cited *supra* note 609.

[612] See, *e.g.*, Jacob v. Miner, 67 Ariz. 109, 191 P.2d 734 (1948); Yates v. Kuhl, 130 Cal. App.2d 536, 279 P.2d 563 (1955); Bashore v. Publix Shirt Corp., 370 Pa. 142, 87 A.2d 468 (1952); United Construction Workers v. Laburnum Construction Corp., 194 Va. 872, 75 S.E.2d 694 (1953). See also 15 Am. Jur., Damages §§133-34.

[613] Lockwood Grader Corp. v. Bockhaus, 129 Colo. 339, 270 P.2d 193 (1954). See also McCormick §29.

[614] McCracken v. Stewart, 170 Kan. 129, 223 P.2d 963 (1950); Evergreen Amusement Corp. v. Milstead, 206 Md. 610, 112 A.2d 901 (1955); Truscott v. Peterson, 78 N.D. 498, 50 N.W.2d 245 (1951).

radioactive materials involving lost business profits. Will recovery be permitted for damages to plaintiff's business if they result solely from the psychological effect of the presence of the nuclear activity? Very few cases and little discussion of this type of injury is to be found and the answer to the question is not at all clear. Yet, at least until the general public learns more about nuclear installations and radiation hazards, such situations are likely to arise frequently in the vicinity of large atomic energy facilities.

Even though there has been no accident or release of radioactive material affecting surrounding property, the mere presence of a reactor or similar installation may depress land value, whether the land is used for business or residential purposes, in the surrounding area. It is possible that patrons of a business may cease to deal with the plaintiff because of the fear generated by his proximity to the reactor. This could involve reducing the ability of the employer to hire employees to work so close to a reactor, or it could involve a loss of patronage of the general public as might be the case with resort hotels, schools, and mercantile establishments so dependent upon the patronage of the public for success. It is quite possible that public apprehension alone, even though it has no scientific basis, may be enough to damage seriously the plaintiff's business operations. Should the school or the resort owner be allowed to prove that the public, whether ill-advised or not, stayed away because of the presence of the reactor?

Cases in which the interference with a business results from libel or slander which destroys the confidence of the public are not directly applicable because such statements are made knowingly, usually with the express purpose of injuring the plaintiff's business—*i.e.,* they are intentional torts. In the case of the reactor or other atomic energy facility, not only would there be little likelihood of proving an intent to injure the plaintiff's business but the operations probably would be licensed and therefore approved by the AEC, such approval being granted only after a finding that public health and safety are not substantially endangered.

The only cases that seem at all analogous are those involving the maintenance of a nuisance. Whether a nuisance is the kind of wrong for which damages for interference with business profits would be permissible is not easy to answer. The general subject of nuisance has been thoroughly discussed by text writers.[615] A determination usually is based on a balancing of "the gravity of the harm against the utility of

[615] Prosser ch. 14; Harper & James §§1.23-1.30. See also discussion *infra* Chapter IV on strict liability.

the defendant's activity in the light of the suitability of the area for the respective competing uses." [616] There also are cases in which "conduct producing apprehension or fear of physical danger may, if the fear is extreme, be sufficiently annoying to amount to a nuisance, as the storing of powder or high explosives in large quantities in a thickly populated portion of a city, or the maintenance of a hospital for persons afflicted with contagious diseases in a residential section." [617]

The types of cases coming closest to the matter here under consideration are those supporting the statement by Prosser to the effect that "Fears and feelings common to most of the community are to be considered; and the dread of contagion from a pesthouse, common to ordinary citizens, may make it a nuisance, although there is no foundation in scientific fact." [618] The hospital cases supporting this statement are as close as analogy to the reactor situation as can be found. In each situation there is apprehension, although an apparently unreasonable one from a scientific standpoint, that harm will result from the kind of activity being carried on nearby. Fear of harm from bacteria in the hospital cases produces a psychological effect similar to the concern about harm from radiation in the case of reactors; both are little understood by the general public.

In *Stotler* v. *Rochelle,* typical of these cases, the court said:

> The question is not whether the establishment of the hospital would place the occupants of the adjacent dwellings in actual danger of infection, but whether they would have reasonable ground to fear such a result, and whether, in view of the general dread inspired by the disease, the reasonable enjoyment of their property would not be materially interfered with by the bringing together of a considerable number of cancer patients in this place.[619]

The fear in this case was caused by the presence of cancer patients. As Prosser points out in his discussion,[620] there are decisions to the contrary where an injunction against the alleged nuisance was refused

[616] Harper & James 74.

[617] *Id.* at 77.

[618] Prosser 396-97. The undertaking establishment cases are not the same for it is not fear of physical danger but generally depressed feelings from closeness to death which is complained of in those cases. See 39 A.L.R.2d 1000 (1955). Radioactive wastes stored in a Pennsylvania community caused enough public concern, apparently unjustifiably, that they were removed. BNA, Atomic Industry Rep. 4:322, 4:382 (1958).

[619] 83 Kan. 86, 91, 109 Pac. 788 (1910). Similar statements are found in the cases cited by Prosser 397, n. 78.

[620] Prosser 397.

when there was no showing that there was an actual existing danger.[621] It is interesting to note that the decisions denying relief are the most recent of all those found, and none even dealing with this type of problem have been found since 1926. This may result from a change in the general attitude of the public toward hospitals and a better realization of the lack of actual danger involved. Or it may be a recognition that the balance of interest clearly is in favor of the maintenance of such institutions. The difficulty with these cases as analogy for our problem is that they all involve equitable relief rather than damages.

The assessment of damages if a nuisance should be declared is somewhat complicated, but there would seem to be no reason to expect the courts to measure the damages in any unique way in atomic energy cases.[622] Of all the cases that have been examined dealing with the problem of damages for nuisance, only one has been found dealing squarely with the problem of the loss of business profits caused by a nuisance—*Johnson Oil Refining Co. of Illinois* v. *Elledge*.[623] In that case the court allowed the plaintiff to recover the profits from his filling station operations lost through the defendant's maintenance of a nuisance in the form of coke dust which settled on the plaintiff's property. In several other cases the courts have either stated or clearly implied that the loss of business profits was permissible, but in each case the courts have found that the evidence of the loss was insufficient to maintain plaintiff's burden of proof.[624]

The facts of *Central Georgia Power Co.* v. *Pope* [625] come as close as any to our suggested case of loss of business because of the mere proximity of a reactor. The defendant had built a dam and it was alleged that mosquitoes bred in the backed-up water, driving most of the people from the surrounding area. The plaintiff was a store owner who alleged that his very profitable business was almost ruined because his customers were gone. While there is a dictum in the official headnotes that lost business profits might be recovered if a nuisance kept customers from

[621] Board of Health v. North American Home, 77 N.J. Eq. 464, 78 Atl. 677 (1910); Jardine v. City of Pasadena, 199 Cal. 64, 248 Pac. 225 (1926).

[622] See discussion in McCormick §127. For much less complete discussions, see Prosser 416-17; Harper & James 91-92.

[623] 175 Okla. 496, 53 P.2d 543 (1936).

[624] Guttinger v. Calaveras Cement Co., 105 Cal. App.2d 382, 233 P.2d 914 (1951); Bollinger v. American Asphalt Roof Corp., 224 Mo. App. 98, 19 S.W.2d 544 (1929); Harriu v. Great Neck Motors, 143 N.Y.S.2d 472 (1955), *aff'd*, 153 N.Y.S.2d 568 (1956); Shreveport Laundries v. Red Iron Drilling Co., 192 So. 895 (La. App. 1939).

[625] 141 Ga. 186, 80 S.E. 642 (1913).

ingress to plaintiff's place of business,[626] the court denied the claim in this case because the defendant's wrongful act affected the customers, if anyone, and not the plaintiff businessman. The court said that, in actions based upon negligence only, injuries or death of one with whom a plaintiff is doing business is not a recoverable damage to plaintiff.

> It is not pretended that the defendant killed some of the plaintiff's customers, and made others sick, for the purpose of destroying his business. The damages sought to be recovered on this account are too remote. If the plaintiff could recover on this basis, it is not readily perceived why a merchant might not bring an action against a railroad company for loss of custom arising from the death of a good customer caused by its negligence; or why, *if one person should create a nuisance in a neighborhood, which should cause one of the residents to move to another place,* every merchant with whom such person dealt before his removal could not recover because his patronage had been lost after his change of residence. It will be readily seen that *such claims for damages might be extended into almost limitless ramifications.* They do not fall within the rules in cases where property has been physically injured, or there has been some interference with an easement or right connected with or appurtenant thereto.[627]

The court then distinguished the case in which, by a nuisance, plaintiff's place of business itself is rendered so unhealthy or unpleasant as to drive away the customers. In many ways the reactor also involves a neighborhood nuisance situation which keeps customers away, not because of any physical deterioration of the plaintiff's property but because of a psychological fear of the neighborhood generally. So interpreted, the *Central Georgia Power Co.* case stands for no recovery in our psychological nuisance situation—the injury, if any, is to the customers, not to the businessman, or at least his injuries are too remote.

On the other hand, one could argue that the psychological nuisance really is not too unlike the coke dust and other cases in which there is a physical interference with the plaintiff's property, in which case there can be recovery of business profits if the losses are properly proved. He could argue that his own property really has become psychologically unpleasant for customers, not just the neighborhood. If recovery were allowed for this psychological nuisance, the reactor owner would have to compensate all established businesses and all homeowners or others

[626] This is the only authority cited by Prosser 417, n. 91, for recovery of lost profits of an established business, though this statement of the court is apparently dictum.

[627] *Supra* note 625 at 189-90. (Emphasis added.)

with property within a radius limited only by the psychological lines drawn by the imagination of the general public.

No doubt the effect upon the federal reactor program of a state court holding the reactor operator liable for such psychological nuisance damages would be significantly burdensome. This raises the question of the effect on state law of the fact that large atomic energy installations are licensed by the federal government. Are such damages thereby precluded?

(a) Effect of Licensing—Constitutional Questions

Since all the uses of radiation sources which will create a serious possibility of radiation injury (such as reactor operators, fuel core fabricators, companies processing radioisotopes or handling the disposal of radioactive waste material), are now federally licensed and will be so licensed for the foreseeable future, it is important to consider the effect of this program on the possibilities of bringing nuisance suits against such operations. Treatise writers seem to agree [628] that so long as the licensee acts within the terms of the license and does not act negligently or in disregard of the rights of others, his activity cannot be abated on the ground that it is a *public* nuisance. Prosser and also Harper and James, however, state that constitutional principles place a limit on the extent to which legislative authority can immunize the licensee from damage actions by surrounding property owners. They agree in distinguishing between "minor" and "major" [629] or "small" and "great" [630] private nuisances. The cases cited in the two treatises to support their conclusions are in point, but not only are all of the cases rather old,[631] a fact which makes them particularly unreliable authority in constitutional law matters, but also the terms "minor-major" and "small-great" are not very helpful, even if they can be considered as accurately descriptive. Actually the problem is one of a balancing of interests, in which case the distinction is not between how great or small is the inconvenience to surrounding landowners, but rather it becomes a matter of determining how much of an inconvenience it is balanced against the general desirability of allowing or encouraging the particular activity. Certainly many substantial inconveniences have been held to be non-recoverable because the activity was licensed.

The cases that have arisen so far have involved situations in which

[628] Prosser 421; Harper & James 87-88.

[629] Prosser 421.

[630] Harper & James 87.

[631] All before 1904 except for one in 1914. *Supra* note 628.

the licensing authority has been a part of the same government, whether state or federal, whose courts have tried the damage actions arising out of the licensed activity. This will differ from atomic energy operations which are likely to present the problem of psychological nuisance merely from the existence of the reactor, fuel core fabricating plant, or disposal operation. In the atomic energy area only the federal government issues the licenses, but, for the most part, it will be in the state courts that the damage actions will be brought. This, therefore, raises the question whether the federal government, by licensing an activity that would otherwise be considered a nuisance under state law, can immunize the licensee from an action to abate either a public or a private nuisance or prevent a damage action for the nuisance created. There is also the further question whether, assuming the federal power, the Congress in setting up the Atomic Energy Commission with its regulatory power and in providing for government indemnity for legal liability imposed upon licensees, intended to preclude either injunctions against operating or damage recovery for losses occasioned by psychological nuisance. If Congress has attempted to preclude such actions and has the power to do so, state law on this question is unimportant. Actually no state at the present time has a real licensing program for major installations,[632] but regulatory programs are being developed and the problem will become important.

(i) The Power of Congress

The general power of Congress to regulate practically all aspects of atomic energy operations and to supersede state regulation seems clear.[633] But this does not answer the question whether such power extends to the point of withdrawing the cause of action that otherwise would exist in the state courts against the operation of a nuisance. The question whether Congress has the power to preclude an injunction or a damage action in the state court must itself be divided into two questions: Can the federal government encroach upon the power of the state in this connection, and can the federal government encroach upon the rights of individuals not to be deprived of their liberty or property without due process? It is also important to recognize that a different answer might be given in the case of damages from that given when an injunction is sought.

[632] See *infra* Part III, Chapter V, on state regulation and also federal pre-emption.

[633] See Estep, "Federal Control of Health and Safety Standards in Peacetime Private Atomic Energy Activities," 52 Mich. L. Rev. 333 (1954).

Interference with State Power. No cases have been found dealing with the right of Congress to interfere with the exercise of state power so far as federally licensed nuisances are concerned, but surely Congress may do so. Beginning with *Gibbons* v. *Ogden,*[634] where the court invalidated state laws granting a steamship monopoly in New York waters, the court has consistently held that where Congress itself has power delegated to it by the Federal Constitution it may supersede state power in the area even without any expression of congressional intent.[635] This is true even when state regulations admittedly are justified, such as in the field of public health and safety, which traditionally is thought to be primarily the concern of the states.[636] That such federal pre-emption precludes the power of state courts to enjoin action which is illegal under state law is made clear by such cases as *Amalgamated Ass'n of Street, Elect. Ry. & Motor Coach Employees of America* v. *Wisconsin Employment Relations Board,*[637] in which the court held that, in the light of the federal statute, a Wisconsin injunction against a peaceful strike for higher wages was not valid. The court also has held that a state may not revoke an interstate carrier's license even though the licensee was using the state highways repeatedly in violation of the state load limit regulation.[638] So long as Congress is acting within the scope of one of its delegated powers, it does not make any difference that it has an effect on a relationship, such as even marriage, which is peculiarly a state matter.[639] The state power to regulate can be superseded by congressional act.

A most recent example of this power to supersede the jurisdiction of the state, or one of its political subdivisions, is *City of Chicago* v. *Atchison, T. & S. F. Ry.*[640] in which the court held that the city could not force a transportation company carrying passengers between railroad stations in Chicago to get a state license to operate, since the activity was within the power of the national government even though the op-

[634] 9 Wheat. 1 (1824).

[635] See many of the cases discussed *infra* Part III, Chapter V, Section E on federal pre-emption.

[636] See *e.g.,* Leisy v. Hardin, 135 U.S. 100, 10 S.Ct. 681 (1890) (liquor); Southern Pacific Co. v. Arizona, 325 U.S. 761, 65 S.Ct. 1515 (1945) (railroad train lengths); Dean Milk Co. v. City of Madison, 340 U.S. 349, 71 S.Ct. 295 (1951) (milk). See other cases cited in discussion of federal pre-emption question, *infra* Part III, Chapter V, notes 314-53.

[637] 340 U.S. 383, 71 S.Ct. 359 (1951). See also Garner v. Teamsters, Chauffeurs & Helpers Local Union #776, 346 U.S. 485, 74 S.Ct. 161 (1953).

[638] Castle v. Hayes Freight Lines, 348 U.S. 61, 75 S.Ct. 191 (1954).

[639] Cleveland v. United States, 329 U.S. 14, 67 S.Ct. 13 (1946).

[640] 357 U.S. 77, 78 S.Ct. 1063 (1958).

erations of the company took place solely within the boundaries of the city. The court said:

> We are fully aware that use of local streets is involved, but no one suggests that Congress cannot require the City to permit interstate commerce to pass over those streets. Of course the City retains considerable authority to regulate how transfer vehicles shall be operated. It could hardly be denied, for example, that such vehicles must obey traffic signals, speed limits and other general safety regulations. Similarly the City may require registration of these vehicles and exact reasonable fees for their use of the local streets . . . [but] the City has no power to decide whether the Transfer can operate a motor vehicle service between terminals for the railroads because this service is an integral part of interstate transportation authorized and subject to regulation under the Interstate Commerce Act. . . . [The] company was not obligated to apply for a certificate of convenience and necessity and submit to the administrative procedures incident thereto before bringing this action.[641]

One week following the decision in the Chicago case the Supreme Court decided that the state of Washington could not raise constitutional objections to participation by contract by the city of Tacoma in a federal power project, except in a manner provided by federal statute, even though the state court had held that the city had no authority under state law to make such a contract with the federal government against the wishes of the state.[642] A lower federal court had held that a federal statute could give such authority to the city [643] and the Supreme Court had denied review by writ of *certiorari*.[644] The Supreme Court said the decision of the Ninth Circuit Court of Appeals was not subject to collateral attack since the federal statute dictated how objections were to be raised.

On the same date that the Supreme Court decided the Tacoma case, it handed down a decision in a case arising out of a reclamation project being carried out in California jointly by the state and federal governments. The court held that the federal government, in the spending of federal money and in releasing the water collected by the use of federal money, could distribute the water in such a way as to ignore the vested rights, under California law, of landowners to use water for irrigation

[641] *Id.* at 88-89.
[642] City of Tacoma v. Taxpayer of Tacoma, 357 U.S. 320, 78 S.Ct. 1209 (1958).
[643] Washington v. Federal Power Comm., 207 F.2d 391 (9th Cir. 1953).
[644] 347 U.S. 936, 74 S.Ct. 626 (1953).

purposes.[645] These cases show that within its delegated powers Congress is supreme and supersedes state regulatory power.

There seems little question, then, but that Congress has the power, under commerce, war, or disposal of property powers, to supersede state laws to the extent deemed appropriate by Congress and to control the conditions under which licensees may operate in the atomic energy area. Less clear is the power of Congress to wipe out the interest, contract or property, of private individuals which have been affected by the existence or the operation of the facility.

Interference with Private Property Interests. The Supreme Court has dealt with two situations which are fairly analogous to the problem created by the atomic installation. Both of them involved the operation of a railroad and consequent injury to private persons in the neighborhood. In the first case, *Baltimore & Potomac R. R.* v. *Fifth Baptist Church,*[646] the railroad company had been authorized by Congress to build the line together with the necessary buildings such as roundhouses. A roundhouse was erected very close to the plaintiff church, which brought an action asking damages for the discomfort occasioned by the operations. The court held that, because of the legislative grant of authority, any incidental inconvenience which unavoidably followed the use of the street by the trains did not give a cause of action, even though the noise and disturbance attending their use were bothersome. Such incidental discomforts to which all members of the public in the vicinity are subject must be endured for the general good. At the same time, after stating that the railroad company had been unreasonable in the selection of its site for the roundhouse, the court held that the defendant must respond in damages for the special injuries inflicted on the plaintiff by the roundhouse operations.

> It admits indeed of grave doubt whether Congress could authorize the company to occupy and use any premises within the city limits, in a way which would subject others to physical discomfort and annoyance in the quiet use and enjoyment of their property, and at the same time exempt the company from the liability to suit for damages or compensation, to which individuals acting without such authority would be subject under like circumstances. Without expressing any opinion on this point, it is sufficient to observe that such authority would not justify an invasion of others' property, to an extent which would amount to an entire deprivation of its use and enjoyment, without compensation to the owner. Nor could such au-

[645] Ivanhoe Irr. Dist. v. McCracken, 357 U.S. 275, 78 S.Ct. 1174 (1958).
[646] 108 U.S. 317, 2 S.Ct. 719 (1883).

thority be invoked to justify acts, creating physical discomfort and annoyance to others in the use and enjoyment of their property, to a less extent than entire deprivation, if different places from those occupied could be used by the corporation for its purposes, without causing such discomfort and annoyance.

The acts that a legislature may authorize, which, without such authorization, would constitute nuisances, are those which affect public highways or public streams, or matters in which the public has an interest and over which the public has control. The legislative authorization exempts only from liability to suits, civil or criminal, at the instance of the State; it does not affect any claim of a private citizen for damages for any special inconvenience and discomfort not experienced by the public at large.[647]

In 1914 the Supreme Court decided *Richards* v. *Washington Terminal Co.*[648] involving an almost identical situation except that the damages were claimed for diminution of property value of surrounding property caused by the gases and smoke discharged from a long tunnel within the city limits. The court here drew a distinction between the gases and smoke necessarily incident to the usual running of the trains and those collected from the whole length of the tunnel and discharged at one spot in such a manner as to peculiarly affect the plaintiff's property. The court said:

We deem the true rule, under the Fifth Amendment, as under state constitutions containing a similar prohibition, to be that while the legislature may legalize what otherwise would be a public nuisance, it may not confer immunity from action for a private nuisance of such a character as to amount in effect to a taking of private property for public use. . . .

But the question remains, in cases of the class now before us, What is to be deemed a private nuisance such as amounts to a taking of property? And by a great and preponderant weight of judicial authority, in those States whose constitutions contain a prohibition of the taking of private property for public use without compensation, substantially in the form employed in the Fifth Amendment, it has become established that railroads constructed and operated for the public use, although with private capital and for private gain, *are not subject to actions in behalf of neighboring property owners for the ordinary damages attributable to the operation of the railroad, in the absence of negligence.* Such roads are treated as

[647] *Id.* at 331-32.

[648] 233 U.S. 546, 34 S.Ct. 654 (1914).

> public highways, and the proprietors as public servants, with the exemption normally enjoyed by such servants from liability to private suit, so far as concerns the incidental damages accruing to owners of non-adjacent land through the proper and skillful management and operation of the railways. Any diminution of the value of property not directly invaded nor peculiarly affected, but sharing in the common burden of incidental damages arising from the legalized nuisance, is held not to be a "taking" within the constitutional provision. The immunity is limited to such damages as naturally and unavoidably result from the proper conduct of the road and are shared generally by property owners whose lands lie within range of the inconveniences necessarily incident to proximity of a railroad. It includes the noises and vibrations incident to the running of trains, the necessary emission of smoke and sparks from the locomotives, and similar annoyances inseparable from the normal and non-negligent operation of a railroad.[649]

The court proceeded to emphasize that normally such incidental inconveniences as are really necessary are protected by the legislative authority. The court then said:

> The present case, in the single particular already alluded to —that is to say, with respect to so much of the damage as is attributable to the gases and smoke emitted from the locomotive engines while in the tunnel, and forced out of it by the fanning system therein installed, and issuing from the portal located near to plaintiff's property in such manner as to materially contribute to render his property less habitable than otherwise it would be, and to depreciate it in value; and this without, so far as appears, any real necessity existing for such damage—is, in our opinion, within the reason and authority of the decision just cited. . . . The case shows that Congress has authorized, and in effect commanded, defendant to construct its tunnel with a portal located in the midst of an inhabited portion of the city. The authority, no doubt, includes the use of steam locomotive engines in the tunnel, with the inevitable concomitants of foul gases and smoke emitted from the engines. No question is made but that it includes the installation and operation of a fanning system for ridding the tunnel of this source of discomfort to those operating the trains and traveling upon them. All this being granted, the special and peculiar damage to the plaintiff as a property owner in close proximity to the portal is the necessary consequence, unless at least it be feasible to install ventilating shafts or other devices for preventing the outpouring of gases and

[649] *Id.* at 553-54. (Emphasis added.)

> smoke from the entire length of the tunnel at a single point upon the surface, as at present. *Construing the acts of Congress in the light of the Fifth Amendment,* they do not authorize the imposition of so direct and peculiar and substantial a burden upon plaintiff's property without compensation to him. If the damage is not preventable by the employment at reasonable expense of devices such as have been suggested, then plaintiff's property is "necessary for the purposes contemplated," and may be acquired by purchase or condemnation (32 Stat. 909, 916, c. 856, § 9), and pending its acquisition defendant is responsible. If the damage is readily preventible, the statute furnishes no excuse, and defendant's responsibility follows on general principles.[650]

The court then remanded the case to the lower court to solve what it admitted to be a difficult problem of distinguishing between that part of the smoke which was attributable to the gases and smoke necessarily arising from train operations from the gases and smoke issuing from the tunnel.

Applying the rationale of these cases, one might surmise that if the reactor operator, for example, should, through negligence or even without negligence, emit more radioactive material into the air or into a stream than was permitted under the federal license there would be a cause of action in favor of an injured party. On the other hand, any damages that might result from material discharged within the limits set in the license might be called necessarily incident to the normal operation of the facility as licensed by the government. The curtailment or destruction of the business of a resort hotel, housing development, school or similar institution because of the purely psychological nuisance created by public fear of a nearby reactor or other atomic energy facility would seem to be the very kind of damages necessarily incident to the existence of the reactor. The Atomic Energy Commission specifically finds as to each major installation that the site, as well as the operation, will not constitute an unreasonable hazard to the public health and safety.

It is not accurate to describe this as a minor or small loss so far as the plaintiff is concerned. Nevertheless, balancing this admittedly significant loss against the needs of the country for these operations in developing atomic energy, it would seem unwise to allow damage actions which would be a continuing burden on the operation of the nuclear installation. This is true when the AEC has found the operation to be a safe one.

[650] *Id.* at 556-57.

The fact that the *Baltimore & Potomac* and *Richards* cases involve nuisances not within a state but within the District of Columbia (federally owned territory) does not affect the application of the principles to cases arising out of reactors situated in states. So far as its effect on individuals is concerned, the constitutional limitation upon the legislative authority to permit a "nuisance" is the same. It is derived from the Due Process Clause. Since the cited cases are rather old and involve operations of a public utility which was a very necessary part of our economic life, the question naturally arises as to whether the same reasoning would be followed today, not only when the facility is owned and operated by a public utility (although it be an electric utility instead of a railroad), but also in cases involving research or other industrial reactors or other large plants not related to a public utility. Several research reactors are already being operated privately in this country, by both universities and industrial concerns.

No subsequent cases have been found dealing with the problem of governmental authorization of what would otherwise be a nuisance. The attitude of the present Supreme Court must be derived from other types of cases which seem to involve similar policy questions, cases in which the rights of private individuals are interfered with by the government in such a manner as to deprive the person of something of value, whether it be vested or not, by way of a regulation which results in giving some other private person a consequent advantage, such as by the avoidance of a contract or other legal liability. Since there is no specific constitutional provision against federal impairment of contract rights such protection depends upon the Fifth Amendment Due Process Clause protecting liberty and property. Cases in which federal statutes actually have taken away a contract right of some pecuniary value are useful analogies that should be considered along with those cases involving the taking of property rights in the traditional sense.

Under War Power. Some of the cases in which there has been the clearest invasion of a significant pecuniary interest have arisen out of the activities of the government during World War II in the exercise of the war power. The setting of maximum prices on commodities,[651] and on rents,[652] which in each case rolled the prices back from the levels

[651] Yakus v. United States, 321 U.S. 414, 64 S.Ct. 660 (1944). See Aidlin, "The Constitutionality of the 1942 Price Control Act," 30 Cal. L. Rev. 648 (1942); Crenshaw, "Constitutional Aspects of Federal Rent Control," 5 Ala. Law. 442 (1944); Taft, "Rationing as a Proper Wartime Governmental Function," 31 Cal. L. Rev. 270 (1943); Merrill, "The War Power as the Basis for a National Agricultural Program," 17 Neb. L. Bull. 23 (1938); Note, 12 Geo. Wash. L. Rev. 414 (1944).

[652] Bowles v. Willinghan, 321 U.S. 503, 64 S.Ct. 641 (1944).

at the time when the regulations were promulgated, undoubtedly had a substantial pecuniary impact on many individuals, not only prospectively but retroactively as well, since they controlled all goods sold and all rental of property after the effective date of the regulation even though the goods or the rental property had been acquired prior to the passage of the act. The over-all reciprocity of advantage involved in such price control regulations perhaps reduces somewhat the amount of the taking, just as does the reciprocity of advantage in the zoning cases. Another kind of war regulation which may come somewhat closer to an actual taking without any real reciprocity of advantage, except the general and remote one of lower taxes, arose out of the Renegotiation Act which provided for recapture by the government of "excessive profits." The court gave a very short answer to the argument that renegotiating of profits was a taking of property contrary to the Fifth Amendment. It said "Not only was it 'necessary and proper' for Congress to provide for such production [of war material] in the successful conduct of the war, but it was well within the outer limits of the constitutional discretion of Congress and the President to do so under the terms of the Renegotiation Act." [653] The court held that the provisions of the act were applicable to even subcontractors who had no direct relations with the federal government; their contracts also were made subject to recapture of "excessive profits."

Perhaps the clearest case of all in which the government regulations for practical purposes destroyed, for the time being at least, something of considerable economic value to the plaintiffs is *United States* v. *Central Eureka Mining Co.*[654] The government regulations resulted in actual closing of the gold mines during the period of the war. It was claimed that while the government did not actually take possession of any of the gold, it in effect had completely destroyed the plaintiff's economic rights to the gold by preventing all mining of it. While the lower federal court felt that this very clearly was a taking, since it amounted to a complete destruction of the plaintiff's right, the Supreme Court reversed on the ground that any restrictions were temporary in nature and there had been no actual taking of the property.[655] Mr. Justice Harlan dissented on the ground that the property had been taken temporarily.[656]

[653] Lichter v. United States, 334 U.S. 742, 765, 68 S.Ct. 1294 (1948).
[654] 357 U.S. 155, 78 S.Ct. 1097 (1958).
[655] *Id.* at 168-69.
[656] *Id.* at 179.

In each of these cases arising out of wartime regulations very substantial pecuniary loss had been suffered by the plaintiff, but recovery of damages was denied. Certainly in many of the cases, particularly in the gold mine cases, there was as much, if not more, "taking" than would be involved in the loss of patronage by a business due to a reactor's psychological nuisance effect. Undoubtedly the most profitable use of property surrounding a proposed reactor in many cases would be the existing one and this use would be damaged by the psychological nuisance. Yet the land undoubtedly could be used for other purposes of a profitable nature, and it would seem to be no more of a taking than those involved in the cases cited above.

The difficulty with using the war cases, however, is that they are an exercise of the war power. As stated by the court in the *Lichter* case:

> In total war it is necessary that a civilian make sacrifices of his property and profits with at least the same fortitude as that with which a drafted soldier makes his traditional sacrifices of comfort, security and life itself.[657]

As the court put it in the *Eureka Mining Co.* case:

> In the context of war, we have been reluctant to find that degree of regulation which, without saying so, requires compensation to be paid for resulting losses of income. . . .The reasons are plain. War, particularly in modern times, demands the strict regulation of nearly all resources. *It makes demands which otherwise would be insufferable.* But wartime economic restrictions, temporary in character, are insignificant when compared to the widespread uncompensated loss of life and freedom of action which war traditionally demands.[658]

Under Commerce Power. Cases arising under the commerce power of Congress are not subject to the same justification of wartime necessity. Many examples exist of exercise of the commerce power by Congress in a manner that substantially affects the contract or property rights of individual persons. The regulation of maximum hours and minimum wages to be paid persons producing goods for interstate commerce,[659] and the control of the uses to which a farmer can put grain raised on his own land, even to the point of denying him the right to use it to feed his own livestock,[660] are examples of very substantial encroachments upon the liberty and property of individual persons, and

[657] *Supra* note 653 at 754.
[658] *Supra* note 654 at 168. (Emphasis added.)
[659] United States v. Darby, 312 U.S. 100, 61 S.Ct. 451 (1941).
[660] Wickard v. Filburn, 317 U.S. 111, 63 S.Ct. 82 (1942).

the court has upheld such invasions of pecuniary interest as necessary to the control of the national economy. Compensation need not be paid for such invasions. The attitude of the Supreme Court toward regulations based upon the commerce power of Congress is exemplified by the following statements from the opinion in *North American Co.* v. *S. E. C.*,[661] where the Court upheld a decree under the Public Utility Holding Company Act of 1935,[662] even though it forced the breaking up of property holdings of a company acquired over a long period of years.

> This broad commerce clause does not operate so as to render the nation powerless to defend itself against economic forces that Congress decrees inimical or destructive of the national economy. Rather it is an affirmative power commensurate with the national needs. It is unrestricted by contrary state laws or private contracts. And in using this great power, Congress is not bound by technical legal conceptions. Commerce itself is an intensely practical matter. . . . To deal with it effectively, Congress must be able to act in terms of economic and financial realities. The commerce clause gives it authority to act.[663]

Another situation in which there is a real, though perhaps minor, taking of property justified under the commerce power is found in the union shop provisions of the Railway Labor Act. They provide that to keep employment each employee must join the union and pay dues. The power of Congress to impose such a requirement was questioned in *Railway Employees' Dept.* v. *Hanson.*[664] Even though such provisions were apparently contrary to the state constitution, the Court held that whether union shops were good or bad was a policy question with which the courts should not interfere; its determination was for Congress.

> Congress, acting within its constitutional powers, has the final say on policy issues. If it acts unwisely, the electorate can make a change. The task of the judiciary ends once it appears that the legislative measure adopted is relevant or appropriate to the constitutional power which Congress exercises. The ingredients of industrial peace and stabilized labor-management relations are numerous and complex. They may well vary from age to age and from industry to industry. What would be needful one decade might be anathema the

[661] 327 U.S. 686, 66 S.Ct. 785 (1946).
[662] 49 Stat. 803, 15 U.S.C.A. §79 (1951).
[663] *Supra* note 661 at 705.
[664] 351 U.S. 225, 76 S.Ct. 714 (1956).

> next. The decision rests with the policy makers, not with the judiciary.[665]

The Court held that the requirement of financial support by all the workers of the collective bargaining agency was within the commerce power of Congress.

The Commerce Clause case that comes as close as any to holding that very real and substantial pecuniary rights can be prejudiced or taken away in the interests of the national economic policy arose out of the Portal-to-Portal Pay Act which Congress passed to take away the extra pay to which the workers would have been entitled for time spent walking from the gate to the work bench under the Fair Labor Standards Act as it had been interpreted in a previous Supreme Court decision. The workers claimed that their rights had vested and were protected by the Due Process Clause of the Fifth Amendment. The Supreme Court denied *certiorari*,[666] after the circuit court held that there was no violation of the Due Process Clause. The Circuit Court used the following language:

> Plaintiff could not expect that their status or rights would remain unchanged through changing circumstances and conditions. They could reasonably anticipate changes in the law. The proposition that their rights granted by the Congress under the commerce clause could not be taken away by congressional legislation under the same clause, is self-contradictory. Rights secured even by private contract may be abrogated by subsequent legislation when authorized by constitutional provisions.[667]

After holding that the law was not invalidated by being in some respects retroactive since it was only a civil case, the court stated that the validity of the policy was for Congress to decide so long as Congress was not "arbitrary, unreasonable or capricious." [668]

The fact that the cause of action involved rights arising from a statute certainly was emphasized by the court as justifying congressional

[665] *Id.* at 234.

[666] Fisch v. General Motors Corp., 335 U.S. 902, 69 S.Ct. 405 (1949).

[667] Fisch v. General Motors Corp., 169 F.2d 266, 271 (6th Cir. 1948).

[668] *Id.* at 272. See comments on statute in Barnett, "The Portal-to-Portal Act of 1947: Direct and Indirect Impairment of Vested Rights," 27 Ore. L. Rev. 274 (1948); Brown, "Vested Rights and the Portal-to-Portal Act," 46 Mich. L. Rev. 723 (1948); Cotter, "Constitutionality of Retroactive Legislation—the Portal-to-Portal Act of 1947," 34 Va. L. Rev. 26 (1948); Smethurst & Haslam, "'Portal-to-Portal' and Other Retroactive Liabilities," 15 Geo. Wash. L. Rev. 131 (1947); Weinberg & Simon, "The Constitutionality of the Portal-to-Portal Act of 1947 in the Light of the Decisions Affecting Retroactive Legislation in the Supreme Court," 22 Temp. L. Q. 369 (1949); Comment, 47 Col. L. Rev. 1010 (1947).

interference. Yet there should be no distinction between a legal right created by statute, where there is no reservation of a right to change an interest vesting under the statute, and rights created by common law decisions. There is no reason for one who may have relied upon a statutory right to anticipate its modification any more readily than he would expect common law rules governing contracts, property or tort rights to be changed by court decision or by statute. The basic question would seem to be whether the legislature, in carrying out some important national or state legislative policy within its general powers, can affect existing rights to the point of reducing pecuniary values if it seems appropriate and desirable. It is not a case of the government appropriating interests for its own use, as in condemnation cases, but rather of regulating the national economy and, where necessary, infringing upon private contract or property rights which incidentally are in conflict with the national policy. There seems little constitutional justification for drawing a line between cutting off a cause of action, such as for psychological nuisance damages in the case of an atomic reactor or disposal plant, and telling a worker that wages he was entitled to under a prior statute are now being taken away. It is a degree question: balancing the private interests against the necessity for the national policy. The one would seem to be no more capricious or arbitrary than the other.

The case that illustrates more dramatically than any other the extent of the congressional discretion pursuant to a delegated power to supersede the rights of private individuals, and to alter them significantly from the standpoint of pecuniary values, is *Norman* v. *B. & O. Ry.*,[669] the famous "gold clauses" case. In establishing fiscal policy during the "Hoover-Roosevelt" depression of the 1930's, Congress provided that gold clauses in contracts stipulating payment in gold dollars of a certain number of grains of gold were invalid and not to be enforced. It was argued that this clearly was a taking of property in violation of the Fifth Amendment Due Process Clause. In meeting this argument, the court said:

> This argument is in the teeth of another established principle. Contracts, however expressed, cannot fetter the constitutional

[669] 294 U.S. 240, 55 S.Ct. 407 (1935). *Cf.* Louisville Joint Stock Land Bank v. Radford, 295 U.S. 555, 55 S.Ct. 854 (1935) (invalidating first Frazier-Lemke Act which delayed foreclosure); Lynch v. United States, 292 U.S. 571, 54 S.Ct. 840 (1934) (invalidating impairment of the government's own insurance contract, but suggesting that the government could withdraw consent to suit); and Perry v. United States, 294 U.S. 330, 55 S.Ct. 432 (1935) (could not impair gold clause contracts but no damage found and Congress withdrew consent to be sued).

> authority of the Congress. Contracts may create rights of property, but when contracts deal with a subject matter which lies within the control of the Congress, they have a congenital infirmity. Parties cannot remove their transactions from the reach of dominant constitutional power by making contracts about them. . . .
>
> This principle has familiar illustration in the exercise of the power to regulate commerce. If shippers and carriers stipulate for specified rates, although the rates may be lawful when the contracts are made, if Congress through the Interstate Commerce Commission exercises its authority and prescribes different rates, the latter control and override inconsistent stipulations in contracts previously made. This is so, even if the contract be a charter granted by a State and limiting rates, or a contract between municipalities and carriers.[670]

The Court then proceeded to say that:

> The principle is not limited to the incidental effect of the exercise by the Congress of its constitutional authority. There is no constitutional ground for denying to the Congress the power expressly to prohibit and invalidate contracts although previously made, and valid when made, when they interfere with the carrying out of the policy it is free to adopt.[671]

The Court concluded that "If the gold clauses now before us interfere with the policy of the Congress in the exercise of that authority they cannot stand." [672]

Again in this case a very substantial pecuniary interest was wiped out by federal legislation. In making it applicable to existing contracts, interests of individuals of substantial proportions literally were being destroyed. It is submitted that the interest wiped out in these cases is every bit as substantial as injury to surrounding landowners and businesses resulting from the psychological nuisance of nuclear operations.

There are many other illustrations. Pecuniary expectations may be adversely affected when a suit barred by a statute of limitations is reinstated by repealing the statute, yet the court always has held this to be within the legislative power, not a taking without due process.[673] An exercise of the power of government to carry out economic policies that have a substantial pecuniary impact upon mortgages was held valid in the

[670] Norman v. B. & O. Ry., *supra* note 669 at 307-08.

[671] *Id.* at 309-10.

[672] *Id.* at 311.

[673] Campbell v. Holt, 115 U.S. 620, 6 S.Ct. 209 (1885). Approved and applied to state action, Chase Securities Corp. v. Donaldson, 325 U.S. 304, 65 S.Ct. 1137 (1945).

cases upholding state mortgage moratorium laws.[674] Municipal zoning ordinances have been sustained although they substantially alter economic interests of landowners who do not conform to the use limitations imposed in their area.[675] Interests having substantial pecuniary value may be impaired by municipal or state regulation in the interests of public health and welfare, as is illustrated by the case involving the prohibition of the operation of a brick kiln once the city grew out around the kiln, even though it had been in operation long before the area became populated,[676] and by the case in which a state regulation prohibited the use of a distilling plant manufacturing intoxicating liquor, although the plant had been in operation for a considerable period of time before the adoption of the prohibition law,[677] or also in the case involving a state law which required the removal of ornamental red cedar trees without compensation so as to preserve the neighboring apple orchards attacked by parasitic fungus.[678]

In each of these cases there was a very substantial impairment of financial values, although imposed by states instead of by the federal government. In finding that such impairment did not violate the Due Process Clause of the Fourteenth Amendment the court used reasoning to support the use of the general police power of the states which would also justify regulations by Congress under one of its delegated powers. The reasoning equally supports the use of the commerce, war, or property powers of Congress to regulate and adjust economic interests arising out of the operation of atomic energy facilities. In all such cases it is a question of balancing the amount of the impairment against the necessity for regulation, with a decision by the legislature that certain interests must give way even though no compensation is provided.

Reciprocity of advantage is often used as one justification for the exercise of government power in zoning cases. It is important to note that there is some reciprocity to the owners of land and businesses in the vicinity of a reactor in the provisions of the federal indemnity act which provide a very large fund to compensate for physical injury to person and property by reactor incidents. The availability of such a

[674] Home Bldg. & Loan Ass'n v. Blaisdell, 290 U.S. 398, 54 S.Ct. 231 (1934). *Cf.* Coombes v. Getz, 285 U.S. 434, 52 S.Ct. 435 (1932).

[675] Village of Euclid v. Ambler Realty Co., 272 U.S. 365, 47 S.Ct. 114 (1926). See also Cusack Co. v. Chicago, 242 U.S. 526, 37 S.Ct. 190 (1917) (billboards prohibited). See discussion of constitutional problem in city planning in Johnson, "Constitutional Law and Community Planning," 20 L. & Contemp. Prob. 199 (1955).

[676] Hadacheck v. Sebastian, 239 U.S. 394, 36 S.Ct. 143 (1915).

[677] Mugler v. Kansas, 123 U.S. 623, 8 S.Ct. 273 (1887).

[678] Miller v. Schoene, 276 U.S. 272, 48 S.Ct. 246 (1928).

fund would seem to be a reasonable reciprocal advantage justifying the taking away of any cause of action for a psychological nuisance damage, assuming that Congress intended to preclude such recoveries in the case of reactor whose operation and location had been specifically approved by the AEC.

Under Condemnation Power—What Is a "Taking"? Some light also may be shed on the power of Congress to preclude psychological nuisance damage actions by cases concerning the federal government's power to condemn property. Such cases at first glance might seem inapplicable to the possible reactor nuisance since they deal with the question of for what property interests must the government pay fair compensation when the government itself takes property. They do not deal with private persons infringing the property rights of others. Nevertheless, they are valuable analogies in two respects; first, many reactors are going to be built by public utilities which either use or have eminent domain power, and second, they give some indication of the interference with property deemed sufficient to require payment of fair compensation. To the extent that property interests are considered compensably impaired by less than a complete taking, this conclusion would seem to be based upon the same reasoning involved in deciding whether a government in effect has permitted a private taking by regulating the contract or tort rights of parties in such a way as to permit similar impairments.

We are concerned especially with the court's attitude concerning the kind of peripheral or incidental damages deemed compensable as part of the taking. For example, *United States* v. *Causby* [679] concerned regular, although not constant, flights of government aircraft at low altitudes over plaintiff's chicken farm so that the chickens killed themselves by flying into fences, and his home became an uncomfortable place in which to live. The court readily recognized this as a taking even though there was no actual, permanent, continuous occupancy of the property by government agents. The court held that not only was there a taking when the plaintiff's property was made completely uninhabitable, but a taking resulted when the government's use of the air space immediately above the land seriously limited "the utility of the land and caused a diminution in its value." [680] The Court said that the flying of airplanes in this manner was like firing guns over a man's property, which had been held to be a taking in an earlier case.[681] The facts in *United States*

[679] 328 U.S. 256, 66 S.Ct. 1062 (1946).

[680] *Id.* at 262.

[681] Portsmouth Harbor Land & Hotel Co. v. United States, 260 U.S. 327, 43 S.Ct. 135 (1922).

v. *Causby,* however, differ from the psychological nuisance situation posed, because there was an actual invasion directly over plaintiff's property by a physical object put in motion by the government.

Where the government has taken less than the entire fee, such as taking a leasehold interest for less than its full period, a taking occurs for which "consequential damages" will be allowed for such expenses as moving costs and losses from destruction of fixtures,[682] or for the going-concern value of business trade routes taken over for less than the full term of years.[683] Where the entire fee is taken, however, moving expenses and other such incidental damages are not awarded. While these cases indicate a liberal attitude in determining the value of what is taken, they do not deal with damage to nearby lands and businesses and hence do not control the question of the psychological damage caused by a nuclear plant.

There is, however, a series of cases which comes much closer to the psychological nuisance case. They involve the awarding of damages to a landowner whose land has been taken in part, not only for what might be thought to be the proportionate market value of the part taken but also for the diminution in the value of the rest of the land resulting from the taking of only a part of it. One of the earlier cases allowing this type of award is *United States* v. *Welch,*[684] where Justice Holmes, in one of his deceptively lucid short opinions which does little more than indicate the conclusion, found that the plaintiff was damaged not only to the extent of the land taken but also because of the diminution in value of farm land when his only access to a county road was cut off by the strip condemned. The court said that the practical destruction of the right of way amounted to a taking.

Even more illuminating is a series of circuit court opinions beginning with *West Virginia Pulp & Paper Co.* v. *United States.*[685] The court there stated that when only part of a unitary tract of land is taken just compensation must include damages for diminution of the value of the remaining land.[686] The court's allowance of still a third item of damages has even greater significance for our psychological nuisance case. The court said:

> A part of the land acquired and held by the company as a site for plant expansion was taken for use by the government as a place for storing large quantities of highly inflammable and

[682] See United States v. General Motors Corp., 323 U.S. 373, 65 S.Ct. 357 (1945).
[683] Kimball Laundry v. United States, 338 U.S. 1, 69 S.Ct. 1434 (1949).
[684] 217 U.S. 333, 30 S.Ct. 527 (1910).
[685] 200 F.2d 100 (4th Cir. 1952).
[686] *Id.* at 104.

> explosive gasoline; and the company was damaged not merely by the loss of the land taken but also by the depreciation that resulted in the value of the remainder of the land by reason of the proposed use. It was entitled to be awarded such sum as would put it in as good position pecuniarily as it would have been in if its property had not been taken. [Citation omitted] A land owner, a part of whose land is taken for the storage of large quantities of gasoline, is certainly not placed in such position unless he receives compensation for the damage done to the remainder of the land left on his hands as well as the value of the part taken.[687]

This is fairly analogous to our psychological nuisance case, and the court held that it was a proper item for compensation. The *West Virginia Pulp* decision was followed by the Fourth Circuit Court of Appeals in *United States* v. *Wateree Power Co.*,[688] where the taking of about one-third of a total tract resulted in an award of severance damages because the acres taken bordered a river and cut off access to the river from the remaining property. Apparently there was no claim that the government's intended use of the condemned property would further depress the value of the remaining tract.

On the other hand, in *Boyd* v. *United States*[689] the Eighth Circuit Court of Appeals was faced with a claim for damages for the taking of fifteen acres of plaintiff's farm to become part of a 5,000-acre government airbase. The plaintiff apparently complained of the depreciation of the remainder of his eighty-two acre farm from the operation of an airbase so close to it. The court approved the trial court's refusal of evidence to prove this kind of consequential damage. It said that none of the acres taken from the plaintiff were to be used for a purpose different from the use of other lands to which it was to be joined. The evidence could not be used to prove damages by way of depreciation of the rest of plaintiff's farm.[690] The court seems to indicate that the damages for depreciation of the remaining property because of the particular use to which the government is to put the condemned property can be claimed only when it is the use of the property taken from the plaintiff that causes a depreciation and not when it is the use made of land taken from others.

The Court of Appeals for the Fourth Circuit was faced with a re-

[687] *Id.* at 103.
[688] 220 F.2d 226 (4th Cir. 1955).
[689] 222 F.2d 493 (8th Cir. 1955).
[690] *Id.* at 496.

lated but somewhat different problem in *Nunnally* v. *United States*.[691] Here the plaintiff complained that his vacation retreat island had ceased to be "a relaxing place to go" because the government had acquired land close to the plaintiff's island in order to carry on proving ground activities, including airplane drops of bombs for test purposes. The trial court found that the plaintiff's property had been decreased in value about $1,500 but held there was no compensable taking. The plaintiff claimed that his property was invaded by the noise and shock of test explosions and by the flight of aircraft over the island. The court said this was not like the *Portsmouth Harbor* case[692] where the shells were fired over the plaintiff's land but rather it was a case where there were damages but not taking; here the damages were consequential only:

> The damages alleged in that case were not consequential; they were the product of a *direct invasion of claimant's domain*. But damages which are the incidental result of lawful governmental action, without any direct invasion of private property, are consequential; they do not constitute a taking under the Fifth Amendment.
> Plaintiff has suffered no peculiar damage. His annoyance is of the same type to which everyone living in the vicinity is subjected in varying degrees. There is, at most, a "sharing in the common burden of incidental damages". *Richards v. Washington Terminal Co.* . . . If it should be held that the facts in the present case constitute a taking, any reduction in the value of property attributable to a federal activity might be urged as a valid claim against the United States. The distinction between a "damage" and a "taking", so carefully preserved by the courts, would be obliterated.[693]

Something fairly close to the psychological nuisance situation arose in *United States* v. *329.05 Acres of Land*.[694] In this case the lands of four different owners were taken by the government for the creation of an ammunition storage depot. Some of the land of each owner was taken in fee and some by way of a safety easement. The question before the court was the compensation to be paid to each. The depot itself was located on the land of only one of the four seeking compensation. The lands of the others were taken for the purpose of building access roads and creating safety easements restricting the use of the property so that residences and other activities bringing together large groups of people

[691] 239 F.2d 521 (4th Cir. 1956).
[692] *Supra* note 681.
[693] *Supra* note 691 at 524. (Emphasis added.)
[694] 156 F. Supp. 67 (D.C. S.D. N.Y. 1957).

could be prohibited. None of the buffer zones had been put to other use by the government. The lands taken were not being used currently and they were somewhat swampy in character, yet apparently a residential subdivision was a likely possibility several years in the future. The court, following the *Boyd* case, held that, when only part of the land was taken, any diminution or impairment of the remainder of the land caused by the use of the land taken by the government was compensable, but that severance damages may not include damages to any owner if the damage resulted from the use to which the government put the lands which were in the same project but which were obtained from others. Thus, only the one owner properly could claim severance damages to his remainder land resulting from the fact that the government was constructing an ammunition depot.[695]

The allowance of severance damages to the extent that the physical severance itself actually causes the value of the remainder land to diminish, such as can happen when access to a waterway is cut off by the parcel taken, seems quite properly awarded as part of the compensation for the taking. This is an effect of the taking that happens only to the owner whose access to a waterway for example has been cut off. On the other hand the distinction made between the recovery for what we have termed psychological nuisance affects all adjoining land, whether it is remainder land of the owner part of whose land has been taken or adjoining land belonging to another. As to psychological nuisance damage the distinction is utterly ridiculous. The use the government is planning to make of the part condemned has no more effect on the remainder land than it does on adjoining land owned by others. The use of the condemned land as an ammunition depot or air base is just as detrimental to adjoining land as it is to remainder land.

Nevertheless, the distinction suggested by the federal cases seems to be followed by state courts as well,[696] whether it be the state itself or a public utility with a power of eminent domain that is taking the land. While some state constitutions now provide for award of damages incident to a taking of land,[697] thus avoiding the narrow construction of a compensable taking under the old rule, generally the courts keep the distinction between effects of physical severance and psychological nuisance effects. There may be an historical explanation for the rule, but it does not make sense from a policy standpoint. Nevertheless, this

[695] *Id.* at 70-71. Citing also Campbell v. United States, 266 U.S. 368, 45 S.Ct. 115 (1924) (nitrate plant).

[696] See cases collected in Annot., 170 A.L.R. 721 (1947) and 6 A.L.R.2d 1197 (1949).

[697] See states listed in Richards v. Washington Terminal Co., *supra* note 648 at 554.

seems to be the law. What result would be reached if this doctrine were applied to the nuclear psychological nuisance case?

If the government (and probably the same is true of a public utility exercising the eminent domain power) condemns less than a whole unit of land, the owner can recover for diminution in value of the remainder arising from the psychological nuisance effect of the use made of the condemned part. The neighboring land owned by others, which would be just as diminished in value because of the psychological nuisance, has suffered no compensable loss.

When the eminent domain power is not involved, such as when an atomic installation is operated by a purely private concern for a nongovernmental purpose, it would seem that the same basic constitutional considerations should govern. If the government need not compensate for psychological nuisance damage to adjoining land, surely the government may adopt a rule that psychological nuisance damages from private plants shall not be recoverable. The preservation of the public pocketbook perhaps is not so important a factor in the case of a private concern not carrying on a public utility function. On the other hand, if the government decides that a national need exists for development of nuclear energy for commercial and war purposes and that protection should be given against recovery for psychological nuisance damage, it still is carrying out a general governmental policy and ought to be governed by the same policy considerations. In fact, as indicated by the "gold clauses" cases,[698] usually the court will hold the government itself to a higher standard under due process than if rights between private parties only are involved.

Conclusions as to Congress' Power to Immunize. Undoubtedly Congress can supersede any power of the states so far as controlling tort liability of large nuclear installations is concerned. The Fifth Amendment, however, does provide some protection against an arbitrary interference by the federal government with private property rights. If substantial quantities of radioactive material are allowed to fall-out on private property so that it could be asserted that special damages have resulted to the plaintiff's land, there is authority in older cases that the government cannot immunize the wrongdoer from liability. In the light of more recent cases decided in connection with somewhat different kinds of situations but involving the same policy considerations, it seems rather clear that maximum recovery can be limited as provided

[698] *Supra* note 669. Compare Norman v. B. & O. Ry., *supra* note 669, with Lynch v. United States, *supra* note 669.

for in the federal indemnity statute. As to small amounts of fall-out, even under the old cases Congress seems to have the power to provide for no recovery at all, because this would seem to be not special damages but simply the damages necessarily incidental to the operation, like normal smoke and noise from operation of a railroad. Congress clearly can immunize the operator from liability for damages from the psychological nuisance created by the mere existence of the reactor in the neighborhood. The balancing by Congress of the needs of landowners subjected to psychological nuisance damage and of society for rapid development of the nuclear industry surely would not be upset by the Supreme Court. It is better policy to refuse to give psychological damages the status of a constitutional right and instead leave it to the legislature to balance the interests and decide whether this kind of damages should be allowed, and if so, to what extent and with what limitations. It is doubtful that the United States Supreme Court would say that such a law denying a cause of action for psychological damages is beyond the commerce and war powers of the federal government.

(ii) The Intent of Congress

Even after it is found that the federal government has the constitutional power to give such immunity from psychological nuisance damage actions, it still must be determined whether Congress intended to preclude such actions. Since there is nothing specific on the matter in either the Atomic Energy Act of 1954 or the 1957 indemnity amendment, the question becomes one of implied pre-emption of the field. Detailed discussions of the pre-emption question as it relates to state power to license and regulate atomic energy entrepreneurs coming under the federal act is found elsewhere.[699] Likewise, the problem of the impact of possible federal pre-emption on damage remedies generally is treated later.[700] These discussions need not be repeated, but application of the conclusions drawn can profitably be made here. The specific question is whether the federal program precludes a state from enjoining the operation of an atomic energy facility or awarding damages to private persons for the psychological nuisance created by the mere presence of the facility.

When the Atomic Energy Commission in a quasi-judicial proceeding authorized by statute makes a decision in a specific case that a licensee

[699] *Infra* Part III, Chapter V, Section E on federal pre-emption.

[700] *Id.*, discussion following note 275. See also *infra*, Part I, Chapter III, discussion at notes 1273-78.

may operate in a certain way in a particular place, this is almost sure to be held to pre-empt the field and prevent the states from requiring licenses or imposing other pre-operational regulations upon such activities.[701] This is particularly true when the federal statute and the agency created by it have provided for health and safety matters comprehensively and in great detail.[702] It seems fair to conclude that the Congress wanted the kind of flexibility in setting and enforcing safety designs and standards "which centralized administration makes possible so as to encourage experimentation and variation on the part of licensees in the hope of obtaining both greater economy and safety. This does not appear to be the time, for example, for the state to specify the precise amount, design, and type of shielding material that is necessary to operate a nuclear reactor or other atomic energy device and it is doubtful that Congress intended the almost inevitable frustration of its policies by such state licensing specifications." [703] It is also true that, "Not only does the Commission study the proposed atomic installation itself and the radiation safety precautions within it, but it also gives due consideration to all the local geographic (*i.e.*, population density, *etc.*), geologic, and meteorologic features as well. In short, when the license is issued, the Commission, pursuant to congressional directive, has determined that the particular licensee is qualified to construct and operate a particular atomic energy installation at a specified location, for specified purposes, and in a specified manner." [704]

As to pre-operation activities of the licensee, our conclusion is, "In the light of the above considerations, it seems reasonably safe to assume that the Supreme Court will hold that Congress has prevented any state or local government from requiring a person, who is licensed or otherwise authorized by the Commission, to obtain prior state or local permission to operate if the granting or denying of that permission is predicated upon an independent analysis of standards of radiation health and safety." [705] It also seems reasonable to conclude that "Local zoning ordinances which clearly discriminate against atomic energy uses and facilities, merely because they constitute radiation hazards deemed undesirable by the community, will probably suffer the same fate as state licensing requirements." [706] It also seems clear that any action which

[701] *Infra* Part III, Chapter V, Section E on federal pre-emption.

[702] *Id.*, see discussion in text at notes 389-423, and seven reasons listed in text between notes 423-43.

[703] *Id.* at text at note 439.

[704] *Id.* at text at note 441.

[705] *Id.* at text at note 450.

[706] *Id.* at text at note 453.

imposes a heavier burden on Atomic Energy Commission licensees also will be held to be pre-empted by federal action because the additional cost of meeting higher state standards undoubtedly would tend to discourage developments which Congress has indicated it wants to support,[707] even though it may be possible for the states to help enforce standards and regulations laid down by the AEC.[708] It must be remembered that the state can intervene in a proceeding to determine whether a license ought to be granted or not.[709] Except where there is an immediate, significant threat to public health and safety, there is a route through the Atomic Energy Commission to ask for modification, suspension, or revocation of licenses. With this channel open, it seems very unlikely that the state will be allowed in a non-emergency case to use any of its own enforcement procedures.[710]

In the light of these conclusions, any attempt by the state to enjoin activities specifically licensed by the Atomic Energy Commission, merely because of the psychological nuisance they may create in the public mind would surely be as invalid as would a state licensing system. The effect of an injunction, whether based upon private or public nuisance, would seem to run counter to the very policy arguments that dictate a preclusion of state licensing. The psychological nuisance arises out of the mere existence of the reactor which is in complete compliance with the federal regulations. Since the existence of this kind of facility, operating in this way, in this place, has been approved specifically by the federal agency, the state has no power to enjoin any activity, even if it considers it a nuisance, public or private. There is not even the possible justification for state action to meet an emergency health hazard in this case.

Where there is provision in the federal statute for all interested parties to participate in an administrative hearing and also provision for judicial review, the scope of federal pre-emption is made dramatically clear in the very recent Supreme Court decision, *City of Tacoma* v. *Taxpayers of Tacoma*.[711] The case involved the right of the city of Tacoma to enter into a contract with the federal government under the Federal Power Act. The construction of a dam made it necessary to condemn a fish hatchery owned by the state of Washington. The court denied the right of the state to object to one of its own municipalities,

[707] *Id.* at text at note 464.
[708] *Id.* at text at note 472.
[709] *Id.* at text at note 460. Sec. 189 of 1957 Act is discussed at notes 458-60.
[710] *Id.* at text at note 477.
[711] *Supra* note 642.

the city of Tacoma, entering into a contract with the federal government in such a way as to condemn state property against the state's desires. The court held that since there was provision in the federal act for any interested party to participate in the Federal Power Commission hearing, the state should have asserted its rights before the Commission. In connection with the powers of Congress to limit the action that a state could take as to its own municipality, the Supreme Court said, that there was no question but that Congress had power to set the conditions and procedures for review and the courts in which it was to take place.[712] The court said:

> Hence, upon judicial review of the Commission's order, all objections to the order, to the license it directs to be issued, and to the legal competence of the licensee to execute its terms, must be made in the Court of Appeals or not at all. For Congress, acting within its powers, has declared that the Court of Appeals shall have "exclusive jurisdiction" to review such orders, and that its judgment "shall be final," subject to review by this Court upon certiorari or certification. Such statutory finality need not be labeled *res judicata,* estoppel, collateral estoppel, waiver or the like either by Congress or the courts.[713]

Provisions for intervention in Commission proceedings and the power of judicial review found in the federal act referred to in the *City of Tacoma* case are quite similar to Section 189 of the 1954 Atomic Energy Act, which specifically provides for a hearing "upon the request of any person whose interest may be affected by the proceeding." [714] Subsection b provides for judicial review of the final order in such a proceeding under the terms of applicable federal statutes regulating federal administrative procedure.[715] When a state or private individual believes that the location of the proposed reactor or other atomic facility is unwise or illegal, it would seem that the proper remedy is to petition the Atomic Energy Commission to be permitted to participate in the hearing determining whether or not the license should be granted. Any later action in state courts seeking to enjoin the establishment or operation of the reactor *in accordance with the terms of the federal license* seems to be precluded by the federal act.

The question remains as to whether or not the right of a private person to sue for damages because of the psychological nuisance also

[712] *Id.* at 336.
[713] *Id.* at 336-37.
[714] Sec. 189a of 1954 Act.
[715] Sec. 189b of 1954 Act.

has been pre-empted. As pointed out later,[716] it is clear that there has been no federal pre-emption generally of the power to award damages arising out of nuclear incidents. From this it certainly could be argued that private suits for damages from the psychological nuisance effect are permissible, even though the injunction action would not be. Yet because of the peculiar character of the psychological nuisance damages, it is possible that this particular type of damage will be considered precluded for the same reasons as those establishing the invalidity of an injunction abating the nuisance.

In the field of labor law the Supreme Court has held that a state court may award damages resulting from illegal activities which are clearly an unfair labor practice within the meaning of the federal statute. There was no pre-emption of this portion of the field. The Court said in the *Russell* case[717] that the primary purpose of the federal agency was to prevent unfair labor practices and that any award remedy was purely at the discretion of the National Labor Relations Board. The Court was very careful to point out, however,[718] that there was no conflict in this instance between the state's power to entertain a damage suit and the power of the federal agency. This emphasis upon allowing only such state action as is obviously consistent with the congressional policy, indicates the basic reason for this writer's conclusion that in the atomic reactor situation, an action solely for psychological nuisance damages should not be permitted, for in this instance it would amount to state action, clearly in conflict with a federal action. To award damages merely for the existence of the reactor or other similar type of atomic energy facility, when there has been no physical harm of any kind, in effect would frustrate the decision of the Atomic Energy Commission that this type of activity, at this location does not present any unreasonable danger to public health and safety, and is in furtherance of the federal program to promote and develop atomic energy by private enterprise. It is submitted that to allow damages, even in a private action, for psychological nuisance would be in direct conflict with the federal determination and therefore with federal policy.

The provisions of the indemnity insurance amendment in 1957[719] actually suggest that, at least so far as the indemnity program is con-

[716] *Infra* note 1273.

[717] United Automobile Workers v. Russell, 356 U.S. 634, 78 S.Ct. 932 (1958), discussed fully *infra*, Part III, Chapter V at note 311.

[718] *Infra* Part III, Chapter V at note 313.

[719] Insurance amendment, 85-256, 85th Cong., H.R. 7383 (1957), discussed in detail *infra* text following note 1265.

cerned, a distinction should be drawn between what might be considered injuries resulting from an actual "nuclear incident" by way of physical damages and the apprehensions and fears involved in a psychological nuisance damage case. In defining "nuclear incident" the act provides that the term "means any occurence within the United States causing bodily injury, sickness, disease, or death, or loss of or damage to property, or for loss of use of property arising out of or resulting from radioactive, toxic, explosive, or other hazardous property or source, special nuclear, or byproduct materials." [720] This language indicates that Congress was concerned with a specific *discharge* of radioactive material in such a way as to have an impact on persons or property, perhaps including in this kind of physical damage any psychological consequences of such actual impact. It also must be remembered that the federal act specifically modifies state law by immunizing the licensee who is indemnified from any liability in excess of $500,000,000, plus any amount of financial protection required of the licensee.[721] There is nothing in the act or in its legislative history to indicate that anything other than damages resulting from actual discharge of radiation or radioactive material was meant to be covered. While the statutory provision is not specified on the question of damages for psychological nuisance, it would seem to be much more consistent with the over-all purpose and policy of the federal provisions to conclude that the allowance of such damages, just as in the case of an injunction to abate a licensed activity, would be inconsistent with the federal program to provide for the public health and safety and to promote the development of atomic energy as fast as is safely possible. Yet the conclusion obviously is not as clear as one could wish, because the federal act leaves the determination of general liability questions to the states.

To dispose of the uncertainty *Congress should enact a statute to make it clear that purely psychological nuisance damages cannot be recovered* where a reactor is duly licensed by the Atomic Energy Commission and is placed in a permissible location under local zoning laws which do not discriminate against reactors as such. At the same time Congress must clearly recognize the right of all possibly affected parties to participate in the AEC hearing held on the granting of the license to operate the reactor. If only small quantities which are within permissible levels established by federal regulation are discharged, perhaps Congress should also make it clear that no recovery may be had for conse-

[720] *Id.* at sec. 30.
[721] *Id.* at sec. 4e.

quent injuries. On the other hand perhaps this should be left to the normal rules relating to compliance with administrative regulation as proof of non-negligence.[722]

(b) Effect of Licensing—Results under State Law

Since state law might be applied in the psychological nuisance damage case (*e.g.*, if the courts find no pre-emption by the federal government), it is important to determine the results which might be anticipated. An even more important reason, perhaps, is that the states surely will enter into the licensing of atomic energy activities in the future as the operations become a normal business activity and Congress perhaps returns more regulatory power to the states. What effect will state licensing have on a determination of whether to treat the installation as a nuisance?

The question is not free from difficulty; broad statements frequently are made by courts which do not take account of important distinctions affecting the result. The first of these distinctions is one between actions to enjoin the licensed activity and actions for damages. It frequently has been held that an activity which is conducted strictly in accordance with legislative authority cannot be enjoined as a nuisance.[723] This rule seems to hold, however, only in situations where there appears to be no other reasonable way to conduct the activity in accordance with the license or other legislative authority. Where possible, the license usually is interpreted to allow the conduct of the activity only in a manner which does not unreasonably interfere with the rights of other property owners. Courts, therefore, have issued injunctions against such activities as blasting rocks so as to throw stones upon the lands of others,[724] shining bright lights onto adjoining land from a city baseball park,[725] and the operation of a city pesthouse in a residential area [726] despite the existence of a license or legislative authority for this kind of activity generally. It is likely, therefore, that if a state licensing agency specifically approves a site for an atomic agency installation, the activity will be deemed non-abatable since any diminution in surround-

[722] See discussion of these rules generally, *supra* at Section B2b.

[723] Fricke v. City of Guntersville, 251 Ala. 63, 36 So.2d 321 (1948) (city drainage ditch in alley blocked access to plaintiff's lot, was claimed to be "dangerous"; injunction denied); Strachan v. Beacon Oil Co., 251 Mass. 479, 146 N.E. 787 (1925) (injunction denied against licensed oil refinery which generated offensive odors, fires, and explosions).

[724] Hakkila v. Old Colony Broken Stone & Concrete Co., 264 Mass. 447, 162 N.E. 895 (1928).

[725] Downey v. Jackson, 259 Ala. 189, 65 So.2d 825 (1953).

ing property values surely will be deemed an unavoidable consequence of its normal, non-negligent operation. Such a specific license is not just a general permit to carry on a specific type of activity somewhere at the owner's option.

On the question whether or not the existence of legislative authority precludes a finding that an activity is a nuisance for the purpose of awarding damages, the courts take positions which, at first glance, appear to be conflicting. On the one hand, there are courts which have indicated that if an activity is conducted strictly in accordance with legislative authority, and the injury which results from the activity is a necessary result of its normal, non-negligent operation, then the activity cannot be found to be a nuisance.[727] On the other hand, there are some courts which state broadly that "the full extent of legislative power to legalize and shield a nuisance is to exempt it from public prosecution," [728] and therefore the rights of private individuals to seek damages for authorized nuisances remain unimpaired.[729] A closer examination of these two positions indicates, however, that there is little more than a verbal difference between them. In the courts which adhere to the doctrine that an authorized activity cannot be a nuisance, it still is recognized that the legislative immunity does not extend to activities which too seriously encroach upon the property rights of private individuals to the point where it may be said that their property is being "taken." The United States Supreme Court has stated, as well as any court, the general approach used by all courts:

> We deem the true rule, under the Fifth Amendment, as under state constitutions containing a similar prohibition, to be that

[726] Baltimore City v. Fairfield Imp. Co., 87 Md. 352, 39 Atl. 1081 (1898).

[727] Transportation Co. v. Chicago, 99 U.S. 635 (1878) (cofferdam obstructed plaintiff's warehouse docks); Messer v. City of Dickinson, 71 N.D. 568, 3 N.W.2d 241 (1942) (city dumping sewage into river so as cause offensive odors). The latter case involved a state statute, N.D. Comp. Laws 1913, §7231, which stated that "Nothing which is done or maintained under the express authority of a statute can be deemed a nuisance." Other states have also enacted similar statutes. See, *e.g.*, People v. City of Reedley, 66 Cal. App. 409, 226 Pac. 408 (1924) discussing the effect of a similar California statute.

[728] Sadlier v. City of New York, 81 N.Y.S. 308, 310 (1903) (slush falling on plaintiff's property from Brooklyn Bridge).

[729] Levene v. City of Salem, 191 Ore. 182, 229 P.2d 255 (1951). In holding that the city was liable for flooding plaintiff's land, the court made it clear that authorized acts can still be considered a nuisance. The court observed, at 197, "We need not consider whether the trespass in the case at bar was a mere nuisance or was of such a magnitude as to amount to a taking of the property in the sense forbidden by the constitution. . . . In either event, it would appear that the municipality is liable to respond in damages."

> while the legislature may legalize what otherwise would be a public nuisance, it may not confer immunity from action for a private nuisance of such a character as to amount in effect to a taking of private property for public use. . . .[730]

It therefore is held that where there is a substantial interference with property rights, the injured party may recover damages despite the existence of legislative authority.[731]

It is clear, then, that the courts must struggle with the "vexed question of what sort of nuisance may amount to a taking of property."[732] The difficulty of such a question is demonstrated by the variety of semantic formulas which have been employed in attempts to answer it. Some courts and text writers have suggested that legislatures may authorize "small" or "minor" nuisances without compensation, but not "great" ones.[733] In at least one case a distinction was drawn between "direct" injuries, which were deemed compensable, and merely "consequential" injuries, which were not.[734] The Court of Appeals of Maryland has attempted to clarify the problem with this statement:

> It is now the law of this State that acts done in the proper exercise of governmental authority which impair the use of nearby private property do not constitute a taking of property within the meaning of the Constitution, unless there is (1) an encroachment upon or physical invasion of the property, or (2) a substantial obstruction of access, or (3) a deprivation and not merely a diminution of light and air.[735]

The Supreme Court of Massachusetts, in *Sullivan* v. *Commonwealth*,[736] pointed out a distinction between acts which demonstrate "premeditation and intention of continuance" of interference with property rights, and acts which merely incidentally interfere with such rights. The court held that physical injury to plaintiff's property was merely an unintended side effect of blasting operations carried on in the construction of an aqueduct, and therefore was not compensable as

[730] Richards v. Washington Terminal Co., *supra* note 648 at 553.

[731] *Ibid.*; United States v. Causby, *supra* note 679.

[732] Bacon v. City of Boston, 154 Mass. 100, 102 (1891) (city held to have unnecessarily damaged plaintiff by its manner of operating sewer system).

[733] Sawyer v. Davis, 136 Mass. 239, 243 (1883) (ringing loud mill bell, under legislative authority, held a "slight" interference, and not compensable as a taking). See Prosser 421, and discussion *supra* at text at notes 629-32.

[734] Sadlier v. City of New York, *supra* note 728.

[735] Friendship Cemetery v. City of Baltimore, 197 Md. 610, 619, 81 A.2d 57 (1951) (flights in glide path of city airport held not a sufficient interference to constitute a taking).

[736] 335 Mass. 619, 142 N.E.2d 347 (1957).

a "taking" of property. The court contrasted this with cases involving deliberate firings of gun batteries over plaintiff's land,[737] or repeated flying of military aircraft at a low level,[738] in which a "taking" had been found.

Perhaps one of the most significant efforts to draw the line between what does and does not constitute a compensable "taking" was that made by the United States Supreme Court in *Richards* v. *Washington Terminal Co.*,[739] previously discussed. This was the case in which the plaintiff complained of diminution in the value of his property both from the normal operation of the railroad, which caused noise, vibration, and dust to invade his residence, and from the location near his property of an outlet for a ventilating system which collected gases and smoke from a tunnel and forced them out by means of a fan. The court denied recovery for injury caused by the normal operation of the railroad, but held that the damage caused by the location of the ventilation outlet near plaintiff's property was a "direct and peculiar and substantial" injury which constituted a "taking" of plaintiff's property. This statement of the rule has been quoted frequently by state courts.

The Maryland court placed the problem in better perspective when it suggested simply that the question of what constitutes a "taking" is a "question of degree." [740] Yet under any of the tests suggested it is to be doubted that a court would impose liability if the presence of a reactor should cause a drop in property values or a loss of business solely because of fear or apprehension arising from the installation. In states where courts have made it clear that only physical interference of some kind will constitute a "taking," such as in Maryland,[741] this seems un-

[737] Portsmouth Harbor Land & Hotel Co. v. United States, *supra* note 681.

[738] United States v. Causby, *supra* note 679.

[739] *Supra* note 648.

[740] Friendship Cemetery v. City of Baltimore, *supra* note 735 at 618.

[741] *Id.* at 619. The U. S. Supreme Court has also indicated that only a physical invasion of some sort will constitute a "taking." In Transportation Co. v. Chicago, *supra* note 727, the city, to facilitate the building of a tunnel, had erected a temporary cofferdam which obstructed the docks in front of plaintiff's warehouse. The Court stated at 642: "But acts done in the proper exercise of governmental powers, and not directly encroaching upon private property, though their consequences may impair its use, are universally held not to be a taking within the meaning of the constitutional provision. . . . The extremest qualification of the doctrine is to be found, perhaps, in *Pumpelly v. Green Bay Company*, 13 Wall. 166, and in *Eaton v. Boston, Concord, & Montreal Railroad Co.*, 51 N.H. 504. In those cases it was held that permanent flooding of private property may be regarded as a 'taking.' In those cases there was physical invasion of the real estate of the private owner, and a practical ouster of his possession. But in the present case there was no such invasion. No entry was made upon plaintiff's lot. All that was done was to render for a time its use more inconvenient."

questionably the result. Also under the reasoning of the United States Supreme Court in the *Richards* case,[742] it could be asserted that the injuries caused by fear were of the kind that "naturally and unavoidably result from the proper conduct" [743] of the reactor, and as such are not compensable. In that case there was also a physical invasion of plaintiff's property, while there is none from a purely psychological nuisance.

Moreover, the nature of the license for the atomic energy activity, or the legislative authorization of it, may have significance, in any future cases involving claims based on a theory of nuisance. Where a legislature or licensing agency approves a specific site for the activity, it would appear that any diminution in the values of property surrounding that site is a necessary incidental effect of the normal operation of the activity; but where only a general license is issued and the choice of site left to the licensee, a court might find that the choice of location, because of the character of the surrounding property, constituted an unreasonable exercise of the authority granted under the license. It is to be remembered that the legislative immunity enjoyed by the licensee will extend only to those injuries which *necessarily* result from the authorized activity, and the scope of the license will be strictly construed.[744] The Minnesota Supreme Court put it this way.

> If the legislature expressly authorizes an act which must inevitably result in public injury, what would otherwise be a nuisance may be said to be legalized; but if they authorize an erection which does not necessarily produce such a result, but such result flows from the manner of the construction or operation, the legislative license is no defense. In order to justify a nuisance by legislative authority, it must be the natural and probable result of the act authorized, so that it may fairly be said to be covered by the legislation conferring the power.[745]

Thus it is frequently held that while a defendant may be operating under a general license or legislative authority, this does not authorize him to conduct the activity in a place or in a manner which unreasonably interferes with the property rights of others.[746] The application of

[742] *Supra* note 648.

[743] *Supra* note 649.

[744] Messer v. City of Dickinson, *supra* note 727 at 577.

[745] Pine City v. Munch, 42 Minn. 342, 345-46, 44 N.W. 197 (1890) (village allowed to abate injurious operation of a dam as a public nuisance, although construction of the dam was authorized by legislature).

[746] Baltimore & Potomac R.R. v. Fifth Baptist Church, *supra* note 646 (locating and operating a railroad engine house near a church held an unreasonable exercise of railroad's authority, and damages awarded); Bacon v. City of Boston, *supra* note 732; Hakkila v. Old Colony Broken Stone & Concrete Co., *supra* note 724; Messer v. City of Dickinson, *supra* note 727.

this principle may become important in the future if the licensing of atomic energy installations, particularly those that are relatively less hazardous, becomes more general than at present.

It also may make a difference whether the legislative sanction is in a form which expresses positive governmental encouragement of the activity or merely constitutes a permit allowing an activity to be carried on. A court may be less disposed to find that legislative immunity exists if the activity is operating under the latter type of permit, since this form of licensing is merely a control device and does not include any expression of the desirability of the activity from a public point of view. A distinction of this kind was recognized in an Alabama case, *City of Bessemer* v. *Abott*.[747] The plaintiff sought damages against the city for maintaining a nuisance in the form of a garbage incinerator which had been erected and operated under a state statute expressly empowering municipalities to establish such facilities. The Alabama court held that the city would be liable only if it were negligent in operating the incinerator. The plaintiff relied on an earlier case in which it had been held that the city was liable for the maintenance of a public privy despite statutory authority. The court in distinguishing that case stated:

> But there was no question presented in that case as to the authority of a municipal corporation, under a general statute, to do an act in the exercise of its police power for the conservation of the public health and welfare. On the contrary, the authority granted by the Vernon charter was effective merely to permit the town to do, as a private corporate act, what any individual could do, and of course to do it in the same way and subject to the same restraints and penalties. Under that authority the town had no more right to maintain privies in modes and places that would render them nuisances than any individual had.[748]

Although this is a distinction not frequently articulated by the courts, under the reasoning of cases like the *Bessemer* case,[749] atomic energy installations having a quasi-public character may come under the heading of acts to be encouraged in the interest of public welfare, and therefore would enjoy legislative immunity. On the other hand, if the atomic energy activity is operating under a mere legalizing permit, the courts may be more willing to rule that the license does not preclude liability for damages on a theory of nuisance. In cases involving claims against the

[747] 212 Ala. 472, 103 So. 446 (1925).
[748] *Id.* at 473.
[749] *Supra* note 745.

owners of funeral homes, for example, it has been held that the existence of a permit being an expression of municipal thought and opinion, may be properly considered on the question of nuisance, but it is not conclusive.[750]

The time may come when the use of atomic energy may be so common that it will no longer enjoy its favored status. Someday it will be put to use in the ordinary processes of purely private industry having no official relationship to the general public interest. In that event, the fact that a permit is obtained apparently would not preclude a court from finding the activity a nuisance and awarding damages under proper circumstances. At the present time, however, both federal and state legislation clearly is directed toward encouraging research and development in the new atomic industry, and therefore licenses are likely to enjoy full legislative immunity from actions based on nuisance theories.

5. Proof Problems—Causation and Damages

a. The General Interrelationship

The unusual characteristics of radiation, particularly its imperceptibility through ordinary human senses and the cumulative character of the effects of exposure, create some unique and difficult problems in proving both causation-in-fact and damages in tort actions. Although these are two different elements of the negligence action and raise somewhat different questions, the proof aspects are in many respects common and the most nearly unique. Therefore, it seems best to deal with the problems of proof together.

In discussing causation at this point we are talking about that aspect usually called causation-in-fact. This differs from that part of causation so often treated under the title of proximate cause. Proximate cause and its effect on limiting the liability of those whose radiation in fact causes injury to others have been discussed previously in connection with the duty element. Here attention is centered on the proof problems that will arise in establishing the fact that radiation from a particular defendant's operations caused a specific damage to a particular person.

The complications arising out of radiation incidents seem to develop principally from three factors unique to atomic energy: (1) Multiple causation problems are created by the fact that radiation comes from

[750] Dawson v. Laufersweiler, 241 Iowa 850, 43 N.W.2d 726 (1950). Sometimes injunctions have been granted also despite a general permit. Gunderson v. Anderson, 190 Minn. 245, 251 N.W. 515 (1933). For other cases in which injunction has been granted despite permits or zoning ordinances, see 39 A.L.R.2d 1026 (1955).

many sources, such as natural background radiation from many types of materials including even the bricks of the houses in which we live and the buildings in which we work, fallout from bomb tests, and medical uses of radiation in addition to whatever radiation may be released by atomic energy entrepreneurs in the course of their operations. (2) Many, if not most, of the injurious effects that are caused by radiation result from the *total* amount of exposure received by the injured person and not just the amount received by him at a particular time from a particular source (although there are certain injuries believed by some experts to result only in case the individual exposures exceed certain threshold levels). (3) The inability to state accurately and specifically that a given injury will be or has been caused by a specific amount of radiation received at a specific time, means that in many cases plaintiffs will be forced to depend upon statistics showing that exposure to radiation will increase by some more or less accurately determined percentage the *likelihood* of a certain injury occurring.

Although the causation and damage questions, particularly as to proof, which are created by these characteristics of radiation are not completely unique in tort cases, similar situations are very few in number, and courts have not had occasion to work out theories and principles for determining liability. Yet the problems will arise inevitably and with much greater frequency as the uses of radiation increase from year to year. Here again it seems that the advent of atomic energy will cause the legal profession to re-evaluate its tort concepts, particularly as they relate to causation-in-fact and the extent of damage.

b. Multiple Defendants

(1) General Considerations

Partly a Duty Matter. The problem of remoteness or foreseeability today generally is considered as a part of the duty question and this also is the manner in which we have treated the subject. It also would have been possible to have treated the question of the liability of multiple defendants as a part of duty under such headings as joint tortfeasors, proximate cause, joint enterprise, master-servant, or concert of action. Yet the difficult and unique aspects of the multiple defendant matter in the radiation cases would seem to arise out of the same characteristics that give rise to the proof problem generally. Therefore, the problem can be seen in better perspective if multiple defendants are now treated in the context of the proof questions that will arise. Never-

theless, the subject of multiple defendants is discussed prior to dealing with proof problems generally because duty considerations are just as important as those of proof of causation. On the other hand, when considering cases involving single defendants, proof of causation becomes of dominant importance. This indicates the desirability of first discussing multiple defendants and thereafter the non-multiple situations.

It is true, of course, that some multiple defendant cases are solved by cause-in-fact principles. The rule usually applied to determine whether a known force is the cause-in-fact of a specific injury to a particular person is known as the "but for" rule. In explaining this rule Prosser says:

> The defendant's conduct is not a cause of the event, if the event would have occurred without it. At most this must be a rule of exclusion: if the event would not have occurred "but for" the defendant's negligence, it still does not follow that there is liability, since consideration other than causation, which remained to be discussed, may prevent it.[751]

This test will take care of most cases including a good many of those involving multiple defendants. There are certain kinds of cases, however, which have caused the courts to develop a supplementary concept usually known as the "substantial factor" rule. As Prosser says in discussing causation-in-fact:

> Such a test is clearly an improvement over the "but for" rule. It disposes of the cases mentioned above, and likewise of the difficulties presented by the type of case where a similar, but not identical result would have followed without the defendant's act. But in the great majority of cases, it amounts to the same thing. Except as indicated, no case has been found where the defendant's act could be called a substantial factor when the event would have occurred without it; nor will cases very often arise where it would not be such a factor when it was so indispensable a cause that without it the result would not have followed.[752]

Whether the test be the "but for" rule or the "substantial factor" concept, the cases involving multiple defendants often create very difficult problems. Except for the discussion by Prosser [753] and Harper and James [754] in their recent treatises, there is surprisingly little written discussion of the subject with the exception of the application of the *res*

[751] Prosser 220.
[752] *Id.* at 221.
[753] *Id.* at 224-41.
[754] Harper & James 1121-31, 694-714.

ipsa loquitur doctrine, to be discussed later.[755] The expanded use of atomic energy should give rise to a considerable increase in cases of this nature.

Some examples of situations that very likely will arise when the use of atomic energy becomes more common will help focus attention on legal problems that need analysis.

As to reactors the following situations very possibly will arise:

(1) Two reactors, owned by different companies, may be so located that the prevailing winds could have carried the materials discharged into the air or into a stream from either one or both and caused the injury to the person or property of the plaintiff some distance downwind or downriver. Distinctions should be recognized between cases where: (a) neither reactor contributed enough to cause damage, but the cumulative effect of both does cause damage; (b) the amount discharged by each was sufficient in and of itself to have caused the damage; (c) there is no evidence as to which one discharged the radioactive material, each claiming it is not from its operation and the plaintiff is not able to prove from which it came. Whether the applicable legal principles are to be strict liability concepts or those of liability for negligence the courts must be prepared to deal with cases involving these difficulties.

(2) The same situation except that instead of two reactors there are three or more such reactors.

(3) The bulk wastes from two or more reactors are turned over to a common disposal agent (owned either privately or by the government), who then negligently disposes of such combined waste so as to cause the plaintiff injury. Assume that vicarious liability will be imposed upon the owner of the waste products but it will be impossible to identify the source of the particular material causing the damage, because the wastes are mixed and not labeled; *i.e.*, they are fungible.

(4) There are two or more reactors, and a person lives in the vicinity of one for a time, then moves to the vicinity of another, and perhaps still another. He is able to show that the cumulative irradiation has caused personal injury although the individual contributions of any one of the sources would not have been sufficient to have done so.

(5) The waste or the discharge from one or several reactors is not enough in itself to cause any damage for which compensation could be recovered, although the discharge was negligent or absolute liability rules will be applied. Yet the plaintiff may suffer a radiation injury because of peculiar susceptibility. The same could happen if plaintiff subsequently needs medical treatment requiring use of radiation and either

[755] *Infra* text discussion beginning at note 1146.

did not know of his prior exposure from the reactor or forgot to inform his doctor of previous exposures, or the doctor may have decided under the circumstances that the risk of additional diagnostic or therapeutic radiation ought to be taken, even though the cumulative dose might be enough to cause injury to the plaintiff.

Similar situations can arise in connection with the disposal or use of radioactive isotopes for either medical or industrial purposes. For example:

(1) Two or more industrial, medical, or research users of radioactive isotopes discharge their sewage into the city system and the city sewage plant bacterial process is harmed, or a city employee is injured by radiation, or someone downstream from the sewage disposal plant is injured by the radiation, and (a) it takes the contributions of all to cause the damage, although no individual user was negligent in the amount discharged in the individual case, or (b) one user must have been negligent because the amount of radiation received exceeds what would have been received if all had released only the proper amount, but it is impossible to tell which one was guilty, or (c) it is possible to tell which one was negligent but his discharge alone would not have caused injury unless added to that of the others who were not negligent.

(2) The total amount of all contributors is not enough to cause injury but, because of the peculiar susceptibility or the necessity for later medical treatment with large amounts of radiation, the particular plaintiff is injured because of the total cumulative dose received, including that contributed by the waste disposal operations of the industrial, medical, and research uses.

(3) A person receives enough radiation to cause injury, including radiation from a particular defendant who is responsible for a part of the exposure; (a) where the other exposure alone was enough to cause the injury as was the amount received from the defendant and it is impossible to tell which exposure actually caused the injury, or (b) the exposure caused by the defendant is not enough in itself to cause injury but when added to that already received by the plaintiff in medical treatment, either carefully or negligently administered by a doctor, causes an injury, or (c) exposure caused by the defendant is not enough in itself to cause injury but does contribute to the total dose received by the plaintiff from other sources, and the total dose is sufficient to cause injury.

(4) Plaintiff's injury would occur only by accumulating several exposures, such as from his job which involves the handling of radio-

isotopes, fallout from government bomb tests,[756] and fallout from the operation of a reactor or as a result of exposure from a highway accident involving waste products, and finally later medical treatment by radiation.

Many other variations can be imagined but these are allustrative of the kinds of cases that very well could happen as the use of atomic energy becomes more widespread. They present causation-in-fact and damage problems that courts will have to answer.

In dealing with multiple causation cases a part of the difficulty arises from questions of joinder, interpretation of verdicts, and the enforcement of judgments. These elements cannot always be separated completely from the substantive question as to who is liable and to what extent. For example, there may be a question of whether in a particular jurisdiction the plaintiff will be permitted under the procedural rules to join as defendants all persons thought to have caused harm, but the modern trend of procedural rules is such that this is becoming less of a problem. Certainly the multiple causation cases can be handled best when all potential defendants are present at the same time. Joining all of the defendants does not need to affect the burden of proof placed on the plaintiff to show causation and damages for each of the defendants separately, although it is true that where the court has all the defendants present it might be more willing to shift the burden, as some of the cases to be discussed illustrate. In any event, the procedural problems of joinder of parties, the nature of the verdict that should be rendered, and the impact of contribution and release of joint tortfeasors should present no different questions merely because the cases arise out of the use of atomic energy. While many issues in these areas are difficult and uncertain, there seem to be no problems peculiar to the atomic energy situations.[757]

(2) Cumulative or Concurrent *Causation* Only—The negligence of each is a necessary link in the causal chain, or the negligence of each is sufficient to cause the total injury suffered and which actually caused injury cannot be determined.

The first problem to be considered arises when several defendants have released radioactive material under such circumstances that each may be held liable for the total injury since the radioactivity released

[756] See study of fall-out reported in N.Y. Times, July 5, 1958, p. 5, col. 1. The AEC reported that only one person in the region of the 1957 Nevada tests received anything approaching the 3.9 roentgen aggregate set as the safety limit.

[757] Harper & James 695-97, 709; Prosser 233-51; 41 A.L.R. 1223 (1926); 47

by each was sufficient by itself to cause the harm without the contribution of the other defendants. This is a situation that could arise when two or more reactor operations or the use of isotopes by two or more persons result in radioactive material being deposited on plaintiff's property where the plaintiff himself is exposed and the exposure from each source is simultaneous either because the discharges were simultaneous or by the time the plaintiff is exposed the two sources are merged. This could easily happen from a discharge of radioactive materials into the air or a stream or into disposal grounds. In this kind of case the courts and the legal commentators agree that the full amount of damages can be charged to one or to all of the wrongdoing defendants.

The analysis of this type of case usually starts with the Massachusetts case, *Coley* v. *Hauener*,[758] where the two defendants simultaneously rode their motorcycles past a horse, frightening it and causing injury to the rider. Many other examples can be given, such as the case of A stabbing C and B hitting C with a rock simultaneously, either blow being sufficient to kill C and he later dies; or the case of two fires being started independently, converging and destroying the plaintiff's house. Similar situations have arisen in connection with automobile accidents as is exemplified by a recent Kentucky case, *Byee* v. *Shanks*. The two defendants negligently raced their cars down the highway. The plaintiff was injured when they crashed into each other, the plaintiff being a passenger in one of the cars but personally free from contributory negligence. Approving an earlier leading Minnesota case the Kentucky court said:

> . . . [W]here two or more persons are unlawfully and negligently racing automobiles on a public highway in concert, all are liable in damages to a guest in one of the racing cars who was injured thereby, when the guest protests to the driver, has no control over the driver, and was not engaged in a joint enterprise with the driver. The Minnesota opinion reflects sound legal and humanitarian principles which are applicable to the factual situation of the case at bar.[759]

The "but for" rule often does not explain holding both defendants liable under these circumstances (though it would in the racing car case) and these situations have given rise to the "substantial factor" rule.[760]

A.L.R.2d 803 (1956); 56 A.L.R.2d 239, 271 (1957); McCoid, "Negligence Actions Against Multiple Defendants," 7 Stan. L. Rev. 480 (1955).

[758] 182 Mass. 250, 65 N.E. 69 (1902); Harper & James 702, 1122; Prosser 220-21. Burnham v. Butler, 31 N.Y. 480 (1865) (two sleighs rather than two motorcycles).

[759] Bybee v. Shanks, 253 S.W.2d 257, 260 (Ky. 1952). See also Harper & James 693, ns. 9-10.

[760] Prosser 221.

It always seems to be assumed, of course, that if the force that actually caused the injury can be identified and separated from a similar force created by another negligent defendant, only the defendant whose force actually caused the injury will be held liable. As an illustrative example, suppose A and B each sell a rope to a person, bent on hanging himself, under such circumstances that they are negligent in so doing.[761] If the person hangs himself with the rope of either A or B, the other is not liable. On the other hand, if the two pieces of rope were tied together, both A and B would be liable for the death. Used as an analogy and applied to the radiation situation, we could assume, as an example, that two radioactive cobalt 60 sources used in the same area were negligently shielded so that either could have injured the plaintiff, but it can be proved that he was exposed only to one. On the reasoning usually applied, there would be liability resting on only one defendant. So too, if the person irradiated is exposed to both sources of cobalt 60 and receives damaging radiation from each, there would seem to be no question about holding the owners of both sources equally and totally liable for the total damage.

The much more difficult question is one that arises when it is impossible to tell whether A's piece of rope or B's was used, but it is clear that only one was used. This raises questions to be discussed later in connection with the unknown wrongdoer.

Generally it is assumed that if the injury resulting from the contributions of both defendants is a single injury, it is an indivisible one and there can be no apportionment. In such situations it is clear that each made a substantial contribution to the ultimate injury even though the injury itself may not be divisible. Is there any reason, however, why the recovery for the single injury could not be divided between the wrongdoers in proportion to the amount of radiation contributed by each if this can be proved? One answer may be that each defendant who substantially contributes toward the final result should as a matter of good social policy be fully liable to the deceased or injured party, assuming the contribution of the other party was reasonably foreseeable. Then there could be some kind of contribution between joint tortfeasors along the lines of the apportionment suggested.

On the other hand, perhaps the radiation case is one in which we should not treat the harm as indivisible even though it is the total and ultimate harm of death, but should treat it like certain other cases of

[761] Carpenter, "Workable Rules for Determining Proximate Cause," 20 Cal. L. Rev. 229, 396 (1932); Prosser 221. See also Haley v. Calef, 28 R.I. 332, 67 Atl. 323 (1907).

subsequent, as distinguished from concurrent, negligent action, *e.g.*, the case in which one driver negligently injures the pedestrian who then is injured further by another driver, or the case in which a driver negligently injures a person and then a doctor negligently increases the damages.[762] In these cases the second person is held liable only for the contribution he makes in terms of additional damage, if this can be separated. In the radiation case where there is a cumulative effect, if it can be proved that a certain number of units of exposure caused a certain injury and the radiation emitted by two different sources was in a ratio of 1:3, the damages caused by the total radiation could be divided between the two defendants in a 1:3 ratio, although the injury itself is not separate and could not be attributed to one or the other exposure. This would be feasible and would seem to be good policy.

A closely related question is that which arises when there is a difference in time between the forces negligently set in motion by the different defendants. When each of the defendants' actions makes a significant contribution to the final result, the general rule seems to be to impose liability on each of them as being concurrent causes of injury. There are many examples of this kind of liability, the most numerous of which are the automobile cases in which action of two or more negligent defendants, perhaps somewhat separated in time, occurs to create the final injury to the plaintiff. In these cases the imposition of liability on all defendants jointly and without apportionment generally is approved by legal writers.[763] The question most likely to give difficulty in this situation is that of determining whether it took the contribution of all the defendants to cause the final injury. This often resolves itself into a proximate cause question of whether or not to hold the particular defendant liable for his contribution. In such cases, of course, the question of "the comparison and determination of alleged plural or concurrent causes falls within the province of the jury. . . . Where there is a factual dispute as to the events and circumstances which caused the injuries, proximate cause is a jury question." [764]

A typical example of this kind of relationship in a radiation case

[762] Harper & James 1124 and cases cited.

[763] See cases cited 26 A.L.R.2d 167 (1952); 55 A.L.R.2d 13, 155, 201 (1957); and discussion and cases in Prosser 222-26 and Harper & James 705-06. See Roush v. Johnson, 139 W.Va. 607, 633, 80 S.E.2d 857 (1954) for treatment of contributory negligence.

[764] Melone v. Jersey Central Power & Light Co., 18 N.J. 163, 175, 113 A.2d 13 (1955). See Atlantic Coast Line R.R. v. Coxwell, 93 Ga. App. 159, 91 S.E.2d 135 (1955), a car and railroad collision case. A very interesting case is Ristan v. Frantzen, 26 N.J. Super. 225, 97 A.2d 726 (1953).

would be that of a supplier negligently assembling a fuel core and the reactor operator also being negligent in not finding the defect, all resulting in a discharge of radioactive material following this combined negligence of the two parties. Under these circumstances it would seem perfectly clear that the law would hold each party, the supplier and the operator, individually liable for the total amount of damage caused to others.

While there are some cases to the contrary, it seems almost equally clear that where the concurrent causes are the result of the negligence of one party but not of the other (as when one source is derived from nature or from an innocent person), the negligent party is liable in full for the jointly caused injury.[765] A good example of this is the case of *Smith* v. *Bonner*,[766] in which the plaintiff was killed while driving along the highway where he was hit by a tree which was blown over from the defendant's property, partly because of the unprecedented violence of the storm and partly because the defendant was negligent in not providing adequate support around the roots of the tree when he filled in an old cesspool.

There are many situations involving radiation sources which could be controlled by this general rule. An example might be the occurrence of an unprecedented earthquake combining with the negligent construction of a reactor to release radioactive material and cause injury to third parties. Even though the earthquake was unprecedented so long as the material would not have been released except for the negligence of the operator, the cases would seem to indicate that the operator will be held liable for the total resultant injury. Similar situations could arise from the discharge of radioactive material into streams, the disposal of radioactive material, or the transportation of such material where an unprecedented natural cause combines with the negligence of the owner to cause injury.

There is one other closely related situation which well might occur in the radiation injury cases in connection with which a somewhat different problem in apportionment arises. Illustrations include the case in which a boy falls from a bridge trestle under circumstances in which death is almost certain, yet on the way down he is electrocuted by defendant's wires which are negligently uninsulated; or the case in which the plaintiff is killed by the defendant's negligence, yet he has a reduced life expectancy because of some previous accident or some existing

[765] Harper & James 706, n. 80.
[766] 63 Mont. 571, 208 Pac. 603 (1922).

disease; or the case in which a house is destroyed which already is almost sure to be destroyed by another fire, or by the pounding sea; or where the defendant blocks the plaintiff's barge in a canal where there already is a landslide which also blocks the way. Under such circumstances there is a question of what is the value of the thing destroyed by the defendant at the time he destroyed it. These problems seem to have been seriously discussed first by Chief Justice Peaslee of New Hampshire.[767] Prosser's analysis, by which he would reduce the value of the thing injured by the defendant's action where the other danger is so imminent that a reasonable man would take it into account, seems much sounder than the suggestion of Harper and James that the wrongdoer be held completely liable.[768] Even if we admit that the "objective of tort law is compensating accident victims" and that this is the proper one to be stressed, there still remains the question of whether the defendant in the case, society as a whole, or the plaintiff (or his own insurance carrier) should bear the loss.

(3) Cumulative or Concurrent *Contribution to Amount of Injury*—The extent of plaintiff's injury results from the accumulation of injurious impact from several sources, usually there being no causal connection between the sources but there being a contribution by each to the total single compensable injury

The multiple causation problems that are most nearly analogous to the situations likely to arise in connection with radiation damage, and matters that will give the most difficulty, particularly as to proof, are those arising from injuries resulting to the plaintiff as a consequence not of any one defendant's contribution, but from the contribution of several, but no contribution is enough to allow imposition of liability even though each was negligent in allowing the force to be set in motion. The suggested problem is one in which each of the defendants, if treated separately, would be considered as having committed no tort, even though

[767] Peaslee, "Multiple Causation and Damage," 47 Harv. L. Rev. 1127 (1934). See also Carpenter, "Concurrent Causation," 83 U. of Pa. L. Rev. 941 (1935); Prosser 231; Harper & James 1122, n. 5.

[768] Prosser 231-32; Harper & James 1123. One need not accept the full implications of Prosser's suggestion that if A kills B right after C has poisoned B so he will die shortly, then the rule of reducing damages charged to A does not apply. What if A acts only negligently or under rules of absolute liability? Maybe it would be better simply to hold C liable even if someone got to B first so long as C's action was reasonably certain to cause death soon.

each breached his duty to use due care in handling some force that affects the plaintiff at least slightly. In analyzing this problem it is most important that one always keep in mind a general rule concerning the proof of causation that the plaintiff must present. The considerations involved in proving causation and damages in radiation cases are discussed later,[769] but the generally accepted statement of the degree of proof required of the plaintiff is set forth by Prosser as follows:

> He must introduce evidence which affords a reasonable basis for the conclusion that *it is more likely than not* that the conduct of the defendant was a substantial factor in the result. A mere possibility of such causation is not enough; and when the matter remains one of pure speculation or conjecture, or where the probabilities are *at best evenly balanced,* it becomes the duty of the court to direct a verdict for the defendant.[770]

The author points out that ordinary experience must be used to determine whether under the circumstances a given action could produce a particular result, and that circumstantial evidence may be used to infer the causal connection. This "more probable than not" test results in real difficulty in cases of injuries suffered only because of contributions of several persons. The corollary of the "more probable than not" test is that "Where the facts proven show that there are several possible causes of an injury, for one or more of which the defendant was not responsible, and it is just as reasonable and probable that the injury was the result of one cause as the other, plaintiff cannot have a recovery since he has failed to prove that the negligence of the defendant caused the injury." [771] What is probable or not in many cases is a question on which reasonable men may well differ. Problems of this type inevitably will arise from the use of radiation sources, if for no other reason than because the effects of radiation are cumulative. Difficulty of proof also will arise in this area because of the inability of human beings to sense the presence of radiation and because radiation in some instances will emanate from certain sources for great lengths of time through many transformations in form and over long distances.

Another very closely related problem is that which arises when it is known that a particular kind of action or energy has caused injury but it is not easy to determine which of several possible defendants or potential defendants are responsible for setting the force in motion. Here

[769] *Infra* discussion beginning just after note 1060.

[770] Prosser 222. [Emphasis added.]

[771] Ingersoll v. Liberty Bank of Buffalo, 278 N.Y. 1, 7, 14 N.E.2d 828 (1938), cited by Harper & James 1111, n. 7.

again the nature of radiation and radioactive sources is such as to make this kind of problem particularly acute in cases that seem inevitable as we make increasing use of atomic energy.

(a) Liability for Another's Negligence Assessed Because of a Legally Imposed Status Relationship

If one assumes that cause-in-fact can be proved (an assumption that is difficult to support in radiation cases as will be indicated later),[772] and further assumes that the defendants who have set the force in motion can be identified, there are some cases about which the answer seems quite clear and all the writers agree.[773] In general they fall into three categories.

(i) Concert of Action

When the parties act "in concert," all of the defendants so acting clearly will be held liable for all the injury. The clearest example of this type of joint liability arises out of situations where several persons are acting together in a manner that may be in violation of both a criminal statute and also the tort rules of due care. These are cases where there is a known and intentional common pursuit of a common end, whether or not it be in the form of a formal joint enterprise, such as one of three deputy sheriffs firing the gun that injured the plaintiff. The court held that:

> It is immaterial which one of the three officers fired the shot that produced the wound. They were all engaged upon a common enterprise or adventure which contemplated the halting of the buggy and its occupants. They were present, encouraging, aiding, and abetting this enterprise, and they were all equally responsible with whichever one of them actually fired the shot that produced the wound.[774]

Similar concert of action, and therefore total liability on the part of each defendant, has been imposed in cases where innocent bystanders have been injured as the result of fights engaged in by defendants. The Tennessee court in one of these cases said:

> The rule is well settled that where two or more persons engage in an unlawful act and one of them commits a serious,

[772] *Infra* discussion beginning just after note 1060.

[773] Prosser 224; Harper & James 1122-24.

[774] Mangino v. Todd, 19 Ala. App. 486, 491, 98 So. 323 (1923). See Moore v. Foster, 182 Miss. 15, 180 So. 73 (1938) for an almost identical situation.

> civil injury upon a person not engaged therein, all are equally liable for damages to the injured party.[775]

Again, in a case of several defendants taking action, which together constitute a nuisance, such as polluting a stream, with full knowledge on the part of at least two of the defendants of the independent acts of others, courts have held that there was concert of action as to those who acted with knowledge:

> Where all have knowledge of the independent acts that create the result and continue the independent acts with knowledge, this *ipso facto* creates a concert of action and makes a common design or purpose. Any other position, from the facts and circumstances of the case, would make plaintiffs practically remediless, although there is a nuisance which all jointly concurred in and contributed to, that is alleged made the plaintiff's land valueless, and but for such joinder the injury would not have occurred.[776]

Other cases which may stretch the concert of action concept too far, are those in which persons hunting together are held jointly and fully liable for the injuries caused when plaintiff is hit by the bullet negligently fired by one of them. Several such cases speak in terms of concert of action, but it would seem that this is a concert of action for a different purpose. The common goal was not that of injuring the plaintiff or capturing him. Where officers assault a potential prisoner, or several persons participate in a fight likely to injure bystanders, there is a real concert of action case.[777] A detailed consideration of the wrongly labeled concert cases involving one of several negligent parties causing unintended injury is found later in this chapter.[778]

Except where there is an actual joint enterprise of some kind, the application of these concert of action cases to atomic energy situations will not be called for with any frequency. This type of case arises much more often where there is an intentional tort, or at least an intentional

[775] Blalock v. Temple, 38 Tenn. App. 463, 468, 276 S.W.2d 493 (1955).

[776] Moses v. Town of Morganton, 192 N.C. 102, 106, 133 S.E. 421 (1926). The same rationale seems to have been the basis for liability in City of Skiatook v. Carroll, 163 Okla. 149, 21 P.2d 498 (1933), and Comar Oil Co. v. Sipe, 133 Okla. 222, 271 Pac. 1010 (1928), although they can be treated as concurrent nuisance cases, discussed *infra* in text at note 784 ff.

[777] Benson v. Ross, 143 Mich. 452, 106 N.W. 1120 (1906); Oliver v. Miles, 144 Miss. 852, 110 So. 666 (1926); Kuhn v. Bader, 89 Ohio App. 203, 101 N.E.2d 322 (1951). See also Reyher v. Mayne, 90 Colo. 586, 10 P.2d 1109 (1932). Similar ideas have been applied in cases where dogs of several owners caused damage. See *e.g.*, Stephens v. Schadler, 182 Ky. 833, 207 S.W. 704 (1919); Arneil v. Paterson, [1931] A. C. 560.

[778] *Infra* note 881 ff.

wrongful act of some kind, a situation not very likely to happen in the atomic energy area.

(ii) Vicarious Liability

Much more important in atomic energy cases is the type of liability that is imposed under the vicarious liability doctrines. In the light of the possibility of saying that radioactive material creates an "unusual" hazard, this concept is particularly important to the atomic energy entrepreneur. Under the cases discussed previously,[779] it is clear that there are any number of situations in which the owner or user of radioactive material will be held vicariously liable for the actions of independent contractors, although a very good case can be made for not imposing it in cases involving independent contractors engaged in transportation and disposal operations.

An equally clear case of each defendant being held liable for the whole damage (at least so far as the plaintiff is concerned), is that in which the law imposes vicarious liability on one party for the acts of another. A typical example is the liability of a master for the acts of his servant carried out pursuant to the employment, or the liability of a principal for the acts of his agent carried out within the scope of the agency.[780] A similar result has been reached in a case involving the person in charge of a city dump. He did nothing to prevent other defendants from causing a nuisance to the injury of the plaintiff through their use of the dump and the kind of material they were allowed to deposit there. In an action against the city and the other persons involved, the court held the city liable even though it in no way approved the action of the other defendants.[781]

(iii) Common Duty

Another category of cases in which all defendants are held equally liable for the whole damage arises when a common duty imposed by law upon two or more persons is not carried out, and someone is injured.[782] This rule often is applied if both the landlord and a tenant are responsible for proper maintenance of a building or two persons are responsible for the proper maintenance of a party-wall. Both are held liable when the wall falls whether because of the negligence of one or

[779] *Supra* discussion at note 207 ff.
[780] Prosser 225; Harper & James 699-700.
[781] Cases collected Annot., 52 A.L.R.2d 1134, 1142 (1957).
[782] Prosser 225-26; Harper & James 699.

the other, or both. This type of case is not so likely to arise in the atomic energy area but one possibility might be if two corporations jointly form a third corporation to carry out research in atomic energy problems. If the third company is held liable on the basis of negligence or absolute liability for injuries caused to others, it is possible that the courts would pierce the corporate veil and hold both of the parent corporations liable. Again, a common duty may be found if two industrial concerns using radioactive isotopes have a common storage vault for such materials as cannot be discharged into the sewage system, and through the fault of one or the other the storage vault leaks and causes damage to a third party. In many ways this kind of activity is really a case of joint-enterprise.

(b) Cumulative Contributions from Several *Negligent* Sources Legally Unrelated Except Each Contributes to the Total Single Injury

The cases which will cause real difficulty, however, are those in which the injury results from the contributions of several persons, each of whom is negligent and no one of whom contributes enough to cause the whole injury, and common duty or vicarious liability rules just discussed are not applicable.

In analyzing these cases several distinctions must be kept in mind. The first is between those cases in which it is possible to make at least some rough apportionment of the relative contribution of the individual parties, and those cases in which it is practically impossible to do so. Another distinction is between those cases in which all of the contributing parties are negligent, where no one of the contributing parties is negligent, where some but not all of them are negligent, and the case where the negligent actions of one or more defendants combine with forces occurring naturally, the combination causing the damage. Likewise important is the distinction between the case where it is clear that cause-in-fact has been proved as to all of the persons joined in the action and those cases where it is perfectly clear that all of the defendants did not participate and the real question is which one caused the harm, it being possible that any one of them might have but only one of them did do so.

Another consideration of importance in analyzing the cases in this area is that joinder of all potential defendants for purposes of trial does not lead necessarily to the imposition of joint liability on all defendants for all of the damages with total liability imposed on all. In

attempting to determine what the liability may be for the cases that are bound to arise in connection with the use of radiation sources, it seems wise to analyze carefully the most nearly analogous cases. In analyzing the cases the distinctions and considerations suggested above should be kept in mind.

(i) Cases to Be Distinguished

In addition to the distinctions between cases which involve cumulative or concurrent contribution to the amount of injury, all of which are here discussed, it is important to distinguish certain groups of cases entirely. The kind of case of concern here should be sharply distinguished from that involving the independent but concurring acts of two or more defendants which create a situation causing injury to the plaintiff, but where the injury itself comes at the end of a chain of events rather than resulting from an accumulation of injuries inflicted by the defendants quite independently of each other.

The case of *Ristan* v. *Frantzen*[783] exemplifies the distinction that should be kept in mind. In this case the first defendant negligently struck the plaintiff's car and, while causing no serious injury to it or the occupants, put the car in such a position on the highway that the second defendant negligently ran into the car, causing very serious injury to its occupants. The first defendant was liable for the whole damage because his negligence put the plaintiffs in such a position that foreseeably they would be seriously hurt by somebody else, such as the second defendant. Because there was no recoverable injury from the first blow by the first defendant, however, the second defendant also is liable for the total damages inflicted because his negligent act caused the total recoverable damages, even though the injury would not have occurred if it had not been for the negligence of the first defendant. These are concurrent contributors but each is clearly liable for the total damage independently of whether or not the other person was guilty of negligence. The case differs from the cumulative contribution cases in which there is an *accumulation* of negligent actions of all defendants each contributing to the total. It would be closer if the plaintiff were hurt seriously from the first collision, then were also hurt seriously from the second collision, and died as a consequence of the combined injuries, although neither one alone would have been sufficient to kill him. It is the cumulative contribution *to the amount of injury* type of situation with which we are concerned here, where the injurious impacts of sev-

[783] *Supra* note 764. The cases set out in Harper & James 706, n. 80 do not.

eral defendants, each negligent, combine to cause the total injury. In considering the decisions that have been made in this area it is important to keep in mind the several distinctions suggested above.

(ii) Cumulative or Concurrent Nuisance Cases Involving Negligence

By far the greatest number of cases bearing on the cumulative contribution to the amount of injury question have arisen in the area of nuisance, usually arising out of the actions of two or more defendants resulting in pollution of streams or air, (sometimes by causing noise), or the flooding of another's property. These cases are of especial significance to the atomic energy entrepreneur in relation to his potential liability problems. The leading cases in those jurisdictions which have faced the problems deserve careful study.

Roughly the cases can be divided into two categories: (1) Cases in which the courts have held that each defendant, though negligent, is liable for only his own acts and may not be held liable without independent proof that more probably than not his actions caused a specific part of the damages. In most cases, this means that it is improper to join several defendants in one action, although as was pointed out previously, joinder is not necessarily to be precluded merely because ultimately the plaintiff will have to prove that more probably than not the defendants individually contributed a specific proportion of the damages. (2) Cases in which joinder has been permitted and joint liability for damages has been assessed, or the court has ordered a shifting of the burden of proof so that each defendant is forced to show the extent of his own contribution to the total damages to preclude being held liable for the whole. The cases involve claims for damages, not for injunctive relief. This point has not always been made clear in analyzing the problem.

Defendants Held Individually Liable Only. In two early cases the *California* court adopted the view that unity of action is present when an injury results from combined acts, no one of which itself would cause any damage. Under these circumstances the California court held the defendants to have acted jointly and to be jointly liable for the damages. In one case[784] tailings from several mining operations in the canyon above plaintiff's land were discharged by the defendants into the waterway and polluted the water that passed the plaintiff's land. In the other case[785] the defendants each diverted some water from a stream so as to deprive plaintiff of water to which he was entitled.

[784] Hill v. Smith, 32 Cal. 166 (1867).
[785] Hillman v. Newington, 57 Cal. 56 (1880).

In a later case, *Miller* v. *Highland Ditch Co.*,[786] however, the California Supreme Court changed its position and held that an action could not be maintained jointly against defendants if each had acted separately, and that it did not become a joint tort merely because the consequences united with consequences caused by other defendants. In this case water from the ditches of the several defendants, each operating independently, combined and injured the plaintiff's land. A similar result was reached in a later case by the California Appeals Court where cement dust from the defendant's operations united with that from another cement company and caused injury to the trees and orange crops of the plaintiff.[787] The court stated that each tortfeasor could be held liable only for such proportion of the total damages as resulted from the dust from his own plant. Recognizing the difficulty of apportioning the damages, however, the court stated that the trier of facts could estimate such damages with a "liberal hand." The problem of joinder of parties did not arise because only one defendant was involved in this particular action. It seems not unlikely that if the plaintiff had tried to join both tortfeasors, a motion for a misjoinder would have been sustained.

The *Colorado* court seems to have adopted the same view in *Ryan Gulch Reservoir Co.* v. *Swartz*.[788] While the court did not make it clear that the damage would not have occurred without the water from both dams which broke as the result of a very heavy rain and caused the damage to the plaintiff's land below the dam, the court takes a position which seems to be quite consistent with that of the later California opinion. The court said:

> We, are, therefore, asked, if we hold on this review that the defendants cannot be held jointly liable, to affirm this judgment as to the lower reservoir owner and then let the two defendants hereafter settle this between themselves, which one, if either, is wholly liable, or what proportion each shall pay of the judgment thus entered by us against the one defendant. We do not think this should be done, even if we had the power to do it. The difficulty that the plaintiff will necessarily encounter, if he brings a separate action against either defendant, in showing what his contribution was to the single injury, is no reason why this court in a joint action against them, where the evidence does not show a joint liability, should hold

[786] 87 Cal. 430, 25 Pac. 550 (1898).

[787] Calif. Orange Co. v. Riverside Portland Cement Co., 50 Cal. App. 522, 195 Pac. 694 (1920).

[788] 77 Colo. 60, 234 Pac. 1059 (1925).

> either defendant liable for the entire injury to which he is only one separate contributor, nor is it any reason why we should permit a joint action to be maintained against both when there was no concurrence, either in time or place, of their distinct and separate acts. There is always difficulty upon the part of a jury in estimating the amount of damages in such cases, but this has never been understood to be a reason for a court arbitrarily to say that defendants, whose wholly distinct and separate acts have caused a single injury, may be joined in one action for the benefit of the plaintiff and to save him the labor of showing in a separate action against either tort-feasor what damage was occasioned by him.[789]

In *Connecticut* there is one case involving stream pollution by several upper riparian owners which contains dictum to the effect that each defendant in a joint tortfeasor situation is responsible only for his own wrongs.[790]

Again, in *Florida* a case involved two separate mining companies as defendants. The waste from their separate plants united to pollute the stream, making it unusable for the plaintiff's purposes in operating his cattle farm. A trial court charge to the jury that defendants could be held joint tortfeasors was reversed on appeal on the ground that to be joint tortfeasors there must be a concert of action which cannot be found merely from the fact that consequences of separate acts unite to form one injury.[791]

A case arose in *Georgia* in which it was alleged that the airplanes of several companies in using the runways of the city airport for landing and taking off were causing such a nuisance to the plaintiff that he was seriously damaged. The court said that "Since the petition does not allege a concert of action in operating on the runway so as to injure the plaintiff and does not allege a conspiracy to so operate it, and does not allege any fact which would make each defendant liable for the acts of the others, the action against the defendants jointly will not lie."[792] Three years later the Supreme Court of Georgia cited this case with approval in denying the plaintiff a joint cause of action against several defendants whose action together brought about the ponding of waters on the plaintiff's lot, causing her damage.[793] The court did go ahead to

[789] *Id.* at 69-70.
[790] Lawton v. Herrick, 83 Conn. 417, 428, 76 Atl. 986 (1910).
[791] Standard Phosphate Co. v. Lunn, 66 Fla. 220, 63 So. 429 (1913).
[792] City of Atlanta v. Cherry, 84 Ga. App. 728, 733, 67 S.E.2d 317 (1951).
[793] Vaughn v. Burnette, 211 Ga. 206, 207, 84 S.E.2d 568 (1954).

say, however, than an injunction action against a continuing tort could be brought against all of the defendants and held that,

> The court, having jurisdiction for the purpose of giving injunctive relief, could under the well-established law of this State retain it as to damages in order to do complete justice between the parties. Code §37-105. The court, upon proper determination of the damages caused by each of the defendants, could render judgment against them for the proportionate parts of the damage done.[794]

It is held, apparently, that it is possible to join the defendants in equity, although the court does not indicate whether or not it is possible to shift the burden of proving what each defendant contributed.

A case arising in *Idaho* [795] involved a situation in which water from the canal of the defendant combined with water from other sources to flow on the plaintiff's land and ruin his hay. The courts held that each independent tortfeasor is liable for that proportion of the injury which he contributed. The court suggested that "exact and definite measurements" of the contribution of each defendant was not essential but "some evidence in that respect is essential." [796] In this case the suit was against only one defendant, there having been no attempt to join all of them, but the court did state that recovery could be obtained against each independent tortfeasor severally.

A similar result was reached by the *Iowa* court in *Bowman* v. *Humphrey,*[797] which involved the pollution of a waterway by the defendant's creamery to the alleged detriment of the plaintiff. Defendant attempted to show that its own pollution was negligible and that somebody else upstream was causing the pollution by dumping dead animals into the water. The trial court instructed the jury that the defendant was liable for the whole damage. The supreme court reversed on the ground that when a defendant has acted separately and without the knowledge of another's activity, only the pollution that could be proved to be the direct and proximate result of his own action can be used to assess damages. The fact that the proof problem would be difficult did not affect the rule in Iowa.

In neither Idaho nor Iowa do the cases actually hold that if all of the

[794] *Id.* at 208.

[795] Woodland v. Portneuf-Marsh Valley Irr. Co., 26 Idaho 789, 146 Pac. 1106 (1915).

[796] *Id.* at 791.

[797] 124 Iowa 744, 100 N.W. 854 (1904). An earlier case involving smoke, soot, and gas also held the injuries must be separated; Harley v. Merrill Brick Co., 83 Iowa 73, 79, 48 N.W. 1000 (1891). See also Tackaberry v. Sioux City Service Co., 154 Iowa 358, 132 N.W. 945 (1912).

defendants were joined in one action the burden of proof would still be on the plaintiff to show the separate contribution of each separate defendant but the two opinions suggest that this would be the rule.

In an early *Kentucky* case,[798] the plaintiff sued for damages to his land alleged to have been caused by the defendant's ditches and culverts which turned surface waters onto the plaintiff's property. The defendant argued that the county contributed to the injury, but the trial court refused to admit this evidence on the ground that it was not sufficient to establish a defense. This ruling was affirmed on appeal, the court taking the position that even if the county wrongfully contributed to the final injury, the two wrongdoers were joint tortfeasors, subject to suit jointly or separately. The court said that the action was to recover damages for the injury, not for the failure of the separate defendants to act with due care. In a later opinion,[799] however, the Kentucky Supreme Court held that tortfeasors acting independently were not jointly liable and could not be joined in one action. The suit was for damages against several oil companies which had permitted crude oil and other harmful liquids to be put in such a position on the bank of the creek that the rains carried it into the stream and onto plaintiff's land.

Joint action was not permitted in a *Minnesota* case involving the waste matter from a canning company and a city operated septic tank combining in a stream and causing a nuisance with damage to the plaintiff's farm which was downstream.[800] The court did not even consider the possibility of joining the parties to try common issues, but separated them for trial of the damage question.

The *Mississippi* court was faced with the problem in *Masonite Corp.* v. *Burnham*.[801] In that case the defendant company had emptied its refuse matter into the waters of a creek into which the city also emptied its sewage. The polluted water damaged the plaintiff. The court, citing many of the cases which we feel should be distinguished,[802] held that the trial court should have instructed the jury that the appellant "would only be liable for its contribution to the pollution of the stream and the damages resulting therefrom, and not for the independent acts of others

[798] Campbell Turnpike Rd. Co. v. Maxfield, 28 Ky. L. Rep. 1198, 91 S.W. 1135 (1906).

[799] Watson v. Pyramid Oil Co., 198 Ky. 135, 248 S.W. 227 (1923). The same idea was applied in a case involving joint fraud, Evola Realty Co. v. Westfield, 251 S.W.2d 298, 301 (Ky. 1952).

[800] Johnson v. City of Fairmont, 188 Minn. 451, 247 N.W. 572 (1933), following dicta in Sloggy v. Dilworth, 38 Minn. 179, 36 N.W. 451 (1888).

[801] 164 Miss. 840, 146 So. 292 (1933).

[802] See discussion *supra* at note 782.

contributing to such pollution and the damages resulting therefrom." [803]

The only case directly in point in *Missouri* is a decision by a Missouri appellate court in a case where the injuries complained of were caused by the depositing through sewer pipes into a waterway of large quantities of manure, soot, garbage, decayed animals, *etc.*, by individual defendants who had received permission to do so from the city. The court denied a joint action on the ground that they were liable only in separate actions for the particular injuries caused by each defendant separately. The court reasoned that "Were the rule otherwise a person, who illegally throws some putrid matter into a highway, might be held legally responsible for the injuries caused by pestilence that depopulates a city, simply because others, by similar illegal acts added to his own, created the nuisance which bred the pestilence." [804] In dictum in a recent case involving a situation where the real issue was which of two possible sources of the injurious force was the one which actually set it in motion, the court used some language which might indicate a contrary view.[805]

The Supreme Court in *Montana* has had two occasions to rule on the problem. In the earlier case [806] the court refused to impose liability for the entire damages on one of several companies where refuse from several mining and smelting plants, including defendant's, had polluted a waterway which had deposited the refuse on plaintiff's land. In a later case [807] several defendants individually had diverted water in such a way as to prevent the plaintiff from using the water for irrigation purposes. The court held in each case that there could be no joint liability and that a joint action could not be brought, whether or not damages were apportioned among all defendants. In another case a federal court sitting in Montana refused to allow damages against any of the defendants in a suit to enjoin multiple defendants, even though an injunction action was proper and a restraining order would be issued against all of the defendants.[808]

[803] *Supra* note 801 at 854.

[804] Martinowsky v. City of Hannibal, 35 Mo. App. 70, 78 (1889).

[805] Schoening v. Claus, 363 Mo. 119, 124, 249 S.W.2d 361 (1952), mentioned *infra* at note 880. Since it arose in a hunting accident situation it is very doubtful that it would be carried over into the nuisance type of case, however. The court did say, "[I]f the two Claus brothers acting together negligently injured plaintiff, then each would be liable. The evidence did not justify such an instruction. If some shot fired from each gun struck plaintiff, then each would be liable. However, if plaintiff's injuries were the result of the shot fired by Elmer, Erwin would not be liable."

[806] Watson v. Colusa-Parrot M. & S. Co., 31 Mont. 513, 79 Pac. 14 (1904).

[807] Howell v. Bent, 48 Mont. 268, 137 Pac. 49 (1913).

[808] Norton v. Colusa-Parrot M. & S. Co., 167 F. 202 (C.C.D. Mont. 1908).

A *Nevada* court in an early decision [809] also held that there was a misjoinder of parties when the defendants independently through their separate ditches wrongfully sent waste water flowing into the drain ditch of the plaintiff, although an injunction would have been permissible.

The plaintiff in a *New York* case sought damages for injury to her property caused by the defendant and other hotel owners through the disposal of sewage into a stream. The language of the New York Court of Appeals has been quoted often by courts in other jurisdictions.

> The right of action arises from the discharge into the stream, and the nuisance is only a consequence of the act. The liability commences with the act of the defendant upon his own premises, and this act was separate and independent of and without regard to the act of others. The defendant's act, being several when it was committed, cannot be made joint because of the consequences which followed in connection with others who had done the same or a similar act. It is true, that it is difficult to separate the injury; but that furnishes no reason why one tortfeasor should be liable for the act of others who have no association and do not act in concert with him. If the law was otherwise, the one who did the least might be made liable for the damages of others far exceeding the amount for which he really was chargeable, without any means to enforce contribution or to adjust the amount among the different parties. So also proof of an act committed by one person would entitle the plaintiff to recover for all the damages sustained by the acts of others, who severally and independently may have contributed to the injury. Such a rule cannot be upheld upon any sound principle of law. The fact that it is difficult to separate the injury done by each one from the others furnishes no reason for holding that one tortfeasor should be liable for the acts of others with whom he is not acting in concert.[810]

The court did not even consider the possibility of shifting the burden of proof to the defendant to show his contributed share. Neither did it consider the advantages of a joint cause of action uniting all of the defendants in one proceeding, and either trying the common questions together and separating the damage question or shifting the burden of proof to the defendant on damages. The case was decided at a time when liberal rules of joinder were not generally accepted.

A lower court in New York in another case cited the Court of Ap-

[809] Blaisdell v. Stephens, 14 Nev. 17 (1879).

[810] Chipman v. Palmer, 77 N.Y. 51, 53-54, 33 Am. Rep. 566 (1879).

peals' opinion as justification for allowing an injunction against multiple defendants whose individual small contributions to the pollution of the stream together caused damage to the plaintiff.[811]

Since only the defendant railroad was sued in the action, the *North Dakota* case of *Boulger* v. *Northern Pac. Ry.*[812] is not really authority for the proposition that several defendants cannot be joined in one action. The court held, however, that the defendant railroad could be held liable only for the damages caused by its own embankment, and not for the additional damages caused by other sources which together with the defendant's contribution caused waters to flood plaintiff's property.

The same rule was applied by the *Ohio* court in a case in which the lower court had held the city liable for all of the damages caused by the pollution of a stream which the city alleged was also partly caused by other riparian owners. The Ohio Supreme Court, reversing the trial court, held that the recovery must be limited to the injuries occasioned solely by the acts of the city, regardless of how difficult it would be to determine the part of the damages so occasioned.[813]

The early *Pennsylvania* case of *Little Schuylkill Navigation Co.* v. *Richard's Adm'r.*[814] is certainly one of the leading cases for this point of view. It often is cited by courts in other jurisdictions. In this case the plaintiff's dam gradually was filled with coal-dirt discharged from the coal mining operations of the several defendants. The instruction of the trial court that each was liable for the whole damage was held erroneous. As in the New York case, the Pennsylvania court held that the deposit of the coal-dirt in the dam's basin was only the cause of the injury but that the tort itself which gives rise to the cause of action was the act of throwing the coal-dirt into the stream. Since each act was wholly separate and independent of the acts of other defendants the torts were several when committed. Nevertheless, the court said that, because of the difficulty of proof, the jury should be permitted to measure the injury caused by each with a "liberal hand."[815] The joinder of several defendants who acted independently is possible in Pennsylvania, however, in an equity injunction action, but the court says nothing about whether this means each defendant would be liable for all, or

[811] Warren v. Parkhurst, 46 Misc. 466, 92 N.Y.S. 725 (1904).
[812] 41 N.D. 316, 171 N.W. 632 (1918).
[813] City of Mansfield v. Brister, 76 Ohio St. 270, 81 N.E. 631 (1907).
[814] 57 Pa. 142 (1868).
[815] *Id.* at 147; approved in Gallagher v. Kemmerer, 144 Pa. 509, 22 Atl. 970 (1891).

merely that damages can be apportioned among the defendants in such a suit.[816]

A somewhat different kind of concurrent nuisance arose in a *Tennessee* case decided in 1903. The defendants were separate and independent corporations engaged in the mining and smelting of copper. The operations of each caused the emission of noxious, foul, and poisonous smoke and gases, which drifted onto the plaintiff's premises. The defendant's demurrer for misjoinder was sustained, and the ruling was affirmed by the Supreme Court, the court holding that the plaintiff must proceed in separate actions for the damages caused by each wrongdoer separately, since otherwise one who contributed only a slight amount to the injury would be held liable for the damages of all. The court was not unaware of the difficulty of proof but at least made some attempt to indicate to the trial court how this might be handled and how to apportion the damages.

> That a plaintiff may be embarrassed in proving the wrong done him by one person is no reason why he should recover his damages from another, who did not cause them, merely because he did the plaintiff a similar injury. [The court suggested that, to measure the damages of each, proof could be made of the extent and capacity of the plants, tonnage of ore, time each has been in operation, proximity from plaintiff's land, condition of the air currents, together with other facts and circumstances to show the amount contributed by each.][817]
>
> While we are not now called upon to pass upon this question, we think that, where defendants are guilty of wrongs necessitating the action, juries should not be held to too great nicety and accuracy of judgment in ascertaining the damages to be assessed against each of the tortfeasors; and this court would be slow to interfere with verdicts supposed to be excessive.[818]

The court, however, did insist on separate actions.

Only one of several who independently contributed to plaintiff's injury was sued by the plaintiff in the *Virginia* case of *Pulaski Coal Co.* v. *Gibboney Sand Bar Co.*[819] The deposit of slack, slate and mine refuse by several companies acting independently caused injury to plaintiff's

[816] Gray v. Phila. & Reading Coal & Iron Co., 286 Pa. 11, 132 Atl. 820 (1926), discussed *infra* at note 834.

[817] Swain v. Tennessee Copper Co., 111 Tenn. 430, 442, 78 S.W. 93 (1903).

[818] *Id.* at 455. In accord, Madison v. Copper Co., 113 Tenn. 331, 83 S.W. 658 (1904). Injunction suit distinguished in Ladew v. Tennessee Copper Co., 179 F. 245, 255 (C.C.S.D. Tenn. 1910).

[819] 110 Va. 444, 66 S.E. 73 (1909).

sand bar when the refuse was washed downstream. The court held that each must be held separately for a proportionate injury caused by his own negligence. The damages contributed by the one being sued had to be proved by the plaintiff, the court said.

Another case that was decided in Virginia in 1946 presents a variation of the problem not found in any of the cases discussed so far. The plaintiff sued the defendant for the pollution of the plaintiff's well by water and minerals running from the defendant's mine. The defense was that the plaintiff by his own activities had contributed substantially to the pollution. The plaintiff introduced no evidence as to how much of a contribution was made by the defendant, and the court held that this, therefore, called for dismissal of the action, since the damage done by the defendant must be proved by the plaintiff.[820]

In the first case arising in *West Virginia,*[821] the court held that the one defendant against whom the action was brought was liable for the entire damage even though several coal mines had contributed by depositing refuse in the stream running by plaintiff's land. The court reasoned that otherwise the plaintiff would be denied relief because he would not be able to prove the proportion of the share of each tort-feasor's act to the total injury. Yet later, in *Farley* v. *Crystal Coal & Coke Co.,*[822] the court expressly overruled the previous decision, and held that there was no joint liability if there was no concert of action, even though the contributions of the six coal mining companies had united to pollute the river and cause damage to the plaintiff's farm.

In a case decided by the United States Court of Appeals (Ninth Circuit) arising in *Arizona,* the court stated that the damages caused by separate smelting companies to the plaintiff's adjoining farm land should be measured separately, and that each should be liable only for whatever damage was done by its own smelter.[823] In this case the lower court had consolidated two cases against two separate defendants and apparently they were tried by one jury, but separate verdicts were given. The defendant who appealed had not introduced any evidence but had objected to the verdict for the plaintiff. The court stated that the evidence was convincing to the effect that the smoke and fumes from the two smelters intermingled and caused the damages, and then proceeded to say "how could plaintiffs, farmers, be reasonably expected to say with anything like precision what the contents of the smoke

[820] Panther Coal Co. v. Looney, 185 Va. 758, 40 S.E.2d 298 (1946).
[821] Day v. Louisville Coal & Coke Co., 60 W.Va. 27, 53 S.E. 776 (1906).
[822] 85 W.Va. 595, 102 S.E. 265 (1920).
[823] United Verde Copper Co. v. Jordan, 14 F.2d 299, 302 (9th Cir. 1926).

were, or what proportion of damage was done by smoke from one smelter as distinguished from the other?" [824] The court then stated that the theory of the plaintiffs was one of separate damages and apparently assumed that the jury's verdict against this one defendant was based upon a separation of the damages caused by the two companies, in spite of the apparent lack of evidence to separate the damages.

Injunction Against Concurrent Nuisance. While almost all jurisdictions, as indicated above, deny any kind of joint recovery in a damage action at law where the nuisance is the result of contributions of independent persons acting without concert, nevertheless, in a proper case it is the rule in every jurisdiction that an action in equity to enjoin the continuance of the nuisance is permissible and in this proceeding all of the contributors can be made parties. An injunction against nuisance is an equitable action, and to avoid multifarious suits the equity court will allow the joinder of all parties and enjoin each of them from making further contributions to the nuisance. The cases supporting this proposition are legion, many of them in the very jurisdictions which deny joint recovery by way of damage award.[825]

Equitable Relief by Way of Damage Award. There are a few cases in which courts, after joinder of multiple defendants for purposes of an injunction, have allowed an award of damages in the same equitable action, even in jurisdictions where a joinder of parties defendant in a law action for damages would not be permissible. Typical of these is *Vaughn* v. *Burnette,* decided by the *Georgia* Supreme Court in 1954.[826] The court held that an injunction against all of the independent concurrent defendants could be had, and—

> The court, having jurisdiction for the purpose of giving injunctive relief, could under the well-established law of this

[824] *Ibid.*

[825] Miller v. Highland Ditch Co., (Calif.) *supra* note 786; People v. City of Los Angeles, 83 Cal. App.2d 627, 189 P.2d 489 (1948); City of Atlanta v. Cherry, (Ga.) *supra* note 792; Lockwood Co. v. Lawrence, 77 Me. 297 (1885) (paper companies polluting water); Woodyear v. Schaefer, 57 Md. 1 (1881) (pollution of water by slaughterhouses, soap company and brewery causing sickening odor affecting flour mill operations); Jessup & Moore Paper Co. v. Zeitler, 180 Md. 395, 24 A.2d 788 (1942) (paper companies polluting water); Johnson v. City of Fairmont, *supra* note 800; State v. Dearing, 244 Mo. 25, 148 S.W. 618 (1912) (mining refuse discharged into stream); Blaisdell v. Stephens, *supra* note 809; Warren v. Parkhurst, *supra* note 811, approved 186 N.Y. 45, 78 N.E. 579 (1906); City of Mansfield v. Brister, *supra* note 813; Madison v. Copper Co., *supra* note 818. See cases (including English) collected 45 A.L.R.2d 1285 (1956) and 4 Restatement, Torts §882, comment b. In Morgan v. City of Danbury, 67 Conn. 484, 35 Atl. 499 (1896) an injunction was permitted against the same defendant for two separate nuisances, filling up pond and polluting air and water.

[826] *Supra* note 793.

> State retain it as to damages in order to do complete justice between the parties. Code §37-105. The court, *upon proper determination of the damages caused by each of the defendants,* could render judgment against them for their proportionate parts of the damage done.[827]

The court in no way indicates that there would be any shifting of the burden of proof to the multiple defendants or that there would be an imposition of joint liability on each of them for the total damage.

The *Nebraska* court faced a similar problem in *Brchan* v. *Crete Mills,* decided in 1952.[828] Here it was charged that the separate dams and dikes of two defendants, acting independently in the construction of the structures, together caused the river to back up in such a way as to create a nuisance, flooding plaintiffs' lands. In addition to an injunction against the maintenance of the dams and dikes, the plaintiffs asked for money damages caused by three previous floods. After the court decided that this was a proper case for joining the parties to enjoin the continuance of the nuisance, the court said, concerning the right to recover damages:

> Some cases hold to the proposition that the collection of damages was not an actionable matter, and that an adequate remedy at law exists for the collection of damages. They further held that the defendant was entitled to a jury trial on the question of damages.[829]
>
> It appears from the foregoing-cited Nebraska cases that this jurisdiction has given approval to the proposition in a suit to enjoin a nuisance, damages suffered by the plaintiff on account of such nuisance may be included in the equitable action. This being an action in equity, the main relief sought is the abatement of the nuisance. The only damages that could be recovered would be the damages occurring as the result of the nuisance, if such be proven. This is based on the following rule: "It is a well-settled principle of equity jurisprudence that, where a court of equity has obtained jurisdiction of a cause for any purpose, it will retain it for all, and will proceed to a final determination of the case, adjudicate all matters in issue, and thus avoid unnecessary litigation." [830]

Since the question arose on a demurrer by the defendant, the court did not answer the question of how the damages should be apportioned, if they were to be apportioned, or if the two defendants were to be held jointly liable for the total damage.

[827] *Id.* at 208. [Emphasis added.]
[828] 155 Neb. 505, 52 N.W.2d 333 (1952).
[829] *Id.* at 515.
[830] *Id.* at 516.

To like effect, the lower court in *New York,* in *Warren* v. *Parkhurst,*[831] in considering the objection of the defendant that money damages could not be awarded in a suit to enjoin a nuisance, said:

> All the defendants may be enjoined, and, if the question of damages is urged, a reference may be had to determine what damage has been caused by each defendant. This power of a court of equity to grant exact justice and proper relief for or against each defendant relieves such an action of any possible hardship.[832]

The Court of Appeals in New York upheld the decision of the lower court, apparently even as to the right to award damages, although the language is not clear on this point. The court said that the complaint stated a cause of action and was not objectionable "on the ground of multifariousness. Whether it would be good if the plaintiff sought only to recover damages at law, it is not necessary now to decide."[833] There is no indication in either New York opinion as to whether it would be possible to assess joint liability against all of the defendants for the total damage, but one gets the impression from reading the cases that the damages would be separated.

The same problem arose in *Pennsylvania* in the case of *Gray* v. *Phila. & Reading Coal & Iron Co.,* the court saying:

> Assuming that each and all of the present defendants could claim a jury trial on the question of damages (a matter which the chancellor will have little difficulty in deciding when called upon to do so), [?], and that they prefer to face the antagonistic sympathy of a jury, rather than the judgment of a court not so influenced, still no difficulty would result; for, in the interest of the public generally, the issues thus raised can be combined for the purposes of trial on this point, so long as it can be done without injustice to the defendants; and, so far as we now see, all such issues could be wisely tried together.
>
> Moreover, the convenience of the remedy in chancery is not the only basis of equitable relief in the present case. Equity is the special forum for obtaining an injunction, which may be granted to prevent actual or threatened trespasses or nuisances of a continuing and permanent character . . . and, when once the jurisdiction has thus attached, equity will itself proceed to round out the whole circle of controversy, by deciding every other contention connected with the subject-matter of the suit,

[831] *Supra* note 811.
[832] *Id.* at 728.
[833] *Supra* note 825 at 49.

> including the amount of damages to which plaintiff is entitled because of injuries theretofore sustained . . . .[834]

The decision of the *Wisconsin* court in *Mitchell Realty Co.* v. *West Allis,*[835] has been cited frequently. The corporate defendants' operations discharged chemicals and vegetable ingredients from their industrial operations into the stream and contributed to its pollution, to the injury of the plaintiff. The action was brought against the city and seven corporate defendants for injuries caused to the plaintiff's property by the discharge of sewage through the city sewage system and thence to a stream running through the plaintiff's land. The lower court allowed damages to the plaintiff in its suit against the city, the other individual defendants having been separated from the action against the city. Separate actions had been begun against each of them. The lower court also went on the assumption that the total amount of damages resulting from the pollution could be charged to the city, which then could obtain reimbursement from the other defendants. The Supreme Court said:

> It is our view, therefore, that the action as originally begun was maintainable, and that the order of the lower court in striking out the allegations as to damages with respect to the private corporations charged was erroneous. Had the action proceeded, the plaintiffs could have obtained their equitable remedy for the abatement of the nuisance, and, upon the determination of the court of the proportionate share of the damage caused by each of the defendants, were entitled to judgment for such amounts, thus disposing of the entire litigation in one action. To accomplish such a result is one of the principal functions of a court of equity.[836]

The court went on to hold, however, that the whole damage could not be assessed against one defendant but would have to be apportioned among the wrongdoers.

Cases Permitting Joinder and Joint Liability. In a few cases courts have imposed total liability upon each of the defendants whose actions contributed in some part to the total injury which caused the plaintiff's damage. An action was brought in *Indiana* to recover damages for injuries resulting from the pollution of waterways from paper factories of several defendants. The defendants were held jointly liable and the court drew a rather unusual distinction. The court held that if the acts had amounted only to a private nuisance the defendants would be

[834] *Supra* note 816 at 16.
[835] 184 Wis. 352, 199 N.W. 390 (1924).
[836] *Id.* at 370.

liable individually only for the consequences of their own acts, but that, since a public right had been violated, each must answer for the wrongs of the others jointly or severally, as the plaintiff elects.[837] No other case has been found in which the court drew a line between public and private nuisances for purposes of finding joint liability for damage. The distinction between these two kinds of nuisance would seem to have nothing to do with the question of whether persons, not acting in concert with each other but whose separate actions concurred and caused a total injury, should be held jointly liable.

In *Arnold* v. *C. Hoffman & Son Milling Co.*,[838] the *Kansas* court held that the defendants, one of whom had constructed a bridge and the other a dam, which together caused an overflow of water on the plaintiff's land, could not object by demurrer to being sued jointly and severally under the alleged facts. The defendants would be jointly liable if it were found that their acts operated jointly and contemporaneously to produce the overflow. A similar result was reached in a later case involving injury to the plaintiff's land caused by pollution of a creek by the city which discharged sewage and an oil company which discharged refuse into the creek.[839]

The opinion in a recent *North Carolina* case gave the same kind of answer when one defendant was sued for damages to land from the depositing of silt from mining operations in a stream flowing through the plaintiff's property. The defendant filed a cross claim against additional defendants seeking to enforce its right of contribution, in the event it was found liable. The court stated:

> If the independent wrongful acts of two or more persons unite in producing a single indivisible injury, the parties are joint tortfeasors within the meaning of the law, and the injured party may sue only one or all of the tortfeasors, as he may elect . . . .
>
> When the aggrieved party elects to sue only one, or less than all of the tortfeasors, the original defendant or defendants may have the others made additional defendants (under the applicable statute) for the purpose of enforcing contributions . . . .[840]

[837] West Muncie Strawboard Co. v. Slack, 164 Ind. 21, 72 N.E. 879 (1904).

[838] 86 Kan. 12, 119 Pac. 373 (1911).

[839] McDaniel v. City of Cherryvale, 91 Kan. 40, 136 Pac. 899 (1913). See also Mosby v. Manhattan Oil Co., 52 F.2d 364 (8th Cir. 1931), *cert. den.* 284 U.S. 677, 52 S.Ct. 131 (1931).

[840] Phillips v. Hassett Mining Co., 244 N.C. 17, 22, 92 S.E.2d 429 (1956). See also McKinney v. Deneen, 231 N.C. 540, 58 S.E.2d 107 (1950); Stowe v. City of Gastonia, 231 N.C. 157, 56 S.E.2d 413 (1949); Lineberger v. City of Gastonia, 196 N.C. 445, 146 S.E. 79 (1929).

Three cases have arisen in *Oklahoma* and the court has held each time that each of several persons acting independently, whose actions combined to produce a single injury, would be held jointly liable for the total damages. In one case [841] livestock water was polluted by several defendants who permitted oil and salt water to run into creeks on plaintiff's land. In a later case [842] a city was sued for its operation of a septic tank and disposal plant which caused obnoxious odors and deposited refuse on the plaintiff's land. The city claimed that others, including slaughterhouses and a cotton gin, contributed to the injuries, but the court held the city liable for the total amount on the ground that this defense was immaterial. In a later case a federal court held the defendant oil companies jointly liable for the damage to the plaintiff's property arising out of the separate drilling operations of the companies.[843] In reaching its decision in this last case, the court considered it to be an application of the rationale used in an earlier case in which crude oil that had flowed into a creek from several defendants' operations and ignited had then burned the plaintiff's barn. These cases can perhaps be distinguished along lines suggested later [844] on the ground that possibly the oil from any one of the defendants would have been sufficient to have ignited and caused the total injury. If so this would not be a case of each of the defendants making a small contribution to the extent of the injury, but rather they happened to be concurrent causes of one single indivisible injury, the burning of the barn.

A fairly recent *Texas* case, *Landers* v. *East Texas Salt Water Disposal Co.*,[845] contains as strong an expression as any for holding each of the contributors of injurious material liable for the whole. The court stated that requiring the plaintiff to assume the burden of proving the contribution of each separate wrongdoer with sufficient certainty under existing rules of damages would deny the plaintiff an effective remedy under prior rulings in Texas. The court then said:

> In other words, our courts seem to have embraced the philosophy, inherent in this class of decisions, that it is better that the injured party lose all of his damages than that any of several wrongdoers should pay more of the damages than he individually and separately caused. If such has been the law, from the standpoint of justice it should not have been; if it is

[841] Tidal Oil Co. v. Pease, 153 Okla. 137, 5 P.2d 389 (1931).

[842] Town of Sentinel v. Riley, 171 Okla. 533, 43 P.2d 742 (1935).

[843] British-American Oil Co. v. McClain, 191 Okla. 40, 126 P.2d 530 (1942).

[844] Northup v. Eakes, 72 Okla. 66, 178 Pac. 266 (1918), the distinction that should be made is discussed in the text *infra* at note 858.

[845] 151 Tex. 251, 248 S.W.2d 731 (1952).

> the law now, it will not be hereafter. The case of Sun Oil Company v. Robicheaux is overruled. Where the tortious acts of two or more wrongdoers join to produce an indivisible injury, that is, an injury which from its nature cannot be apportioned with reasonable certainty to the individual wrongdoers, all of the wrongdoers will be held jointly and severally liable for the entire damages and the injured party may proceed to judgment against any one separately or against all in one suit. If fewer than the whole number of wrongdoers are joined as defendants to plaintiff's suit, those joined may by proper cross action under the governing rules bring in those omitted. To permit the joinder as defendants of such wrongdoers without at the same time imposing joint liability upon them would not relieve the inequities of the situation nor cure the ills of the plaintiff. Simple procedural joinder of the defendants would put the plaintiff in no better position to produce the required proof of the portion of the injury attributable to each of the defendants. In most such cases, under the decisions heretofore cited, he would still be the victim of an instructed verdict. It would be of no comfort or advantage to the plaintiff that the instructed verdict relieved all of the defendants of liability in one suit and at one time rather than in separate suits and one at a time.[846]

A rather odd result was reached in a very early *Vermont* case.[847] Here two separate dams caused water to overflow on the plaintiff's land but one of the defendants removed his dam immediately upon hearing of the injury to the plaintiff's land. The jury found this defendant not guilty and the other guilty. The one found guilty appealed on the ground that there was a misjoinder in the trespass action. The court said the joinder was proper on the theory that if the plaintiff had brought an action against either one separately, the defendant would have argued that his dam caused no injury at all. The court concluded that it is possible to join both defendants and permit the jury to decide where the blame should be placed. The case, therefore, really is not a holding that there can be joint liability. In a much later case,[848] however, the Vermont court held defendants jointly and severally liable where the dam of one and the piers of the other together raised the water level and caused it to flow onto the highway.

A case arose in *Washington* involving the pollution of a river by sewage of a city and waste from the defendant's slaughterhouse.[849] The

[846] *Id.* at 256.

[847] Wright v. Cooper, 1 Tyler 425 (Vt. 1802).

[848] Town of Sharon v. Anahama Realty Corp., 97 Vt. 336, 123 Atl. 192 (1924).

[849] Snavely v. City of Goldendale, 10 Wash.2d 453, 117 P.2d 221 (1941).

court did not allow imposition of joint liability because it felt it was unjust to hold one responsible for the entire injurious effects of acts committed by all, but it did allow joinder of parties in one suit to determine more accurately the rights and duties of all. It held that there was no misjoinder. This seems to reverse an earlier Washington decision in which one defendant was held liable for the whole injury in a concurrent causation situation.[850]

The United States Court of Appeals for the Eighth Circuit in a case arising in *Louisiana* adopted the joint liability for the total injury view.

> Louisiana follows this rule. If, therefore, on a new trial, plaintiffs can introduce evidence sufficient to show that the defendants, or any of them, were negligent and, though acting separately, their negligence combined to produce the pollution damage, plaintiff may recover for the whole damage against one or all of those contributing.[851]

The recent decision by the *English* House of Lords in *Bonnington Castings, Ltd.* v. *Wardlaw*[852] indicates that the English rule in this kind of case is analyzed in simple terms of "material contribution," the only requirement being that the part contributed by each defendant being sued make a material contribution. If it does, then total liability is imposed upon each. At least it was so held in the case of an occupational disease, silicosis. This analysis does not seem to be dependent upon the fact that the case involved the breach of a statutory duty or liability to an employee, since the question is one of causation.

Results in Cumulative Contribution Radiation Cases Under Existing Doctrines. The results which courts would reach under existing rules in several of the multiple defendants situations have been indicated already, including, (1) when the negligence of each of two or more defendants has furnished a link in the chain of *causation* resulting in a single injurious incident, (2) when two or more independent sources negligently operated have exposed the plaintiff and each contribution was sufficient to cause the total injury but which actually caused the injury cannot be determined, and (3) when several sources each make a cumulative contribution to the amount of injury but total liability may be imposed upon one or more of the defendants because of legally imposed responsibility for the acts of another such as in concert of action, vicarious liability, and common duty situations.

[850] Johnson v. Irvine Lumber Co., 75 Wash. 539, 135 Pac. 217 (1913), where defendant's log jam and the acts of others combined to cause injury.

[851] Phillips Petroleum Co. v. Hardee, 189 F.2d 205, 212 (5th Cir. 1951).

[852] [1956] 1 All. E.R. 615. Commented on in 106 L. J. 387 (1956).

In addition, the results which courts will reach under existing rules in other situations will be discussed in the next two subsections. *Negligent Unknown Wrongdoer* deals with those situations in which less than all of the potential defendants are responsible for the injury (in the sense that some simply could not have made any contribution), but it is impossible or at least extremely difficult for the plaintiff to identify the responsible party or parties. *Cumulative Effect from Non-Negligent Source* is concerned with cases in which the manner of operation, including the amount of radiation, is in compliance with the standard of conduct required of the reasonable man under the circumstances.

The cumulative or concurrent nuisance cases possibly give us answers to the radiation situations in which several legally unrelated defendants each has been negligent and *each has made the total injury greater* than it would have been without his contribution. Whether the sources of radiation be reactors, industrial and research isotopes, or waste products being disposed of, two types of cumulative contribution cases may arise: (1) when each negligently releases radiation but the amount is below the threshold level which causes observable injury so that without the contribution of others no tort liability would have been imposed; and (2) when each negligently releases sufficient radiation to cause recoverable injury to the plaintiff without the contribution of the others but the injury caused by each is now combined in one total injury. Many of the nuisance cases appear to involve the latter situation, but the facts of others would seem to be similar to those in the first group. Unfortunately the courts have not been concerned with such a distinction so the facts are not stated in a manner that would reveal which is involved. Under existing rules evolved from the nuisance cases this could cause a difference in result which would seem unjustifiable.

The clear majority of jurisdictions in the United States holds that there can be no joint liability in the cumulative-contribution-to-amount-of-injury case; and many of these do not allow even a joinder of defendants in the same cause of action, nor do they permit a shifting to the defendants of the burden of proving proportionate contribution. In such states the injured plaintiff must sue each one separately and prove the amount of damage caused by each. To the extent that the contribution of any one of the defendants is not sufficient to cause *any* recoverable harm this would seem to lead to a result denying recovery at least for this amount of the injury. In many cases, particularly of radiation exposure, this could mean no recovery at all. A good example would be genetic damage since the increase in incidence of mutations

apparently is directly proportional to the amount received. Using the more probable than not test, if the increase in chances of a mutation is allocated to each defendant, the contribution of no one defendant is likely to be sufficient to make the chances of mutation more than fifty per cent. Therefore, recovery could be had from no defendant. Theoretically, when each source contributed enough to cause recoverable injury, plaintiff can get full compensation if he can find and recover from all of the defendants. This would seem to be the case with such radiation injuries as shortened life span in which there apparently is a linear and cumulative effect from all radiation. In some jurisdictions [853] joinder may be permitted and the jury allowed to apportion the damages with a liberal hand so far as proof of relative contribution is concerned.

In those eight jurisdictions which not only have allowed joinder of all defendants but also have imposed joint liability on all defendants for the total damages, the plaintiff will not only avoid the very difficult problem of proving how much each defendant contributed but also will get a windfall in two senses. Joint liability as imposed by the courts in these jurisdictions means that each defendant is liable not only for his own contribution, but also in a real sense is a surety for all other defendants in the event they cannot be found or are unable to contribute their share of the damages. In addition, the effect of joint liability could be to make the defendant or defendants who were negligent and successfully sued by the plaintiff liable not only for their own contributions but also for any contribution made by any other source of radiation which contributed to the total injury, including natural background radiation and that from non-negligent sources, such as those used in medical treatment. It can be argued that imposing total liability in such situations is like the "thin-skull" cases, or those in which the first negligent person who injures the plaintiff is liable for the negligence of a doctor who treats plaintiff for his initial injuries, or even some of the concurrent *causation* cases in which it took both a dam built by one defendant and a railroad embankment built by another to cause plaintiff's land to be overflowed.[854] Even if this explanation be accepted, it should not be used to justify the imposition of suretyship liability upon one collectible defendant when it is clear that each defendant caused some separable part of the total injury.

Surely better solutions can be worked out and the responsibility for doing so rests primarily with lawyers. We make the following suggestions as a start toward better solutions.

[853] *E.g.*, California. See case cited *supra* note 787.

[854] Arnold v. C. Hoffman & Son Milling Co., *supra* note 838.

Cumulative or Concurrent Causation and Cumulative or Concurrent Contribution to Amount of Injury Distinguished. The importance of distinguishing between the two types of cases is so great that restatement of the distinction is justified. It would seem better social policy to apply different recovery rules in each type, or at least not to carry over into the cumulative contribution cases the doctrine of total liability that has been applied in cumulative causation cases, as a few courts have done.

The cases pertinent to this subsection (5 b (3) (b) (ii)) all involve situations in which the forces set in motion by more than one source (human or otherwise) not only combine to injure the plaintiff but also each force itself makes some contribution toward *increasing the damages;* they are not just an essential causative link in creating the accident which caused plaintiff's injury.

An example of a case in which there clearly is cumulative or concurrent *causation* but not cumulative *contribution* to the amount of the damages is *McKay & Roche* v. *Southern Bell Tel. Co.*[855] In this case the injury to the plaintiff's horse and property resulted when a telephone wire negligently maintained by one defendant, fell across a trolley wire, negligently maintained by another defendant, thereby becoming charged with electricity and causing injury when it fell to the ground. Here it took the concurrent forces of two wrongdoers to cause the final injury, but the injury itself was no different in extent or kind because there were two wrongdoers. Other examples of this type of case are the car collision cases in which both drivers are negligent and an innocent third party is hurt, referred to in section 5 b (2).[856] These are cases of true joint tortfeasors.

Neither are the true cumulative contribution cases considered in this subsection (5 b (3) (b) (ii)) quite like those where two causes, equally capable of causing the total injury, happen concurrently and in fact cause one injury, such as in the two motorcycles case or the two fires case, hitherto mentioned in section 5b(2) and similar situations.[857] While the facts are not always clear, some of the concurrent nuisance cases may really be cumulative or concurrent causation situations rather than cumulative contribution ones.[858] They should be distinguished, there-

[855] 111 Ala. 337, 19 So. 695 (1896). Daggett v. Keshner, 149 N.Y.S.2d 422 (1950), seems to be of this category, though the facts are very fuzzy. See also Roush v. Johnson, *supra* note 763.

[856] *Supra* notes 763-64.

[857] *Supra* note 758.

[858] *Supra* note 844.

fore, even if the courts do not do so, from the case in which there is true cumulative contribution to the amount of injury.[859]

A few of the cumulative contribution situations analyzed in section 5 b (3) (b) (ii) perhaps do fall just in between the cumulative causation cases and those in which it is the injury itself to which each of several defendants contributes, not to the causation of the situation or accident from which the plaintiff is hurt. In a few of the cases where the plaintiff's land has been flooded because of obstructions placed there by two or more defendants and where it took the effect of both obstructions to cause the flooding, we have cumulative forces that could be said to be either uniting in causation or in contribution to the damages resulting.[860] In many of these cases the facts do not make it clear whether it took both or several obstructions to cause *any* damage, or only that each of the obstructions made some contribution to the total damages. If the latter is the case then they should be treated as cases in which there is a cumulative contribution to the damage only, while if the former is the case, they should be treated as cases of cumulative causation.

The Correct (?) Solutions. While the view denying imposition of joint liability clearly is the weight of authority even today, many authorities have condemned the result. Some of them go all the way in support of the rationale of the Texas court in the *Landers* case.[861] Wigmore would adopt the following rule:

> *Wherever two or more persons by culpable acts,* whether concerted or not, *cause a single general harm, not obviously assignable in parts to the respective wrongdoers, the injured party may recover from each for the whole.* In short, wherever there is any doubt at all as to how much each caused, take the burden of proof off the innocent sufferer; make any one of them pay for the whole, and then let them do their own figuring among themselves as to what is the share of blame for each.[862]

Such reasoning would seem to go too far and is not necessary to protect the innocent plaintiff.

[859] *Supra* note 843.

[860] *E.g.,* Boulger v. Northern Pac. Ry., *supra* note 812; Brchan v. Crete Mills, *supra* note 828; Arnold v. C. Hoffman & Son Milling Co., *supra* note 838; Wright v. Cooper, *supra* note 847; Town of Sharon v. Anahama Realty Corp., *supra* note 848; and perhaps Johnson v. Irvine Lumber Co., *supra* note 850; Howell v. Bent, *supra* note 807. See also Tackaberry v. Sioux City Service Co., *supra* note 797.

[861] *Supra* note 845.

[862] Wigmore, "Joint Tortfeasors and Severance of Damages; Making the Innocent Party Suffer Without Redress," 17 Ill. L. Rev. 458, 459 (1923). Harper & James

A much more desirable result would seem to be a simple shifting of the burden of proof from the plaintiff, once he has shown damages and that each of the defendants contributed toward that damage, requiring each defendant to assume the obligation of showing his contributive share by producing proof to limit his liability to something less than the whole damage.[863] As Prosser points out,[864] the difficulty of proof necessary to make a proper apportionment probably has been overstated. The difficulties may have been caused by lack of imagination or diligence of counsel in defending the accused. Actually a combination of solutions might prove to be best. In any event it seems clear that a joinder of all possible defendants is eminently desirable, and under liberal joinder rules now in effect in many jurisdictions this will be possible.[865]

It has been suggested [866] that if there is no proof of apportionment the damages be divided equally between the persons who contributed to the damage. When all of the defendants can be brought together in one suit, the shifting of the burden of proof to the defendants seems entirely satisfactory, allowing each to limit his liability, with the over-all requirement that the total damages should be fully compensated by the contributions of all defendants when added together. On the other hand, if it is not possible to join all of the defendants in one cause of action even under liberal joinder rules (*e.g.*, if the action is brought in a state court and one or more of the defendants is out of the jurisdiction, as well may be the case where radioactive substances are involved), then one gets into difficulty unless the arbitrary rule of complete joint liability is accepted, or, alternatively, the arbitrary rule of equal liability is used. Yet complete joint liability is unjustified if there really is no concert of action either by reason of relationship or because of knowledge of the existence of the other contributing factor. While the defendant may be a wrongdoer legally, this does not necessarily mean that he is to be punished rather than merely forced to compensate for *his*

seem to accept this result as sound without considering shifting the burden of proof but not creating joint liability *per se;* Harper & James 708-09. But *cf.* language at Harper & James 1130-31.

[863] This seems to be essentially the suggestion of Prosser 229. And see the suggestions in Carpenter, "Workable Rules for Determining Proximate Cause," 20 Cal. L. Rev. 396, 406 (1932); Jackson, "Joint Torts and Several Liability," 17 Tex. L. Rev. 399 (1939).

[864] Prosser 229, taken from Prosser, "Joint Torts and Several Liability," 25 Cal. L. Rev. 413, 439, 443 (1937).

[865] See Prosser, "Joint Torts and Several Liability," *supra* note 864 at 443 and Prosser 236-37.

[866] Prosser 229, n. 88.

own wrongdoing. The law is trying to distribute losses so as to reach a fair result. The Harper and James general philosophy, *i.e.*, when in doubt always compensate the innocent injured party, does not necessarily always produce real justice. There would seem to be no justification for holding any single defendant who happens to be sued by the plaintiff, but whose contribution is only a minor one although an ascertainable part of the whole, liable for all of the damages, and then in addition place on him the burden of assuring reimbursement from the other defendants. Assuming that there is some way of apportioning, which will be the case in most situations, and especially in radiation cases, then there seems to be no reason to shift the burden of finding the other wrongdoer to the one who happens to be served with process, just to compensate the plaintiff. If our theory is to be one of social insurance which will assure recovery to the damaged party in every case, then we ought to impose a general social insurance scheme. We should not pick out a party to bear the social insurance policy losses merely because he happens by coincidence to damage the plaintiff in the same or similar manner as one or more other persons, where the consequence of the wrongdoing is to add to the total injury, part of which was contributed by others. The coincidence is no justification for imposing the total liability of compensating the injured party on one person who happens to be available for suit. Not only are the cases which go "whole hog" to joint liability illogical, but also, strangely enough, unjust.

In determining to which cases real joint liability for total damages should be applied, it seems fairer and more realistic to distinguish between the cumulative causation and cumulative contribution cases, rather than between divisible and indivisible damages situations.[867] It is one thing to say that it is impossible to measure the separate contribution made by each of several causal links in the chain leading to a single injury. It is quite another to say that every person who contributes something to the total amount of injury should be held liable for the total damages. Even in cases of cumulative causation in which joint liability is imposed, the effect of the trend allowing contribution between joint tortfeasors is to permit apportionment.

At least as to radiation cases (and others too, probably) involving cumulative contribution to injury and not to causation it is best to make each defendant liable only for the part he contributed, otherwise every negligent user becomes a potential insurer for the wrongs of all users of radiation who cause the plaintiff some radiation harm. In addition,

[867] *Id.* at 226-31. Harper & James 695, 699, 706-09.

the negligent user who discharges only a small amount also would become liable for all injuries caused by non-negligent sources such as background and medical therapy sources, if his contribution added something to the total injury. This would include all other users and sources everywhere, often over a long period of time (at least the statute of limitations period), so long as the plaintiff was exposed to their radiation source before or after exposure to the particular defendant's source. Surely the defendant at least should be permitted to prove how much he did not contribute and avoid becoming a surety for injury caused by all other radiation sources who cannot be joined in the same action or are not liable at all.

The cumulative nature of radiation effects makes existing rules inadequate. This points up sharply the need for a wholly new scheme for solving the radiation damage problem, perhaps along the lines suggested later.

(iii) Other Concurrent Contribution Cases Involving Negligence

Defamation. When two or more persons utter the identical slander against the same plaintiff, absent any conspiracy, the courts practically unanimously hold that there can be no joint liability.[868] If no distinction is to be drawn between physical injuries and injuries to a person's reputation, these cases are additional authority against imposing joint liability. Moreover, if anything, the problem of separating the damages in such cases would seem to be even more difficult than in the case of physical injuries, such as those resulting from the accumulation of refuse or the cumulative effect of doses of radiation from separate sources which concurrently contribute to a total injury. Nevertheless, it would seem that the trend, though a minority as yet, toward joinder of multiple defendants, and possibly to a shifting of the burden of proof, or even to imposition of joint liability on all defendants in physical injury cases, undoubtedly will be even more persuasive in radiation cases than in defamation cases. Thus it may be that the nuisance cases will lead to a liberalization of the defamation rule.

Mental Disturbance. The facts in *Industrial Finance Service Co.* v. *Riley,* decided by a Texas appellate court,[869] illustrate the variety of situ-

[868] In a recent A.L.R. annotation over fifty cases are listed which apparently hold that there can be no joint liability; there are only three cases, one being a slander of title case, in which there is language indicating the possibility of joint liability. 26 A.L.R.2d 1031 (1952).

[869] Industrial Finance Service Co. v. Riley, 295 S.W.2d 498 (Tex. Civ. App. 1956).

ations in which concurrent contribution can arise in mental disturbance situations. Plaintiffs, husband and wife, in financial difficulty, borrowed from seventeen different loan companies. When they failed to make payments, the companies and their collection agencies sought to make collections. Their efforts were found to be unreasonable and to be made with malice and disregard for the health and welfare of the plaintiffs. There would seem to be no question that the constant calling day and night and the visiting at places of employment to demand payment caused mental shock and psychosomatic symptoms. Although there was no showing of any concert of action between the several companies as to their collection efforts, the court said, citing the *Landers* case [870] as authority:

> As we have already stated, under the evidence in this case it was impossible to ascertain the amount of damages caused by any one loan company separately from the entire damage caused by all the loan companies considered as joint tort-feasors. It was therefore proper for appellees to prove their entire damages, which entire damages they were entitled to recover from any one or more of the joint tort-feasors.[871]

Because of the cumulative nature of radiation effects, the apportionment problem in radiation cases may not always be as difficult as was the proof problem in this case, but it is not hard to predict that in Texas, at least, the courts are very likely to impose joint liability on all defendants who are cumulative or concurrent contributors in a radiation injury situation.

Defamation and mental disturbance cases present situations in which the argument of indivisible harm is most clearly applicable. To judge and apportion human emotional reactions, whether as a target of a slanderous remark, or as a victim of mental torture, would seem to be much more difficult than to judge the cumulative effect of doses of radiation, even though it probably is true that the final injury results from a combination of all forces brought to bear on the situation. The contribution of an individual user in the radiation case, however, would seem to be more nearly mathematically apportionable. The relative contributions of radiation are even more measurable than the contributions of concurrent contributors in many of the more conventional pollution cases, whether of the air or water.

Workmen's Compensation Analogies. Probably the situations most

[870] *Supra* note 845.

[871] Industrial Finance Service Co. v. Riley, *supra* note 869 at 504.

nearly analogous to our radiation problem have occurred in the workmen's compensation area, particularly in cases involving occupational diseases such as silicosis. While negligence rules are not imposed in this type of situation, at least where the occupational disease is covered by the workmen's compensation scheme, the question of proving causation is still present. These cases should not be ignored in analyzing the radiation cases.

Where the statute does not provide otherwise, some jurisdictions adopt the rule that the employee, at his option, may recover an award for the entire disability against any one or more of the successive employers or insurance carriers. While it is necessary to show that each employment under which claim is made against the employer contributed to the disability, it is not necessary to show that it is the sole cause of disability. Typically the employers held liable in these jurisdictions have a right to get an apportioned recovery from other contributors in a separate action which in no way delays the employee's compensation.[872]

[872] Colonial Ins. Co. v. Industrial Accident Commission, 29 Cal.2d 79, 172 P.2d 884 (1946) (applicant contracted silicosis while with employer who was covered during the period of employment by various insurance carriers; held, an award for the entire disability may be made against one insurer for a period when it was not acting as such); Niedzwicki v. Pequonnock Foundry, 133 Conn. 78, 48 A.2d 369 (1946) (death due to silicosis and both employers held liable); White v. Taylor, 5 So.2d 337 (La. App. 1941) (deceased hurt his back when a wheelbarrow of brick fell on him and two days later, when working for a subcontractor, attempted to lift heavy objects and suffered back pains; held, the combination of the two accidents totally disabled the employee and the two insurers can be held jointly liable); Marsolek v. Miller Waste Mills, 244 Minn. 55, 69 N.W.2d 617 (1955) (while in three different employments, employee sustained injuries from accidents, each of which was superimposed on the preceding one; held, full compensation may be had from the last employer, who has a right to have the court apportion the award among the previous employers); Dickerson v. Essex County, 2 App. Div.2d 516, 157 N.Y.S.2d 94 (1956) (while in employ of county, deceased fell and injured his leg; because of weakened condition he fell again and re-injured it; in subsequent employment he again fell, was injured and died; held, the chain reaction all proximately resulted from the first accident, therefore the first employer is liable, but the current employer is also liable for injuries sustained in the course of the employment; as between the employers, the apportionment of the award is for the Board to decide); Esmond Mills, Inc. v. American Woolen Co., 76 R.I. 214, 68 A.2d 920 (1949) (employee contracted dermatitis under one employer and then became totally disabled while working for another; held, for the employee's benefit, the act permits him speedy recovery and allows him to collect the total compensation from the one for whom he was working when he became disabled, and such employer could then have the right to ask for apportionment from the former employers); Gosselin v. Parker Brass Foundry, 119 A.2d 189 (R.I. 1955) (deceased contracted silicosis prior to working for respondent but died of it during such employment; held, nothing in the act requires the employee to prove the disease was contracted while working for the last employer; it is sufficient to establish a causal connection between the employee's disability from the disease and his employment in work of the same

In other states, usually by virtue of a statutory provision, recovery is granted in full against the last employer in whose employment some contribution was made to the disease or injury.[873] It is clear that cases in general follow the rule of imposing complete liability on either the most available employer defendant, or upon one or all of them at the choice of the employee.

Whether the analogy of the workmen's compensation cases can be carried over into the public liability situation is highly questionable,

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nature as that in which the disease was contracted; court cites the Esmond Mills case, *supra,* approvingly). In these cases, it should be noted that the question of contribution among employers or carriers did not really concern the injured employee. In any event, he was allowed to recover the entire amount to which he was entitled from at least one of his employers. Other states, usually by virtue of a statutory provision, grant recovery in full against the last employer, under whose employment contribution to the disease or injury was made.

[873] Travelers Ins. Co. v. Cardillo, 225 F.2d 137 (2d Cir. 1955), *cert. den.,* 350 U.S. 913, 76 S.Ct. 196 (1955) (occupational disease complained of was loss of hearing; employee had several employers and employers had several insurance carriers during the course of the contracting and aggravation of the disease; held, under the Longshoremen's and Harbor Workers' Act, for its proper and speedy administration, it was the intent that the employer during the last employment in which the employee was exposed should be liable for the full amount of the award; by the same token, the last carrier who insured the liable employer during the employee's employment should bear responsibility for the discharge of the duties and responsibilities of the liable employer); Mundy v. McLean, 72 So.2d 275 (Fla. 1954) (plasterer developed dermatitis while working for appellant; he left this job and took another one with no ill effects; then he left and worked for a third employer when his condition became worse and he was cautioned not to return to his trade; held, suit against the original employer will not lie by virtue of the act's provision which says that the employer in whose employment the employee was last exposed to the disease shall alone be liable without right of contribution from any prior employer); Central Foundry Co. v. Industrial Comm., 374 Ill. 300, 29 N.E.2d 511 (1940) (the case itself is not applicable to the present discussion but it mentions the Illinois statute, Ill. Rev. Stat. 1939 c. 48, §172.25, which provides that liability be fixed, in cases of silicosis or asbestosis, on the last employer in whose employment the employee was last exposed during a period of sixty days or more after the effective date of the act; and exposure of less than sixty days shall not be deemed a last exposure); Walsh v. Kotler, 43 N.J. Super. 139, 127 A.2d 908 (1956) (a roofer worked forty years as such and for the past ten years for respondent; in the last two years his hands began contracting and it was diagnosed as Dupuytrens Contracture; respondent claimed his employment did not contribute to the disease since once it begins it will progress of its own accord; held, the last employer is liable regardless of when the disease is contracted, as long as the last employment exposed the employee; as to this causal question, the burden is on the employer to show that his employment added nothing to the severity of the disease or its acceleration); Stewart v. Duncan, 239 N.C. 640, 80 S.E.2d 764 (1954) (employee, a coal miner all his life, contracted silicosis at an undetermined date and became disabled while in employ of appellant; held, G. S. 97-57 is applicable and provides that the employer in whose employment the employee was last injuriously exposed to the hazards of the disease, and the insurance carrier at that time, shall be liable; the exposure is deemed injurious if

since the workmen's compensation approach really is a social insurance program which as yet has not been adopted in the area of public liability generally. The principles are readily applicable only where there are statutory provisions and administrative procedures by which the liability award can be determined. Without statutory assistance, it would be unrealistic to try to carry these theories into the usual tort liability cases. From the standpoint of radiation injuries in workmen's compensation situations themselves, assuming that radiation injuries are covered, there would seem to be nothing unusual or unique about such injuries that would call for any different rule than that applied in other cases.[874]

(c) Alternative Liability—*Specific wrongdoer* who caused injury *unknown* although an identifiable group which includes the wrongdoer can be found

Atomic energy cases not infrequently should present courts with a type of problem often described as one involving alternative liability, or as we prefer, one involving an unknown-wrongdoer. The term unknown-wrongdoer is used because, while it can be determined that one or more of a limited and identifiable group of defendants set in motion the force that irradiated the plaintiff, it also is clear that only one or at least less than all of the group were responsible for the radiation which actually did harm the plaintiff. In this sense the wrongdoer is unknown and unless the plaintiff can prove which one or ones "more probably than not" [875] caused his injuries, he will not recover under the

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the employee was exposed for as much as thirty working days within seven consecutive calendar months, in cases of silicosis and asbestosis; the plain language of the statute dispels any possibility of contribution among successive employers or carriers); Karoly v. Jeddo-Highland Coal Co., 166 Pa. Super. 571, 73 A.2d 214 (1950) (employee had silicosis; held, the employee's last exposure fixes liability on the employer and carrier at that time); Leva v. Caron Granite Co., 124 A.2d 534 (R.I. 1956) (stonecutter worked for previous employer, who was not covered by workmen's compensation, for thirteen years, after which he worked on a temporary basis for respondent for about seven weeks; he became disabled from silicosis though it was clear he did not contract it while with respondent; held, all the act requires is that the disease was due to the nature of the employment, regardless of when it was contracted; therefore the last employer is liable); Pocahontas Fuel Co. v. Godbey, 192 Va. 845, 66 S.E.2d 859 (1951) (coal miner disabled from silicosis; Va. Code 1950 §65-47, states that the employer in whose employment he was last injuriously exposed and the carrier at that time is liable, without a right of contribution from any prior employer or carrier).

[874] *Infra* Part II on workmen's compensation.

[875] *Supra* note 770. See discussion of *res ipsa loquitur, infra* text at notes 1173 ff.

traditional rules of tort liability which require him to prove by the preponderance of evidence that a specific and identifiable defendant or defendants caused his injury. It is assumed that the plaintiff can prove that each of the defendants owed a duty not to irradiate him and that one or more of them, but less than all, is liable to the plaintiff for the injury suffered if the specific cause can be shown. The plaintiff, however, may not be able to pinpoint which of the group actually *caused* the harm. The only issue is that of causation, not duty, breach, or damages.

As already suggested, under traditional rules the plaintiff loses because he has not proved causation. The result, at least in some cases, certainly is not fair to the plaintiff and there is a very small group of recent cases which may be indicative of a new approach to the problem. As yet they do not represent the majority view and perhaps are not even indicative of a trend. The impact of these cases, however, if applied to radiation situations is so startling, and so unjust in many cases if traditional tort liability rules are applied, that they must be noted. It should be emphasized that this causation question is presented regardless of whether rules of negligence, perhaps supplemented by the doctrine of *res ipsa loquitur,* or those of absolute liability are applied.

While it has not always been done, again it is important to distinguish certain types of cases already discussed above, which are not directly analogous, but rather involve problems of multiple causation,[876] contribution to damage,[877] vicarious liability,[878] and equal concurrent

[876] Also to be distinguished from the true unknown-wrongdoer cases are those in which the concurrent negligence of two different defendants each contributes to cause the injury of the plaintiff, the injury resulting from a single impact. Saisa v. Lilja, 76 F.2d 380 (1st Cir. 1935) (two racing cars, and jury found both caused injury though only one hit pedestrian); Brown v. Thayer, 212 Mass. 392, 99 N.E. 237 (1912) (clear contribution of racing car drivers).

[877] Micelli v. Hirsch, 83 N.E.2d 240 (Ohio App. 1948), is a good example of an often miscited case. There the decedent was struck by a car driven by one defendant and was run over by the car of another defendant. Joinder of the two defendants was allowed since the court considered the injury indivisible. There was no question but that each was negligent and, more important, that each did damage to the decedent. The only question was one of dividing the damages and the joint liability imposed upon each is similar to the results of stream pollution cases or car collision cases in which the negligence of each of two different persons concurs so as to inflict one injury upon the plaintiff, and the courts make the concurrent defendants separate the amount each contributed to the total damages. This is not a case of an unknown wrongdoer, but rather a case of unknown extent of damages. Actually, some of the hog, dog, and cattle cases really fit into this category, since it is known whose animals participated in the damage but it is not known just which animals did how much of the damage. Anderson v. Halverson, 126 Iowa 125, 101 N.W. 781 (1904) (had to prove separate damages, however); Worcester County v. Ashworth, 160 Mass. 186, 35 N.E. 773 (1893) (interpreting statute); S. S. Nohre v. Wright, 98 Minn. 477, 108 N.W. 865

causation.[879] Once these groups are distinguished, as they should be, the number of cases dealing with the question of the true unknown-wrongdoer, as here defined, is small indeed. Because in some of these distinguishable cases the rule of liability has developed because of the difficult proof problems, there is some tendency to use them as authority in the unknown-wrongdoer situation. This is not good analysis and

(1906) (damages must be separated); Miller v. Prough, 203 Mo. App. 413, 221 S.W. 159 (1920) (to plaintiff's advantage to claim separate liability); Kerr v. O'Connor, 63 Pa. 341 (1869) (statute interpreted as imposing liability for all damages on all dog owners); Nelson v. Nugent, 106 Wis. 477, 82 N.W. 287 (1900) (same); Remele v. Donahue, 54 Vt. 555 (1882) (same); McAdams v. Sutton, 24 Ohio St. 333 (1873) (same); Stine v. McShane, 55 N.D. 745, 214 N.W. 906 (1927) (no joint liability and joint liability statute not effective yet); Hill v. Chappel Bros. of Montana, Inc., 93 Mont. 92, 18 P.2d 1106 (1932) (horses, and jury allowed to estimate as best they could); Wood v. Snider, 187 N.Y. 28, 36, 79 N.E. 858 (1907) (liability on basis of ratio of each defendant's cattle); Pacific Livestock Co. v. Murray, 45 Ore. 103, 76 Pac. 1079 (1904) (separate liability but defendant offered to show others contributed); King v. Ruth, 136 Miss. 377, 101 So. 500 (1924) (separate damages between hogs).

[878] Also to be distinguished from the true unknown-wrongdoer situation are those cases involving application of the rules of vicarious liability, whether it be in terms of master-servant, [Raber v. Tumin, 36 Cal.2d 654, 660, 226 P.2d 574 (1951)]; or some concept of concert of action, artificial though this is in some of the cases, [Reyher v. Mayne, *supra* note 777—hunting group and particular defendant known but all liable; Ushirohira v. Stuckey, 52 Cal. App. 526, 199 Pac. 339 (1921)—joint maintenance of herd of cattle; Stephens v. Schadler, *supra* note 777—one defendant harbored both his own and others' dogs but the court did emphasize proof problem in imposing joint liability; Kuhn v. Bader, *supra* note 777—gun injury from one of hunting group; Oliver v. Miles, *supra* note 777; Benson v. Ross, *supra* note 777; and see cases set out *supra* note 877; Queen v. Salmon, 6 Q.B.D. 79 (1880)—criminal liability for all in target practice activity; State v. Newberg, 129 Ore. 564, 278 Pac. 568 (1929)—criminal liability for both hunters in group shooting regardless of whose shot killed]; or liability of landowner or primary contractor for accidents occurring during construction work on the premises, [see cases discussed *supra* in text at notes 220-291. Liability may not be imposed, of course; Wolf v. American Tract Society, 164 N.Y. 30, 58 N.E. 31 (1900)—brick fell where nineteen independent contractors were using 250 men]; or liability of a manufacturer for products sold without the application of the *res ipsa loquitur* doctrine, [see *infra* Chapter V on product liability and discussion of *res ipsa loquitur* in text following note 122; see *e.g.*, Escola v. Coca Cola Bottling Co., 24 Cal.2d 453, 150 P.2d 436 (1944); Burr v. Sherwin Williams Co., 42 Cal.2d 682, 268 P.2d 1041 (1954); Gordon v. Aztec Brewing Co., 33 Cal.2d 514, 203 P.2d 522 (1949); Loch v. Confair, 372 Pa. 212, 93 A.2d 451 (1953); Nichols v. Todd, 174 Kan. 613, 258 P.2d 317 (1953)]; or some kind of special relationship in the nature of joint enterprise such as may be the explanation of some injury-to-surgical-patient cases [Prosser, "Res Ipsa Loquitur in California," 37 Cal. L. Rev. 183, 223 (1949), suggests this analysis for the famous case of Ybarra v. Spangard, 25 Cal.2d 486, 154 P.2d 687 (1944); see also Oldis v. La Societe Francaise, 130 Cal. App.2d 461, 279 P.2d 184 (1944); Cavero v. Franklin General Benevolent Society, 36 Cal.2d 301, 223 P.2d 471 (1950); Meyer v. St. Paul-Mercury Indemnity Co., 61 So.2d 901 (La. App. 1952)—finding no negligence, however; Duprey v. Shane, 39 Cal.2d 781, 249 P.2d 8 (1952)].

[879] In the same general category to be distinguished are the cases in which two

makes for poor justice so long as the existing system of tort recovery is used. At least the distinctions should be recognized, even if it should be concluded that they are distinctions without a difference in some cases.

This particular causation difficulty could occur with considerable frequency in atomic energy cases. One example, already mentioned at the beginning of the discussion of multiple causes, would be if some person downwind from two reactors which could discharge identical radioactive material were injured by radiation which could only have come from one or the other of the reactors, but he has no way of proving from which reactor it came. A similar legal problem could arise if there were a limited number of industrial users of isotopes discharging radioactive material into some central place such as the sewage system. If a sewage plant employee is injured or if there is injury to the sewage plant itself because of the presence of excessive amounts of radioactive material resulting from an accidental discharge from one of the users, how can it be determined which of the potential defendants is to be held liable, assuming it is clear that only one discharged the excessive amount? It also is possible that *both* users of radioactive material were negligent in that they breached the standard of conduct required under the circumstances or else discharged radioactive material under circumstances calling for absolute liability but it is impossible to determine from whose plant the particular material which injured the plaintiff came. This could happen if plaintiff could not pinpoint the exact time of his exposure but he could show that it was from one or the other of the defendants' materials or operations. Should traditional rules be applied and the plaintiff denied recovery?[880] Should the burden of proof

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forces, equally capable of doing the total damage, act so nearly simultaneously that it is impossible to tell whether one or the other or both caused the injury. Corey v. Havener, *supra* note 758. See also Hanrahan v. Cochran, 12 App. Div. 91, 42 N.Y.S. 1031 (1896) (same except sleighs instead of motorcycles); and probably concurrent causation or at least concurrent contribution to total injury in Finnegan v. Royal Realty Co., 35 Cal.2d 409, 218 P.2d 17 (1950).

[880] Anderson v. Halverson, *supra* note 877, applied this rule in a dog-killing-sheep case. Stine v. McShane, *supra* note 877 (same). *Cf.* language of court in Stephens v. Schadler, *supra* note 777 at 837. Common law concept applied in Schoening v. Claus, *supra* note 805 (hunting accident); Haley v. Calef, *supra* note 761 (two towns responsible for bridge and injured plaintiff could join but must show which town responsible for part of bridge where hurt); Louisville Gas & Electric Co. v. Nall, 178 Ky. 33, 198 S.W. 745 (1917) (not known whether plumber or gas company employees left hole in closet uncovered); Casey Pure Milk Co. v. Booth Fisheries Co., 124 Minn. 117, 144 N.W. 450 (1913) (not known which two companies responsible for goods lost); Hartzell v. Bank of Murray, 211 Ky. 263, 277 S.W. 270 (1925) (not known whether bank or bank cashier liable for loss of note—but why not master-servant lia-

be shifted to each defendant to prove his innocence? Or, are we to impose joint liability for the total injuries upon each defendant, even though it is clear that only one caused the plaintiff harm?

In answering this question two general categories of cases can be identified, each involving what we have termed unknown-wrongdoers. First, there are cases in which it can be shown that each of the defendants was negligent in that he owed a duty to the plaintiff and did not live up to the standard of conduct expected of the reasonably prudent man under the circumstances, but there is only one injury and only the force placed in motion by one defendant could have caused the injury. Second, there are cases such that clearly only one, or at least less than all of the possible defendants were negligent in the sense that they breached the standard of conduct required, but the plaintiff can not prove which defendant set the force in motion.

(i) All Potential Defendants Negligent

Many cases establish and support the general common law rule denying recovery where all of the multiple defendants clearly are negligent but which one caused the injury is unknown, even though the result is that the plaintiff's injuries will be uncompensated.[881] There are a few cases pointing in the other direction, however. It might be argued that some of the hogs, dogs, and cattle cases[882] really are examples of liability imposed upon a person whose responsibility for the injury has not been proved. This would not seem to be a correct analysis, except for the very unlikely case. It is possible that a particular defendant's hog, dog, or steer, while part of a damage-feasant group actually did

bility?); Ogleship Sureties v. The State, 73 Tex. 658, 11 S.W. 873 (1889) (not known in which term sheriff's defalcations occurred); Cohn-Baer-Myers & Aronson Co. v. Realty Transfer Co., 102 N.Y.S. 122 (1907) (cannot plead alternative rights against two separate defendants for failure to obtain title to land); Wolf v. American Tract Society, *supra* note 878 (brick fell where nineteen independent contractors working); and cases discussed in McCoid, "Negligence Actions Against Multiple Defendants," 7 Stan. L. Rev. 480, 501-03 (1955). See also discussions, often criticizing common law rule: Carpenter, "The Doctrine of Res Ipsa Loquitur in California," 10 So. Cal. L. Rev. 166 (1937); James, "Proof of the Breach in Negligence Cases (Including Res Ipsa Loquitur)," 37 Va. L. Rev. 179 (1951); Prosser, "Res Ipsa Loquitur in California," 37 Cal. L. Rev. 183 (1949). *Cf.* Seavey, "Res Ipsa Loquitur: Tabula in Naufragio," 63 Harv. L. Rev. 643 (1950); Prosser 222. The effect in such cases of a recent Arkansas statute allowing tolling the statute of limitations period against unknown wrongdoers is uncertain but presents some interesting and difficult questions. *Infra* note 1371.

[881] See cases cited *supra* note 880.

[882] *Supra* note 877.

none itself, but this is a most unlikely situation, and practically all of the cases find or assume that each of the animals caused some damage. The only real difficulty is in determining the amount that each did. Therefore, this is not a case of unknown-wrongdoers in our sense. A truly analogous situation would arise if several dogs, owned by different persons, were negligently allowed to run free, and less than all of them attacked a flock of sheep, it being perfectly clear that one or more of the dogs (but which is not known) did not participate. If we held all of the dog owners liable for all of the damages under these circumstances we would have a real unknown-wrongdoing dog case.

Cases that come much closer are those involving hunting accidents in which one or more of the group are negligent in using the weapons, but the injury obviously comes from only one gun.[883] In all such cases, the courts, except for a recent California decision, have found concert of action among the hunting party as a reason for imposing joint liability. This really is an application of vicarious liability rules. If the situation instead of involving two members of the same hunting party, involved two hunters acting without knowledge of the existence of the other, this would present the true case of the unknown-wrongdoer, to which the usual rule of vicarious liability for concert of action could not be applied.

The California court in *Summers* v. *Tice*[884] faced up to the proof problem without relying on the concept of concert of action in a case in which two hunters in the same party negligently discharged their guns in such a manner that a pellet from one of them put out the plaintiff's eye. The trial court, after assuming both defendants were negligent, and finding that there was no way to determine from which of the guns the shot came, imposed joint liability, reasoning as follows:

> When we consider the relative position of the parties and the results that would flow if plaintiff was required to pin the injury on one of the defendants only, a requirement that the burden of proof on that subject be shifted to defendants becomes manifest. They are both wrongdoers—both negligent toward plaintiff. They brought about a situation where the negligence of one of them injured the plaintiff, hence it should rest with them each to absolve himself if he can. The injured party has been placed by defendants in the unfair position of pointing to which defendant caused the harm. If one can escape the other may also and plaintiff is remediless. Ordinarily defendants are in a far better position to offer evi-

[883] *Supra* note 777 and note 878.

[884] 33 Cal. 2d 80, 199 P.2d 1 (1948).

> dence to determine which one caused the injury. This reasoning has recently found favor in this court. In a quite analogous situation this court held a patient injured while unconscious on an operating table in a hospital could hold all or any of the persons who had any connection with the operation even though he could not select the particular acts by the particular person which led to his disability (Ybarra v. Spangard, 25 Cal. 2d 486 [154 P. 2d 687, 162 ALR 1258].) There the court was considering whether the patient could avail himself of res ipsa loquitur, rather than where the burden of proof lay, yet the effect of the decision is that plaintiff has made out a case when he has produced evidence which gives rise to an inference of negligence which was the proximate cause of the injury. It is up to the defendants to explain the cause of the injury.[885]

Prosser feels that the result is "a very desirable solution where negligence on the part of both is clear and it is only the alternative causation which is in doubt." [886] It certainly is not "more probable than not" that *both* caused the injury; in fact it is one hundred per cent certain that this is not the case. On the other hand it is *equally* probable (rather than more probable) that either did it. Therefore, the violation of the usual rule is only in terms of a fraction of a per cent. Harper and James also approve the result.[887]

A remarkable sequel to *Summers* v. *Tice* arose in Canada in 1957.[888] Here again an innocent third party was struck by a single rifle bullet fired by one of a group of boys, all of whom were under fourteen years of age. The defendants were two merchants, each of whom had sold the boys a box of cartridges, and the court held that each of them was negligent in making the sale to boys of this age. The damaging bullet was the very last cartridge fired when the boys came back to town after having used all the other cartridges from both boxes out in the country. The court held both defendants to have been at fault and liable for the total damages. It rejected the argument that only the seller of the last cartridge could be held liable because this placed on the plaintiff "the burden of identifying the one who sold the shell that was last fired; a burden which needless to say, was not discharged." [889] This case makes

[885] *Id.* at 86-87.

[886] Prosser 231.

[887] Harper & James 1115. The result does spread the loss rather than leave the plaintiff uncompensated.

[888] Saint-Pierre v. McCarthy, [1957] Qué. B.R. 421 (Q.B.), approved in 4 McGill L. J. 298 (1958).

[889] *Id.* at 422.

it clear that concert of action is not required, a possible alternative explanation for the result in *Summers* v. *Tice*. The Canadian case is even more remarkable because of the causation reasoning used by the court. Instead of adopting the rationale of *Summers* v. *Tice*, shifting the burden of proof to the defendants each to exculpate himself if he could prove his force did not do any harm, the Canadian court worked out a theory whereby it concluded that each was not only negligent in selling the shells, but also was a cause-in-fact of the injurious last shot. The argument of the court is remarkable enough to set out in full.

> The sale of the cartridges must be regarded as one act, for though two separate sales were made it took both to put the boys in the position to do the damage. Had one box only been sold then, on the facts as they came to pass, the accident could not have happened since all of the cartridges in the one box would have been fired outside of the village. But—again on the facts as we know them—since two boxes were sold it became possible for the boys to exhaust their interest in the country and yet have cartridges in their possession when they returned to the village. In consequence it required both sales to make the accident possible and for this reason the relationship for cause and effect is established.[890]

One wonders if the court would apply this reasoning if it could have been proved whose bullet caused the injury. If so this reasoning is not too far removed from the argument that the driver of a car who breaks the speed limit and gets to his destination in time for lightning to strike his guest as he steps from the car is liable for the death of the guest because, "but for" his breaking the speed law, the guest would not have been where the lightning struck. In fairness, however, the Canadian case is not quite the same because the injury that did occur was the very thing which could have been anticipated by a careful person and the foreseeability of which made the selling of the shells negligent. Nevertheless, this kind of "but for" reasoning cannot be recommended for other cases.

Undoubtedly radiation cases will arise to which this reasoning could be applied. Two manufacturers of an industrial device utilizing radiation might furnish identical items to the same user and someone is found to have been injuriously irradiated from this type of source because the devices were made negligently. The evidence of exposure might be such that it is clear the person received radiation from only one source but

[890] *Id.* at 423. This is like saying that the man who loaned them the car negligently is liable because without it they could not have been where plaintiff was.

it is impossible to tell now which source was responsible because records were not kept of when the various sources were used at particular places in the plant or operations of the user.

The validity of the *Summers* v. *Tice* solution of shifting the burden of proof to multiple defendants should be tested by altering the facts slightly. What if, instead of two negligent persons, there were three or ten? Here the probabilities are not even equal; for each wrongdoer there is either a one-in-three or one-in-ten chance that he is responsible for the injury. At what point does the probability become *de minimus?*

In a sense, this criticism can be made of the holding in another California case, *Ybarra* v. *Spangard,*[891] in which an unconscious surgical patient apparently was negligently injured by some one of the number of persons who handled him while he was unconscious, but it was rather clear that less than all of them were directly responsible.

To impose joint liability on all who have been negligent and who possibly have caused the plaintiff's injury actually goes beyond even absolute liability concepts. While negligence need not be shown if an activity is ultra-hazardous, the causal connection with the defendant's action must. In effect the reasoning of the California and Canadian cases turns the fault doctrine around. Instead of holding defendants liable only if fault can be shown, it is making any person who has breached the required standard of conduct responsible for any injury which his action might just possibly have caused unless he can prove absence of causal connection. While Harper and James object to the use of the traditional fault doctrine to excuse liability, there is no indication that they also would do away with proof of causation.[892] It is true, however, that the reasoning of these few cases compensates the plaintiff more often and spreads the risk.

If the reasoning of the Canadian court is accepted at face value, the result would be to impose liability on all negligent persons for all harm that results not only from their own negligence but also from that of all persons similarly situated who have been negligent. If liability is to be imposed simply for increasing the risk that somebody will be injured by negligently setting some harmful force in motion, traditional tort liability procedures should be abandoned. Our system of total liability or none in each individual case as to each defendant will not work fairly if such reasoning is used.

If the *Summers* v. *Tice* reasoning is to be used in radiation injury

[891] *Supra* note 878. Discussed *infra* in text at notes 1180 ff.

[892] Note discussion in Harper & James 1116, n. 24.

cases, a different system of compensating plaintiffs and assessing liability on defendants should be adopted, one developed on a much more statistically accurate basis. Use should be made of some kind of insurance fund to which all persons who might be negligent or who have been negligent in dealing with harmful radioactive material should contribute in accordance with the increase in the risk of harm caused by a particular defendant. Injured parties who could not identify the specific source of their injury would then sue this fund. Perhaps something like the unsatisfied judgment fund schemes for covering injuries from automobile accidents in hit-and-run cases can be used,[893] or perhaps all radiation injuries could be compensated under a fund similar to that suggested below for future injuries,[894] or other fund schemes suggested by others.[895]

Such a plan would provide a more scientifically accurate basis for spreading the risks than would the rationale of *Summers* v. *Tice* when it is carried over into the situation in which there are more than two defendants, even though all have been negligent in some manner in releasing radiation that may possibly have hurt the plaintiff. Certainly the *reasoning* of the Canadian court as to causation should not be used. If we are to impose monetary responsibility for all negligence, even though actual damages have not been proved, it would seem preferable to make some kind of administrative evaluation of the potential loss that might be created by each mistake and force a contribution to some fund from which injured plaintiffs could recover. Traditional rules are unsatisfactory in the multiple defendants case because plaintiffs remain uncompensated when they would recover except for failure to prove which defendant was the cause. Nevertheless, using the reasoning of these few recent cases also leads to unrealistic results.

Courts also should avoid too broad application of the justification suggested for the *Ybarra* type case (unconscious patient injured by one of several defendants), that the actions constituted something of a joint enterprise of all participating persons. If liability is imposed on all, each one is forced to take the utmost precautions to see that no injury is inflicted upon the patient during the time he is unconscious. Caution also should be used in applying the theory that joint liability is

[893] See Elder, "The Unsatisfied Judgment Fund and the Irresponsible Motorist," Current Trends in State Legislation 1953-54 at 45 (U. of Mich. Law School, 1954).

[894] A "contingent injury fund" is discussed *infra* in text following note 1123.

[895] Summer Institute, Workshops on Legal Problems of Atomic Energy, U. of Mich. Law School (1956), position of minority at 36. Switzerland and West Germany have fund plans under consideration.

justified as a method of forcing people who probably know what happened to inform on each other. These justifications should not be applied under existing tort rules in situations in which there are several wrongdoers who are acting quite independently of each other and have no control over their co-defendants or, perhaps better, their co-potential defendants; they have no power of selection or rejection and no way of taking extra precautions to protect themselves against the results of the negligence of another.

(ii) Only One Defendant Negligent

If the law is to be accommodated to the plaintiff's difficulty in proving causation in unknown-wrongdoer cases, then the ultimate development would be the result reached by an appellate court in California recently, in *Litzmann* v. *Humboldt County*.[896] This is the case in which the plaintiff's small boy was seriously injured when he ignited an aerial bomb which he found lying in the fairgrounds. The court held that the plaintiff had a right to jury instruction to the effect that if he proved that one or the other of two defendants was negligent in dropping the aerial bomb, then he was not required to prove which defendant had been negligent. The appellate court held that this was a correct instruction.

This is exactly the kind of situation which may arise in the atomic energy area. For example, there could be three, five, or ten reactors so located that the radioactive material which caused the plaintiff's injuries could have come from any one of them. If circumstantial evidence clearly supports an inference of negligent emission, perhaps via *res ipsa loquitur*,[897] then a parallel case is presented, and the plaintiff, by analogy to *Litzmann*, would not be obliged to prove which of the reactor operators was the guilty party.

While this is not quite the same thing as absolute liability because it assumes that one of the parties was negligent, nevertheless, so far as the innocent accused are concerned it is worse. Even strict liability is dependent on proof of causal connection. Currently our theory of negligence liability is aimed at allocating the losses that occur on a basis of culpability and not upon a doctrine of "compensate every plaintiff who can show an injury." Accordingly, the use of the plaintiff's difficulty as an excuse for placing the burden of proof on a potential defendant

[896] 273 P.2d 82 (Cal. App. 1954). The case was settled while an appeal was pending before the California Supreme Court, Note, 28 So. Cal. L. Rev. 429 (1955).

[897] See discussion of *res ipsa loquitur, infra* at notes 1146 ff.

to free himself from liability is to make the incidence of loss from negligent injuries depend upon the laws of chance in a peculiarly unscientific and unjust manner.

In practical effect it means that whether or not one is to be charged with a loss depends on the purely fortuitous circumstance of whether somebody else engaged in a similar activity happens to have caused injury. This is going even further than absolute liability because in absolute liability cases it is essential that cause-in-fact be proved. The principle is really no different than saying that one whose dog was running loose at the time that some person was bitten by a dog, assuming that it was at night and the dog could not be identified, is to be held liable for some or all of the loss if it was at all possible that his dog was in the vicinity at the time. It would be the same as holding, in the case involving the theater patron whose eye was put out by a spit ball projected by some member of the audience,[898] that the plaintiff could hold each spitball-shooter-carrying member of the audience liable unless he could prove that he did not do it. This negative usually can be established only by finding the one who did do it, a task as difficult for the innocent defendants as it is for the plaintiff. Or perhaps liability could be limited to those who sat within spit ball range of the plaintiff.

A similar case could be one holding two contractors liable for a falling brick which injured the plaintiff even though their only relationship was that they happened to be working on different but adjoining buildings at the same time.[899] If we are to spread tort risks on a broader basis than is now the case where proof of cause-in-fact is usually insisted upon, this objective should be accomplished by some kind of more scientifically justifiable scheme.

This should be true even if absolute liability rules are adopted for some aspects of atomic energy operations. Some writers at least[900] would not approve of the solution which renders all liable even though some, or all but one, are innocent. Surely making two or four or nine innocent parties stand the loss caused by one wrong-doing party would carry the compensation principle too far, at least as applied to the radiation injury cases. The *Litzmann* rationale, particularly if it were carried beyond the case of two well-identified potential wrongdoers, is com-

[898] Pfeifer v. Standard Gateway Theater, 262 Wis. 229, 55 N.W.2d 29 (1952).

[899] This is also similar to Wolf v. American Tract Society, *supra* note 878, (a brick fell where 19 independent contractors were working) if a brick fell from between two adjoining buildings.

[900] Prosser 231; Seavey, *supra* note 880 at 648. Harper & James 1116, do not take a position on this kind of case.

pletely unjustified and unrealistic. When one takes into account the great time and space intervals that can intervene between a discharge of radioactive material and its reaching a place of rest where injury is inflicted, almost any user of radioactive material in the county, at least of the kind found to have caused the injury, might possibly have been responsible. Surely joint liability should not be imposed under our present tort system. To do so truly would be to impose absolute liability on atomic energy operations with a vengeance and without the requirement that has always been applied in the past, *i.e.*, that cause-in-fact must be shown. For whatever comfort it is to potential defendants, most of the courts do not approve the *Litzmann* rationale, although most of the cases were decided prior to *Litzmann*.[901]

(iii) Effect of Common Insurance Carrier

One fact which will almost inevitably be present in many atomic energy cases might justify application of the *Tice, Ybarra,* and even the *Litzmann* solutions. If in this type of unknown-wrongdoer case every one of the potential wrongdoers were insured by the same insurance carrier against the kind of loss which occurred, then a good case could be made for recovery, at least to the extent that there was identical coverage up to the limit of the lowest policy. If the insurance company covered all of the defendants, it would be perfectly clear that if any one of them were found liable the insurance company should pay. To decide in such circumstances that recovery will be allowed where there is an insurance policy, while it would not be allowed against the same defendant if there were none, violates our traditional rules concerning the liability of insurance companies when policies are written on an indemnity basis only. The result, however, does seem to make good sense, by compensating innocent plaintiffs without imposing liability on someone who should not be required to pay.

This suggestion has peculiar applicability to the area of radiation injuries, at least to the extent that the user of radiation is licensed by the federal government and is required to furnish financial protection[902] which ordinarily will be in the form of an insurance policy taken out from one of two carriers of such insurance. One of them is relatively so much smaller than the other[903] that it is very likely in many situations one insurance carrier will have insured all potential defendants,

[901] See cases set out *supra* note 880, some of which involve only one wrongdoer.

[902] See insurance discussion *infra* beginning at note 1265.

[903] See discussion *infra* at notes 1347-48.

at least in the reactor field. In the event of a major reactor disaster in which the damages run over sixty million dollars, and clearly in the case of an accident involving a much smaller total, where the government's responsibility to take over liability will come in at a much lower figure, there is then absolute identity of the insurance carrier in effect, though not technically, since the federal government's liability is only that of an indemnitor, not as an insurer. The same result should be reached because the government actually is indemnifying all of the potential wrongdoers above the limits of financial protection set by the AEC. Insurance companies surely will try to find a way out of the dilemma created by this suggestion, but until they do the solution is attractive.

In such states as Louisiana and Wisconsin in which the insurance carrier can be sued directly there would seem to be no difficulty in holding that even the *Litzmann* reasoning applies if all of the multiple defendants are covered by the same insurance company. In other states a court might change the common law rule and hold that recovery will be allowed if the court finds that one carrier covers the liability of all defendants, but deny recovery otherwise. If an insurance policy is more than an indemnification agreement and imposes direct responsibility on the carrier if the defendant does not pay, as is the case with much of automobile collision insurance today, is there any reason why the court should not determine this and impose liability as a matter of common law rule? This does not need to violate the usual "hope" that juries will not be allowed to know an insurance carrier is involved when they make their fact determinations. Nevertheless, enactment of a statute undoubtedly would be the better procedure for achieving this result.

(d) Cumulative Effect from Innocent Sources

In one other situation, which creates more difficulty than any other, the solution surely should not be joint liability, if liability is to be imposed at all. Except for those involving unknown wrongdoers, there was, in the cases discussed so far, concurrent contribution toward the amount of damage inflicted by persons at least *some and usually all of whom were wrongdoers* in the sense that they breached the standard of conduct required of the reasonably prudent man. Actually the facts in many of the cases seem to indicate that the defendants must have acted with knowledge of the existence of the contribution of other persons, and so might even be considered as acting in concert with each other. Many of the cases arising in connection with cumulative impacts of ra-

diation may involve situations where the contributions of the other persons to the total injury are not known. Nevertheless, where *all parties breach the standard of conduct* required by law, shifting the burden of proof does not seem to be too much of a burden to place upon them.

If the amount of radiation released by one or more of the concurrent causal factors is so small that the discharge can be considered innocent *because there has been no breach of the required standard of conduct,* the court faces a real difficulty. Prosser,[904] in commenting on the situation where the contribution of two or more parties, standing alone, would not even be a breach of the standard of conduct, states that:

> Where, as in the usual case, such liability must be based upon negligence or intent rather than on any ultra-hazardous activity, it would seem that there can be no tortious conduct unless the individual knows, or is at least negligent in failing to discover, that his conduct may concur with that of others to cause damage. And liability need not necessarily be entire, for there is no reason why damages may not be apportioned here, to the same extent as in any other case.[905]

This situation could easily arise where radiation is the cause of the injury. Persons using a radioactive source may have complied with statutory or administrative limits for discharge of radioactive material, and may have acted as a reasonably prudent man would have in the light of present knowledge and the circumstances, and yet, through an unusual set of circumstances several discharges from such sources might cause damage or unite with radioactive material *negligently* released and cause damage. Should the innocent contributor be held liable for all or a part of the damage caused? Surely there is no excuse in this situation for holding him jointly liable for the *whole* and thereby shifting to him the burden of finding the evidence for the plaintiffs. If the Texas liability rules[906] are not applied, as surely they should not be in many atomic energy activities where the quantity of radiation is at a very low level, it seems difficult to justify imposing any liability. It is even more difficult to justify complete liability such as that imposed in the case of true joint tortfeasors.

Once the concurrent contribution injury is discovered there would seem to be no real obstacle to an injunction suit to abate what very likely is a nuisance, and even compliance with official regulations might not justify the kind of taking of property that would be involved in this

[904] Prosser 232.
[905] *Id.* at 233.
[906] See discussion *supra* note 845.

situation.[907] As to damage recovery, this may be the very case in which social policy limitations on imposing liability should be brought to bear to relieve the "innocent wrongdoer" from liability because, by hypothesis, in this last situation, the defendant had no reason to suspect that there would be other contributions added to his minor one resulting in an injury. The question in tort case really is not always how can we compensate the innocent plaintiff but who should bear the losses that do arise out of normal activities in today's complicated, highly industrialized life. Perhaps this is the case where the plaintiff must take out insurance to protect himself rather than seek compensation from a person who has acted prudently. The situation that can arise in the radiation field, at least in some cases, would be analogous to a suit against an individual homeowner whose heating system emits into the air in a large city some unburned particles of coal, gas, or oil contributing to the pollution of the air over the whole city, or against the drivers of thousands of cars who do the same thing through the discharge of unburned particles through exhaust pipes. In this situation it would seem a little unrealistic to say that if we can prove any one car driver or any one householder contributed some small part to the total pollution he should be liable for the whole. This is utterly ridiculous, if it is not unjust. In the case where there are only a few contributors it still is unjust. Perhaps the atomic energy situation may present the very kind of case suggested in the English opinion in *Blair* v. *Deakin;*[908] one person might put something into a stream which in and of itself was not dangerous but when combined with another equally innocuous substance put in the stream by another person creates a dangerous condition. Injunction in such situations would seem perfectly justified, but to impose liability for all foreseeable damages because it is now found that such chemicals when combined will create a dangerous substance comes close to absolute liability. Any imposition of liability for the injuries caused in situations where the individual's contribution is not enough in itself to be considered tortious and where he has no basis in terms of knowledge or reasonable grounds to believe that others are contributing a substance which will cause harm when combined with his is in effect to impose strict liability without admitting it. It is doubtful if damages which result from many of the situations that will arise in connection with radiation sources where the contributions of many people are very small is really any more dangerous to a city, to a country or to the world than

[907] Compare psychological nuisance case and see cases there discussed, *supra* notes 628-722.

[908] [1887] 57 L.T.R. (n. s.) 522, 525.

a discharge into the air of carbon dioxide, an inevitable result of our modern industrialized, technological life. Once we find the evil exists something should be done, but it would not seem that the tort system, devised to solve damage questions between individuals or small groups of individuals, is the vehicle by which such problems can be solved. Compensating the plaintiff is not the only aim of the tort system. As suggested before, the aim really is to decide who should bear the loss which seems inevitable in our kind of complicated society. There are methods other than always imposing liability on the defendant, even admitting that in a particular case the defendant's actions have caused some harm. A fire insurance type of policy (or medical insurance, or life insurance) carried by the potential victim may be the better way for some cases, particularly where the contributions are in and of themselves innocent, if we want normal growth of atomic energy, which is so important to us in the long run. In any event, as long as existing damage rules are used, there is no justification for making the innocent contributor actually jointly liable in the sense of being held responsible to the plaintiff for his total injuries to which many others contributed. Surely at most he should be held responsible only for his own contributive share.

c. Proof of Cause and Damage Generally

Criticism of the common law system of handling the losses that occur as the result of what might broadly be called accidents (as distinguished from intentional torts) has been increasing both in amount and vigor in recent years. Many respected legal scholars have advocated a sweeping examination of present tort rules, and many, of course, attack the very basic concept of fault that underlies so much of our tort law today.[909] Many of them argue for strict liability or something approaching it in many more situations, and they urge that this be combined with some sort of shifting the burden of losses to the industrial community, or in appropriate areas by requiring insurance coverage, such as in the case of automobile accidents. While such drastic changes are not imminent, it certainly is possible that there will be a continued move in this direction and possibly even an acceleration. Whether the rule of

[909] Ehrenzweig, Negligence without Fault (1951); Harper & James Introduction & Ch. XI; Green, "The Individual's Protection Under Negligence Law—Risk Sharing," 47 Nw. U.L. Rev. 751 (1953); James, "Social Insurance and Tort Liability: The Problem of Alternative Remedies," 27 N.Y.U.L. Rev. 537 (1952); Leflar, "Negligence in Name Only," 27 N.Y.U.L. Rev. 564 (1952); Freezer, "A Circle Tour Through Negligence," 27 N.Y.U.L. Rev. 647 (1952); Ehrenzweig, "A Psychoanalysis of Negligence," 47 Nw. U.L. Rev. 855 (1953).

absolute liability be applied across the board, or a scheme of insurance or governmental funds is adopted supported by assessments of the workmen's compensation type or by general taxes, the injured party who seeks compensation still will face the same problem that he faces under the present tort rules in the usual situation where the claim is against a single alleged wrongdoer defendant. The plaintiff who sues the industrial producer or operator, or the individual wrongdoer or his insurance company, or the federal or state government fund set up to award compensation in accident cases, will have to prove that his disability was *caused* by the accident. The plaintiff will have to show (1) that he has been "injured," and (2) that his injury was "caused" by a force for which he has a claim against an individual wrongdoer under our present system, or against an insurance company, a fund, or some other social group in the event our system of loss distribution should be changed to make this possible.

Very likely our present system will continue to be the law for many years to come, although minor changes undoubtedly will be made. Even if it has been proved that a duty was owed to an injured party by a defendant who did not meet the standard of conduct expected of a reasonably prudent man under the circumstances, or if the accused is to be held to strict liability and the type of injury for which the plaintiff is seeking compensation is recognized as compensable, the plaintiff still must show that he received such an injury and that it was caused by the force set in motion by the alleged wrongdoer. Whether he represents the plaintiff or the defendant, the lawyer handling radiation cases will find some of his most difficult problems in this area of proof. Many radiation cases will arise in which proof of cause and damages will be relatively simple and certainly solvable in accordance with existing commonly recognized principles. Likewise, in the cases where the proof problems are considerably more complex and subtle, it seems clear that answers will be found, if only by leaving the doubtful cases to the jury. The great majority will fall in this category. It is in the area of proof that our present tort rules and theoretical analysis of them have been most inadequate. The appellate opinions and the legal writers have concerned themselves for the most part with the problems of substantive law by which we determine who is liable to whom for what kind of injury. The proof problems usually are buried in trial records, and even the rules of evidence seldom get down to the level of concrete types of proof that are available and might or should be used to prove specific fact questions. Here again the radiation cases, which are bound to arise in increasing numbers in the next twenty years, very likely will show,

sometimes dramatically, the inadequacy of our present analysis of the problems of proof. It is still too early in the study of the relationship between scientific technology and legal problems, and certainly it is beyond the scope of a general treatise, to answer in detail the many scientific-legal proof problems that inevitably will arise. Some lines of attack under existing rules can be indicated, however, and attention can be focused much more sharply on some of the inadequacies of existing concepts of proof, particularly as applied in tort cases.

A study of the problems that seem inevitable in radiation cases convinces one that here again is evidence of the fact that policies underlying the legal rules of proof and probability may be somewhat different from those assumed by scientists when, in their scientific activities, they are concerned with proof. The present concern of the legal profession as to the proper use and control of expert testimony is perhaps evidence of an awakening legal recognition of the problem. In any event it seems clear that lawyers must concern themselves much more with the premises and techniques of the scientists if they are to handle adequately the proof problems that are to be an inevitable part of radiation litigation. Atomic energy cases seem destined to increase the need of mutual understanding between the lawyer and certain other professions and sciences such as physicists, engineers, and biologists, to name merely the most obvious and most inclusive categories. Radiation cases bid well to force lawyers to recognize much more sharply the areas of specialty among experts and to use those who may not have a license but who nevertheless know scientific principles essential to the case. In looking at the proof problems it seems convenient to separate those involved in the doctrine of *res ipsa loquitur* and treat them as a separate group. The *res ipsa loquitur* doctrine cannot be completely separated from duty and particularly breach concepts but most commentators treat the doctrine primarily as one of proof, and this seems wise. It will aid clarity of analysis, nevertheless, if the *res ipsa loquitur* problem is treated separately.

(1) Proof of Radiation Injuries and the Law of Probabilities

As indicated previously, scientists generally agree that exposure to radiation can cause many personal injuries. In analyzing the problem of tort liability, however, the question is not what *can* be caused by exposure to radiation, but, rather, whether a particular injury *was* caused by such an exposure; or, stated otherwise, is a given exposure to radia-

tion the cause-in-fact of the injury. With few if any exceptions, present scientific knowledge indicates that there is nothing qualitatively unique about injurious radiation from the standpoint of its observable physiological and pathological effects. Numerous other forces can be causes or causal factors with respect to seemingly identical injury manifestations. Added to this problem of multiple possible causes of the same injury is the inconvenient fact that science has no very precise way of determining which was the actual medical cause—much less the legal cause. The lawyer finds himself confronted, therefore, with possibilities and probabilities. The legal result to be reached is far from certain in many, if not most, cases.

The question then becomes one of availability of acceptable evidence to prove or disprove that a particular cancer or cataract or genetic injury was caused or influenced in some harmful fashion by the negligently occasioned exposure to radiation.

In answering this question it is important to recognize that the causation-in-fact question is double-barreled. First, there is the question of whether the negligent act or omission of the defendant actually caused the plaintiff to be irradiated, and, second, assuming there was a radiation "impact" upon the body of the plaintiff or decedent, did this particular exposure in fact cause or aggravate the apparent injury. Assuming that the radiation "impact" is not in itself a compensable injury, both of these issues of causation must be resolved against the defendant before liability attaches, regardless of whether absolute liability, negligence, or workmen's compensation rules are used. Different types of phenomena may be needed to provide the answers to "prove" these two causation questions. If those needed to show "impact" are somewhat esoteric, those bearing on the second question are almost occult. The proof must embrace a substantial portion of the fields of scientific knowledge about matter and energy.

For the most part this study is limited to biological questions of causation—from impact to injurious consequence; however, it is not possible to disregard entirely non-biological considerations or matters of social policy. One cannot avoid the feeling that in many cases, rightly or wrongly, the plaintiff's burden of showing biological causation is made easier if the proof of causation as to impact is quite persuasive and not just barely "more probable than not." While the burden of proof may not shift, seemingly it becomes somewhat less onerous to prove biological injury if the impact is clearly established. It is not surprising to find juries influenced in this fashion, but it is a little dis-

appointing to discover the same effect upon some of the courts. Some of the cases containing implications of this attitude are discussed below.

(a) Some General Considerations as to Proof of Biological Cause

For our purposes biological injury can be deemed to be the terminal result of a totality of causes. Some may be more immediate than others, but each is essential, qualitatively, quantitatively, and chronologically, to the result. These causes form a reticulated pattern of antecedent events and processes made up of increments of matter and of energy which culminate in an observable or predictable injury. In its broadest sense, and probably in the scientific sense as well, the determination of causation embraces this entire dynamic structure, or, to be charitable, it would if we could make it so.

One of the aims and techniques of science is to find or at least to illuminate the causal facts. The method of science is essentially one of filling in the gaps between existing observational data with a postulate or theory, and then testing the theory. The law has taken too little cognizance of this method. The scientific investigator is confronted with a biological condition which he rarely can observe either on the level at which it actually develops or as a dynamic process—limitations on aided and unaided perception being what they are. Nevertheless, through experiment and what observational situations he can contrive the investigator is gradually able to isolate various external influences and obtain more or less incomplete cross-sectional views at various stages in the pattern. As soon as a consistent, or perhaps one should say readable, pattern begins to unfold, the scientist will commence to put together these observable influences with a theory that assigns cause and effect roles to each factor. A causal theory usually consists of numerous subtheories which seek to explain what happens between observed and partially known consecutive steps in the phenomena.

The scientist has learned to live with the frustration that comes from realizing that a given theory of causation is only one of the many possible theories to explain a particular disease or injury, and that no two situations are ever precisely the same. To each injurious result there are a number of causal routes, some occurring with greater frequency than others, but none revealing their real origins or their true nature to the casual eye, and few even to the trained one. The scientist is a humble man in his field, but, unfortunately, not enough judges and attorneys and even jurors are equally so when they enter the same field. Con-

cerned with the assigning of legal responsibility, they too often borrow from science with little understanding and apply the borrowed knowledge with only a modicum of caution. The plaintiff, having been injured, looks for one or more causal theories that include as a necessary influence an event like the impact or trauma ascribable to the negligence of the defendant. His attorney then directs his proof only to those events which justify the application of those theories rather than some other. He states, for example, that the plaintiff's health was excellent before the impact, that the impact left a pronounced bruise, and that six months later a cancer was discovered at the precise point of impact. The plaintiff obtains the services of one or more physicians who take the stand and testify to the existence of a causal theory that cancer *can* be caused and aggravated by a single trauma. Perhaps these experts will state that the plaintiff's injury *could* have been caused by the trauma, but, with becoming caution, they may be unwilling to state that in their opinion the cancer *probably was* caused by the impact. These physicians have been entirely honest, for, while the single trauma theory of cancer causation has little currency, today,[910] it was looked upon with greater favor at an earlier time and still has not been explained away entirely.

At this point the defendant presents his evidence, but what evidence does he have? All of the evidence is inside the plaintiff or in his past. The defendant offers alternative theories of cancer causation, but these remain hypothetical without evidence of specific events to which they can be tied, and problematical even with such evidence. Even assuming that there were pre-impact manifestations of cancer or that other external influences impinged, the plaintiff is under no obligation to volunteer this information nor do the discovery procedures give the defendant much assistance. On cross-examination the plaintiff's experts may be made to admit that the defendant's theories of causation have wider acceptance in the medical field, but without some kind of circumstantial evidence to show that basis exists in the instant case for applying one of the alternative theories, little is going to help the defendant, short of judicial notice that the plaintiff's theory of causation is too tenuous. Thus the fact of causation has been "proved," for legal purposes at least.

On appeal from the judgment attacking the sufficiency of the evidence as inadequate to justify the jury's finding of causation, the defendant is

[910] Small, "Gaffing at a Thing Called Cause: Medico-Legal Conflicts in the Concept of Causation," 31 Tex. L. Rev. 630 (1953).

worse off than at the trial. On such an appeal the court will look only at the plaintiff's evidence, and this in its best possible light. In addition the plaintiff can cite in his brief numerous cases involving cancer caused or aggravated by a single trauma: a metastatic cancer in the tibia caused by a sidewalk fall;[911] breast cancer caused by an exploding hot water heater;[912] cancer caused by an automobile accident,[913] or by an umbrella handle,[914] or a railroad seat;[915] an eye cancer caused by a blow with a fist;[916] a foot cancer caused by a fall in a hole;[917] death from jaw cancer caused by false teeth worn for three months;[918] or cancer of the womb caused by a miscarriage two days after a railroad accident, with death four months after the accident;[919] or a death "caused" by cancer in the sacral area induced by a fall from a streetcar twenty months earlier, where an autopsy revealed that the victim also was suffering from tuberculosis, Bright's disease, acute and chronic cystitis, acute and chronic prostatitis with abscess formation and chronic selenitis;[920] or dormant cancer of the larynx triggered by smog.[921]

Thus does the law rush in where science fears to tread, "proving" cause-in-fact with one theory of causation out of many (and that theory of questionable virtue), allowing a minimum of circumstantial evidence to indicate a circumstantial theory of causation, and saying, that in the absence of affirmative proof to the contrary, the impact and the injury, plus a few facts, such as prior good health, speak for themselves on the issue of causation if the jury wants to accept them. This is virtually proof by default. Is it any wonder that "the doctor is shocked by judicial treatment of *cause* in tort. . . [and] dumbfounded when introduced to the workmen's compensation and occupational disease cases"?[922] Perhaps the doctor himself is to blame in part because he has failed to realize the social purpose for using a scientific theory to prove in a court before a jury what "caused" an injury.

Juries are always suspected of assuming that a wealthy, corporate

[911] Shaw v. Owl Drug Co., 4 Cal. App.2d 191, 40 P.2d 588 (1935).
[912] Vitale v. Duerbeck, 338 Mo. 556, 92 S.W.2d 691 (1936).
[913] Lee v. Blessing, 131 Conn. 569, 41 A.2d 337 (1945).
[914] Louisville Ry. v. Steubing's Admr., 143 Ky. 364, 136 S.W. 634 (1911).
[915] Shaw v. Chicago, R.I. & P.Ry., 173 Ill. App. 107 (1912).
[916] Harris v. Hindman, 130 Ore. 15, 278 Pac. 954 (1929).
[917] Atlantic Coast Line R. Co. v. Thompson, 211 F. 889 (4th Cir. 1914).
[918] Coddaire v. Sibley, 270 Mass. 41, 169 N.E. 797 (1930).
[919] Louisville & N. R.R. v. Kemp's Admr., 149 Ky. 344, 149 S.W. 835 (1912).
[920] Thompson v. New Orleans Ry. & Light Co., 145 La. 805, 83 So. 19 (1919).
[921] Hagy v. Allied Chemical & Dye Corp., 122 Cal. App.2d 361, 265 P.2d 86 (1953).
[922] Small, *supra* note 910 at 641.

defendant clearly has done something "wrong," and the "pathetic" plaintiff has to be taken care of by someone. In fairness, it must be recognized, however, that the laws of probabilities surely support the conclusion that many injuries go uncompensated because there are "more probable" explanations for the injury which actually was caused as hypothesized by that "tenuous" or "too speculative" theory. If the fifty-fifty chance is where the line is drawn, as many deserving plaintiffs lose as undeserving win. The most euphemistic way to state the end result is that "rough" justice is reached. Even this is true only if we accept the concept that two wrongs average out to make a right. There should be a better way, but first some examples of how the present system works.

(b) The Legal Standard Required to Prove Cause-in-Fact

As set out previously in the discussion of multiple causation cases, causation is often arrived at by applying the "but for" test or preferably the "substantial factor" test.[923] That these formulas are helpful always in deciding concrete cases is at least questionable. Yet even assuming the validity of such tests, the underlying question still remains, did the radiation in the case under consideration amount to a "substantial factor" or, "but for" the radiation, would the injury not have occurred? In the ordinary case the plaintiff must prove that *more probably than not* the radiation was a substantial causal factor inducing the injury.[924] In terms of probability, when reduced to percentages, this would seem to mean that the chances must be at least fifty per cent plus that the radiation caused the injury and that the chances of all other possible causes together actually having caused the injury are slightly less than fifty per cent.

A few cases to the contrary notwithstanding, as pointed out in the multiple causation discussion, the majority of judicial opinions have stated or implied that they are following the "more probable than not" standard.[925] How the legal fact finding process really works perhaps never will be known. Certainly the reading of appellate court opinions cannot begin to furnish the answer, if for no other reason than that an infinitesimally small portion of the litigated cases get to the appellate courts. In addition, lawyers who try cases in the lower courts fre-

[923] *Supra* notes 751-53. See also Harper & James §20.2.

[924] *Supra* note 770.

[925] Cases cited *supra* note 880.

quently are unable to recognize their cases as they are described in appellate court opinions.

A real understanding of how the fact finding system works in the law would require a complete study, not only of how juries react, but also how trial judges and plaintiffs' and defendants' attorneys think in such situations. In addition, a factual study would need to be made of the kinds of evidence used in thousands of trials, and, once the evidence was collected, the necessary analysis to make sense from the material would require a statistician and an IBM machine to aid all the other experts.

Realizing these limitations, however, the lawyer must take account of the rules and concepts laid down by the appellate courts which have more or less effect on the actual trial of cases and, therefore, even the settlement of cases. Also, even though the appellate approach to the proof problem cannot be described adequately in the generalities dictated by the format of legal treatises, such generalizations can be helpful to the lawyer who is seeking the cases from which he must distill the approach of the appellate courts.

Certain generalizations that can be made are summarized briefly below. In addition, attached as an appendix at the end of this section are briefs of a group of representative cases which have dealt, in one way or another, with the standards of probability. The cases thus briefed support the following general propositions. When a case is mentioned in the text or footnotes of this section by name only, it can be found in its alphabetical location in the Table of Cases—Problems of Proof.

If one accepts the frequency with which a problem appears in appellate opinions as an indication of its importance, one would have to conclude that the instruction given by the court to the jury prior to its reaching a verdict is of key significance. Again accepting numbers as the proper criterion in determining the weight of authority, the instruction to the jury in most cases is to the effect that the evidence must show that it is "reasonably certain" or "reasonably probable," both that defendant's negligence caused a harmful force to affect the plaintiff and that the harmful force caused the injury that has been alleged. Many cases deal specifically with the second causation question, namely, did the defendant's force cause the biological result observed in the plaintiff? [926]

[926] See the Boland, Charlton, Cohenour, Menarde, Ramberg, Vaccaro, and Walker cases as throwing some light on this test, *infra* Table of Cases at end of this section. "Reasonably" is not always tacked on "probable." Sometimes "certainty" (?) is required, Menarde case; and see also DiFazio v. J. G. Brill Co., 133 Pa. Super. 576,

There are cases, however, in which words on their face indicating a somewhat lower standard than "reasonably certain" or "probable" have been used by appellate courts or have been approved by such courts in reviewing the standards set by trial courts. Such words as "possible," "likely," "could," and "liable," have been used or approved by appellate courts.[927]

Discussed in a number of appellate court decisions[928] has been the question of the effect of other possible causes on the plaintiff's proof—the question of whether the plaintiff must produce evidence explaining away other possible causes or whether, on the contrary, the defendant has the burden of showing the probability of suggested alternative causes. If by "reasonably certain" or "probable" one means "more probably than not," then by hypothesis the other possible causes added together do not weigh as heavily as did the force set in motion by the defendant. By the same token, if an alternative cause suggested by the defendant is more likely to have been the cause than any other, then by hypothesis the plaintiff has not proven causation with reasonable certainty or probability. It therefore would seem more accurate to consider the question of other possible causes as simply a ramification of the reasonably probable rule.

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3 A.2d 216 (1938); American Motorists Ins. Co. v. Landes, 252 F.2d 751, 753 (5th Cir. 1958); Kowalke v. Farmers Mutual Auto Ins. Co., 3 Wis.2d 389, 88 N.W.2d 747 (1958); Durivage v. Tufts, 94 N.H. 265, 51 A.2d 847 (1947); Howley v. Kantor, 105 Vt. 128, 133, 163 Atl. 628 (1933). See also cases cited Harper & James 1117, n. 32. See also discussion of cases *infra* notes 984 ff.

[927] Alley, Bearman, Boland, Cohenour, Louisville, Vaccaro, Walker, and Wood cases, see Table of Cases at end of this section. See also Bogany v. Consolidated Underwriters, 252 F.2d 764, 767 (5th Cir. 1958). See also cases cited Harper & James 1118, n. 33.

[928] Bucher, Charlton, Cohenour, Cornbrooks, Ingersoll, Magazine, Ramberg, Vaccaro, Walker, and Wood cases, see Table of Cases at end of this section.

TABLE OF CASES—PROBLEMS OF PROOF

The cases here briefed are representative of the thousands that could be cited dealing with the proof concepts discussed in the preceding section and in the ones to follow. *They are arranged alphabetically* to facilitate reference to them if the reader wants to check the authority for numerous statements made in the accompanying text discussions. The same case often supports more than one proposition and *they are not arranged by particular subject matters* as such. Each contains a detailed statement of facts and quotations from the opinion of the court bearing on the important holdings or implications of the case.

Alley v. *Charlotte Pipe & Foundry Co.*, 159 N.C. 327, 74 S.E. 885 (1912). Plaintiff was injured when a defective core for molding pipe caused molten metal to flow onto

plaintiff and seriously burn him. The negligence charged against the employer was that it had hired an incompetent core-maker and kept him on the job notwithstanding that it knew him to be such. The jury found that the company was negligent and that plaintiff was not guilty of contributory negligence. A verdict of $6,000 damages was returned.

Defendant contended that the court should not have permitted a physician to state "that the character of the plaintiff's wound was such that a sarcoma, or eating cancer, was liable to ensue." The court said the rule was that such testimony should be confined to probable consequences, "but in this instance we do not think the physician indulged in pure speculation. . . . The word 'liable' is defined as 'exposed to a certain contingency more or less probable.' Webster's Dictionary. The word was used by the witness in the sense of probable, and was doubtless so understood by the jury." (P. 330)

As to mental anguish the court said: "We think the evidence competent also as tending to prove acute mental suffering accompanying a physical injury. The liability to cancer must necessarily have a most depressing effect upon the injured person. Like the sword of Damocles, he knows not when it will fall." (P. 331)

Ayers v. *Hoage* (*Deputy Commissioner*), 63 F.2d 364 (1933). Plaintiff (appellant) was employed by Langmead's Arm Chair Lunch in the District of Columbia from 1925 to 1931 when he was found to be suffering from tuberculosis. During employment plaintiff lived in the same house with a tubercular sister.

Plaintiff filed a claim under the Longshoremen's and Harbor Workers' Act, which was rejected by defendant on the ground that: (1) Plaintiff failed to establish either an accidental injury arising out of and in the course of employment or that he was suffering from occupational disease or infection that arose naturally out of such employment; (2) it was not shown that there was aggravation, activation, or acceleration of a pre-existing condition due to employment.

Plaintiff worked long hours and ate at irregular times. He was employed sometimes as a bus boy, short order cook, and counterman. He contracted a cold of unknown origin in January 1931. He usually worked twelve hours a day. In the middle of January a sewer trap in the lunchroom overflowed for about one week and plaintiff got his feet wet. Plaintiff testified that he contracted tuberculosis or the cold because of his employment. Expert testimony was given as follows:

(1) Dr. Walters—plaintiff's family physician. A bad cold will act as an accelerant. Many other predisposing factors will do this also: long hours, continual exposure to draughts, irregular meals. It is *possible* to contract the disease from dishes, silverware, *etc.*, or from plaintiff's sister. Did not testify that plaintiff contracted tuberculosis at the lunchroom.

(2) Dr. Tewksbury—tuberculosis specialist, twenty years, 40,000 cases. Possible to carry tuberculosis bacilli and the infection for many years. Sputum test negative is not conclusive (Dr. Walters had obtained negative results in 1928). Twelve hours of work a day would not cause tuberculosis nor cause it to flare up, nor would a cold do so, nor standing in water. Could come in contact with the bacilli anywhere any time; many infected people were wandering about. It is not probable that cold lowered resistance to the spread of tuberculosis . . . though possible. Tuberculosis is not a disease peculiar to restaurant workers; very few cases seen involving restaurant workers. The percentage of cases among restaurant workers is about average, the same as clerks in the government departments; danger of coming in contact with bacilli is *just as great on the outside as inside. No way of proving definitely where the individual gets the disease.*

(3) Dr. Avery—In 1928 took a negative sputum test of plaintiff. Plaintiff's tonsils then badly infected (should have been removed). Sputum test is not a positive sign. Any exposure may accelerate the condition of tuberculosis; anything causing an un-

usual strain on the resistance would have a tendency to aggravate. (Dr. Avery was a general practitioner and surgeon.)

Decision: Decree dismissing plaintiff's bill affirmed.

An injury "arises out of" the employment within the meaning of the Compensation Act when it occurs in the course of the employment and as the result of a risk involved in or incidental to the employment or to the conditions under which it is required to be performed. The mere fact that the injury is contemporaneous or coincident with the employment is not a sufficient basis for an award.

The question the court must answer is: "Was the employment a proximate cause of the disablement, or was the injured condition merely contemporaneous or coincident with the employment?" (P. 365)

It conclusively appeared that tuberculosis is not peculiar to restaurant workers, and that the disease may be contracted in any place frequented by the public. To hold that there was a causal connection between the disease and the employment would be to indulge in conjecture.

Bearman v. *Prudential Ins. Co. of America,* 186 F.2d 662 (10th Cir. 1951). Action on a life insurance policy which insured against loss of life resulting directly from bodily injuries and independently of all other causes. Immediately before the final illness the insured was struck on the back by an apparently unknown object. He died six weeks later. Prior to the injury he was in apparent good health.

An autopsy revealed atherosclerosis of the left coronary artery and a thrombus completely occluding that artery. Three experts testified that this was probably a long standing disease, that in their opinion there was no relation between the disease and the accident, and that there was no causal connection between the injury and the atherosclerosis, the rupture of the atheromatous abscess, the thrombosis, or the coronary occlusion. They also testified that trauma or strain *may* produce a coronary occlusion and that the injury *might* have contributed to the death. Judgment for defendant was affirmed.

> Whether there was causal connection between the accident and resulting injury and the atherosclerosis, the rupture of the atheromatous abscess, the thrombosis, or the coronary occlusion presented a question for solution not within the competency of laymen, and a question with respect to which, *only a medical expert* with training, skill, and experience could form a considered judgment and express an intelligent opinion. Indeed, it perhaps would require a medical expert trained and experienced *in a specialized field.*
>
> The great weight of authority supports the rule that medical expert testimony to be sufficient to take the case to the jury must be to the effect that the accident or injury *probably* caused the Insured's death; and that testimony to the effect that a causal connection between the accident or injury and Insured's ensuing death was possible, such as testimony that the accident or injury "might have," or "may have," or "could have" caused the death of Insured, *is insufficient* to take the case to the jury, because such testimony leaves the issue in the field of conjecture and permits the jury to speculate or guess as to the cause of death. (P. 665) (Emphasis added.)

Boland v. *Vanderbilt,* 140 Conn. 520, 102 A.2d 362 (1953). The plaintiff was injured in an automobile accident in which the jury found the defendant negligent. Plaintiff claimed to have sustained (1) strains, bruises, and contusions, and (2) that he suffered a cerebral thrombosis seventeen days after the accident.

Trial of the case came some two and one half years after the accident. At this time plaintiff's left arm was almost completely paralyzed, he walked with great difficulty, he suffered constant buzzing in his head, headaches, and dizzy spells. He had to be driven about to do his work and was earning less than formerly. Judgment for plaintiff affirmed.

The defendant claimed there was no evidence to support an award for future permanent injury, pain, and suffering. The court pointed out that plaintiff was healthy before the injury and that his injuries were readily apparent. "Speaking broadly, the jury

had the opportunity to appraise his condition and the *probable* future consequences of it." (P. 523) The court distinguished this case from another in which the injuries were "of such a nature that the extent and probable duration of future disability by reason of it could not have been ascertained by the jury without the aid of testimony upon that element of damage [a knee injury]."

The defendant also maintained that plaintiff failed to establish any causal relation between the accident and the cerebral thrombosis. The court said "The occurrence of a post-traumatic cerebral accident or thrombosis is recognized by medical science. There is a likely connection between the plaintiff's cerebral thrombosis and the automobile accident. . . ." (P. 525)

> To be entitled to damages a plaintiff must establish a causal relation between the injury and the physical condition which he claims resulted from it. . . . This causal connection must rest upon more than surmise or conjecture. . . . A trier is not concerned with possibilities but with *reasonable probabilities.* . . . The causal relation between an injury and its later physical effects may be established by the direct opinion of a physician, by his deduction by the process of eliminating causes other than the traumatic agency, or by his opinion based upon a hypothetical question. . . .

The medical witness here testified, in answer to a hypothetical question, that there was a *"likely connection."* The court found this to mean "[o]f such a nature or so circumstanced as to render something probable . . . [a]ppearing like truth; seeming to justify belief. . . ." (Emphasis added.) (P. 525)

Bucher v. *Wisconsin Central Ry.*, 139 Wis. 597, 120 N.W. 518 (1909). Plaintiff was injured on September 26, 1906, while standing on the step of an engine cab, leaning out to catch a signal from a conductor. His head struck a standpipe along the right-of-way as the train moved past at ten to fifteen miles per hour. Plaintiff was examined the same day by a physician employed by defendant. There was a contusion and small swelling on the back of his head and a contusion on his right hip and right shoulder. He made no complaint about his ear, but complained of pain in his left testicle. The doctor examined and found a small chronic varicocele. Plaintiff testified that he was in sound health before the accident, that he was in bed about a week after it, that he went to work (for another employer) in November and worked until the middle of Jaunary. In February plaintiff called on Dr. Corbitt when he was suffering from an acute attack of grippe. He also complained of pain in his head, dizziness, loss of sleep, numbness in the arms, impotency, and tenderness in the upper and lower parts of his spine.

Dr. Corbitt testified that the nerve controlling erection was contained in the *sacro plexis,* and that plaintiff was tender in that region, that the brain, spinal cord, and the penval nerves all take part in the phenomenon of erection, that he believed from an examination of the plaintiff and the injury that there was sufficient injury to either the brain or the spinal cord from the blow on the back of the head to cause permanent impotency.

Dr. Brazeau (specialist in eye, ear, nose, and throat) examined plaintiff and found him to be suffering from suppuration of the middle ear. He cautiously stated that this condition *might have* been caused by the accident. An osteopath testified that the accident as described *could have* caused the injuries complained of. . . . The jury found for plaintiff ($4,000).

In reversing and remanding, the court pointed to the period of apparent good health of about five months following the accident and before the attack of grippe, and that the opinions regarding impotency were given by men who saw plaintiff after the attack of grippe. The court said:

> The verdict of a jury founded upon facts is entitled to great weight, and is almost conclusive upon this court if supported by any evidence. But the verdict

> of a jury founded only upon the opinion of experts concerning the cause of a condition, which condition is itself established by the opinion of experts, has no such weight. (P. 606)
> Opinions of medical men may be rejected as an insufficient basis for a finding of fact by a jury where the court is convinced that reasonable certainty is outside of the possibilities of the situation. (P. 607)

The court further pointed out that one physician found plaintiff to be suffering from grippe and having a suppurated ear, with some indications of varicocele and fever five months after the accident, and that this physician was of the opinion that plaintiff's sexual impotence was not due to any of these causes, but rather to the accidental injury. It was pointed out that he did not see plaintiff until five months after the accident, nor see the actual wounds or injuries, nor was there any evidence that they were described to him. The court pointed out that the physician who examined the plaintiff immediately after the accident found a chronic varicocele, and that "Dr. Allen McLane Hamilton, in his work entitled 'Legal Medicine,' expresses the opinion that varicocele except in its earlier stages finally results in the production of both impotence and sterility." (P. 609) Apparently another treatise informed the court that grippe could cause impotence.

In discussing the character of such an injury as impotence the court said:

> It is very easy to exaggerate before a jury the cause, effect, or probable permanency of such a condition as impotence. The same is true with regard to nervous disorders. Both are easy to feign, hard to disprove, exaggerated by auto-suggestion, and it is comparatively easy for an expert to have an opinion tracing either to a particular physical injury instead of to a disease, a mental condition, or a general impairment of health. If loss of sexual power is to be thrown into the scale as an item for which the plaintiff is entitled to be compensated in a personal injury case, common sense informs us that in practically all cases of severe injury, pain, suffering, or sickness there must be and ordinarily is during such period of stress a suspension of the sexual functions. . . . The consequence of considering this as an additional or independent item of damages must be that every sick or injured man may assert his sexual impotence as a ground for recovery additional to pain, sickness, or suffering, and thus duplicate damages. Cases may no doubt occur of direct injury to the generative organs in which some such ground of damages would not be a matter of mere conjecture, and what is here said has no reference to such cases. (P. 609)

The court then found that Dr. Corbitt, under the circumstances detailed, and five months after the injury, had no certain or satisfactory data upon which to base his opinion that the impotency of the plaintiff, if it existed, was caused by the accident. The court discounted the testimony of the osteopaths entirely.

In concluding, the court stated:

> The testimony of experts is proverbially unreliable at best, even when the experts are learned and competent, because bias is almost unavoidable on account of our mode of selecting experts, and bias requires small basis upon which to ground an opinion. But where this unreliability is accentuated by a showing that the expert has little or no data upon which to base the opinion . . . , and the subject upon which he expresses an opinion is one recognized by the approved learning of the times to be of great doubt and difficulty, or where the alleged expert demonstrates his lack of knowledge by his testimony, [as the osteopaths apparently did] such testimony will not be sufficient to support a verdict which to this court seems unjust or excessive. (Pp. 611-12)

Charlton Bros. v. *Garrettson*, 188 Md. 85, 51 A.2d 642 (1947). Following an operation for bilateral hernia, and about two weeks after returning to work, the plaintiff, in a collision between the streetcar of one defendant and the truck and trailer of the other, was thrown forward and struck in the region of the groin by the

frame of the seat ahead of him. Plaintiff claimed it caused "terrible pain." Following the incident the plaintiff was in the care of Dr. Wilkerson, who performed the hernia operation. The doctor testified that in his belief the accident produced a *recurrent hernia.* He further testified that the only curative treatment is another operation, that there was no "more than a fifty-fifty chance" of cure, that ten per cent of the hernias operated on recur without accident, but that this particular type of hernia is a *direct* hernia, *i.e.,* one that must be acquired, and ordinarily is due to some abdominal trauma. (An indirect hernia is one for which all the elements necessary for it to occur are present at birth.)

The defendant claimed reversible error in the court's charge to the jury to the effect that it might consider whether the injuries would be permanent, and in overruling objections to Dr. Wilkerson's testimony as to causal connection, as to the chance of cure, and as to a "direct hernia." Apparently the doctor did not hear the testimony in the case. Judgment for plaintiff approved.

> . . . It was not necessary for him (the doctor) to hear the testimony. [Since he had unusually extensive, firsthand acquaintance with the plaintiff's condition.] (P. 93)
>
> The law requires proof of probable, not merely possible, facts, including causal relations. Reasoning *post hoc, propter hoc* is a recognized logical fallacy, a *non sequitur.* But sequence of events, plus proof of *possible* causal relation, may amount to proof of *probable* causal relations, in the absence of evidence of any other equally probable cause. [Italics by court.] . . . We are not required or permitted to assume that the collision and the new hernia were a mere coincidence and that the hernia would have recurred if there had been no collision.
>
> There is also evidence of permanent injury. Plaintiff *is* [Italics by court.] permanently injured, unless he is cured by a formidable operation, which offers a 50 per cent chance of cure. Before the collision his condition involved a 10 per cent risk of recurrence. His present condition, *if* [Italics by court.] he undergoes another operation, involves a 50 per cent risk of recurrence. *This increase in hazard is itself a permanent injury.* Expert testimony hardly seems necessary to show that such an operation would leave plaintiff in a permanently weaker condition. (P. 94) (Emphasis added.)

Cohenour v. *Smart,* 205 Okla. 668, 240 P.2d 91, (1951). Plaintiff alleged serious injuries as a result of an automobile accident caused by defendant. Following the accident, the plaintiff got out of the car and walked around, and gave no indication of injury whatsoever. He told a highway patrolman that he "was fortunate because he had a weak back and was not even hurt." Plaintiff had been injured in a similar accident twelve years previously. He also had been in an accident the previous year, but claimed he had suffered no permanent injuries as a result of either event. He had been a frequent visitor to doctors both before and after the accident, but he did not complain to any of them of having received an injury in this accident. Examination showed that at some time two of his vertebrae had become compressed.

This action was commenced thirteen months after the accident. The only medical witness called by the plaintiff was one who examined him two years after the accident for purposes of testifying. This witness testified that the accident *could* have caused the condition in plaintiff's back. Judgment for plaintiff reversed.

> Did the plaintiff establish by expert testimony that the plaintiff's injuries were a result of the accident . . . ? The answer to this question necessitates the consideration of two points, the first being: Did Dr. Rice testify with sufficient definiteness that plaintiff's injuries were the result of the accident . . . ? and second: Were the other accidents in which plaintiff was involved properly eliminated as possible causes of his alleged injuries? We think the answer is "No." (P. 670)

The plaintiff must show that the accident *probably did* cause the injuries.

> . . . [T]he authorities clearly hold that medical testimony as to the possibility of a causal relation between a given accident or injury and the subsequent impaired physical condition of the person injured is not sufficient, standing alone, to establish such a relation. (P. 670)

The court also pointed out that Dr. Rice testified on cross-examination that plaintiff's injuries could have been caused at another time than the date of the accident. "We think that until the plaintiff has eliminated other possible causes of his injuries as being the sufficient cause, he should not recover." (P. 671)

Cole v. *Simpson,* 299 Mich. 589, 1 N.W.2d 2 (1941). Plaintiff claimed to have been injured when she was dragged by a bus from which she was alighting. No one saw the accident and there was considerable doubt whether the accident ever occurred.

The only outward evidences of injury were a few abrasions and bruises on her left leg and hand and on her face. Five months after the accident the plaintiff complained of pain in her back. Ten months after the accident X-rays disclosed that she was suffering from duodenitis and colitis, the latter in ulcerated form. Her main complaint is that the accident caused frequent, irregular, and very prolonged and painful menses.

There was medical testimony that duodenitis and ulcerated colitis, because of the advanced stage disclosed by X-rays, must have developed before the alleged accident. There was evidence that the menstrual difficulty was caused by this diseased condition; however, one of the plaintiff's medical experts, when asked whether he had any opinion based upon reasonable medical certainty whether or not the findings he had made (a considerable period after the injury) "could have been caused by a fall or being dragged," answered, "Why it was possible, yes." He further stated that the possibility was "very great," "80 per cent possible." Another medical witness for the plaintiff (the doctor who had been treating her) felt that the menstrual injury, duodenitis and ulcerated colitis were the result of a previous accident. Judgment for the plaintiff reversed on other grounds. (On subsequent discovery the defendant showed that plaintiff was a professional in personal injury actions.)

> We agree that this testimony has very little probative value; that medicine is not such an exact science that the cause of disease can always be determined and it may be said that in most instances there is a possibility that any untoward condition may cause a more serious one. However, there was no error in admitting the testimony. In *Hunter* v. *Village of Ithaca,* 141 Mich. 539, we held that it was not improper to ask a witness whether an injury "could cause" a condition rather than whether such an injury would be likely to cause such result. We held that the objection went to the weight of the question rather than to its admissibility. The weight of authority sustains this ruling. (Pp. 595-6)

Comeau v. *Beck,* 319 Mass. 17, 64 N.E.2d 436 (1945). The plaintiff testified that she was three months pregnant at the time of the automobile collision for which the defendant was responsible. She further testified that the force of the collision threw her against the steering wheel, that she experienced pain and nausea, that she was obliged to stay in bed after the accident for a week, and that on the ninth day after the accident she suffered a miscarriage. She introduced no medical evidence on her behalf.

The defendant called as a witness a doctor, who had examined the plaintiff about six months after the accident. He testified that there was *grave doubt* that she had suffered a miscarriage, and that, if she did, it was not as a result of the accident. On appeal the defendant contended that the jury could not, *unassisted by expert medical testimony,* find that the plaintiff suffered a miscarriage or that such a miscarriage was causally related to the accident.

The court held that the plaintiff's own testimony as to her pregnancy and that she

suffered a miscarriage was sufficient evidence for the issue of the injury to go to the jury. With respect to the issue of causal connection the court stated:

> The testimony of an expert that such causal connection exists, or probably exists, has been held sufficient. . . . [E]xpert testimony that merely shows "that such (causal) relation is possible, conceivable or reasonable, without more, leaves the issue trembling in the balance." But there is no rule of law that this relation must be proved only by expert testimony. . . . Expert testimony that an accident would be an adequate cause of subsequent disease has been held "sufficient, taken in connection with the plaintiff's testimony that his health was good before the accident." . . .
>
> We think, although with some hesitation, that the plaintiff's testimony with respect to the accident and the condition of her health afterwards, in conjunction with the testimony of the defendant's doctor to the effect that a miscarriage might be produced by "some injury, (or by) the striking of the abdomen," was enough to support a finding that the plaintiff's miscarriage was causally related to the accident." (Pp. 19-20)

Judgment for the plaintiff was affirmed.

Cornbrooks v. *Terminal Barber Shops, Inc.*, 282 N.Y. 217, 26 N.E.2d 25 (1940). The plaintiff sought damages for loss of the sight of his left eye, alleged to have resulted from the negligent operation of an electric vibrator by a barber employed by the defendant. The electric vibrator came in contact with the left side of the plaintiff's face on January 9, 1934. The plaintiff testified that there was an unpleasant jarring sensation; however, he sensed no further discomfort until the afternoon of the same day when he became aware of a dimness of vision which gradually became more pronounced. By January 15 the sight of the plaintiff's left eye was reduced to ten per cent of normal. Medical examination revealed that the retina had been torn. Prior to application of the vibrator, the left eye had been moderately nearsighted. Both before and after the injury the eye was entirely free from disease or infection.

Plaintiff's experts testified that the most common causes of a retinal detachment are trauma, jarring, or body strain. The plaintiff testified that he had undergone no unusual exertion nor sustained any blow. These experts testified that the detachment of the retina is not accompanied by pain, and that the vibration would have been a competent producing cause of the injury. Even the defendant's experts (barbers) testified that the vibrator should never be applied to the face.

The plaintiff was given judgment and the defendant prosecuted the appeal on the ground of a failure to show cause-in-fact. He supported the assertion by citing the experts' testimony to the effect that the injury might have been caused by a jolt or jarring sustained on a subway train, a taxicab, or a bus, in which vehicles the plaintiff had admitted riding on the 9th of January. The defendant offered no proof of such incidents. With respect to these contentions of the defendant, the court stated:

> But the significant fact is that the record contains no proof that plaintiff had been jarred or jolted at any time and, to the contrary, the plaintiff denied such an occurrence.
>
> It is not enough that the defendant, in an effort to break the chain of causation, should prove that plaintiff's injury *might* [Italics by court.] have resulted from other possible causes, nor is it required of the plaintiff that he eliminate by his proof all other possible causes." . . . It is enough that he shows facts and conditions from which the negligence of the defendant and the causation of the accident by that negligence may be *reasonably* inferred." (P. 223) (Emphasis added.)

The judgment for the plaintiff was affirmed.

Fidelity & Casualty Co. of New York v. *Industrial Accident Commission*, 84 Cal. App. 506, 258 P. 698 (1927). Proceeding in *certiorari* to review an order of the Commission awarding compensation for the death of an employee of Balfour, Guthrie & Co. Deceased was sent by his employer from San Francisco to Valparaiso, Chile,

to attend a nitrate conference. On the return trip he stopped at Arequipa, Peru, pursuant to his employers' orders to visit company customers. There he contracted typhoid fever and died. Due to unsanitary conditions, typhoid in both Chile and Peru, while not epidemic, was prevalent and a constant source of danger. At least one of the deceased's superiors was familiar with the health conditions in both countries, and had warned deceased to this effect advising him concerning the precautions to be taken. The Commission found deceased sustained injury arising out of and in the course of employment. Judgment was for plaintiff.

This court was without power to determine weight to be given the evidence . . . or which of two opposing inferences should be drawn therefrom. Claimant was not required to show proximate cause by a preponderance of the evidence. The evidence need merely be reasonably sufficient to support the award.

The distinguishing feature between this and prior cases where an award is denied is that here at least one of the employers was aware of the greater prevalence of the disease in the places to which the deceased was sent. ". . . [A]nd we are unable to say that the conclusion of the Commission that the employee was subjected to an exposure in excess of the commonalty was not reasonably supported." (P. 510)

"Commonalty" means the great body of citizens, the mass of people.

> . . . [A]n employee who contracts a contagious or infectious disease has the burden of showing affirmatively that he was subjected to an exposure in excess of that of the commonalty and in the absence of such showing his illness or death cannot be said to have been proximately caused by an injury arising out of his employment . . . the question is one of fact for the Commission, and its finding thereon if reasonably supported cannot be disturbed. (P. 508)
>
> Furthermore, the evidence sufficiently shows that the inhabitants of these localities, while not immune from the disease, were less subject to infection therefrom than foreigners. . . . (P. 510)

Harris v. *Hindman*, 130 Ore. 15, 278 P. 954 (1929). The defendant hit the plaintiff in the eye with his fist. The abrasion which resulted did not heal. Subsequent examination revealed the presence of a cancerous growth, for which the plaintiff sought damages.

In appealing from the judgment for the plaintiff the defendant contended that the opinions of the plaintiff's five medical experts rose no higher than inference in the scale of evidence. In affirming the judgment and disposing of the defendant's contentions, the court quoted from Chamberlayne on Evidence (§1811):

> "The necessity for receiving the reasoning of skilled witnesses is self-evident. . . . [T]he skilled witness, as an observer, is permitted to state facts perceived by him with the same admixture of reasoning which is allowed the ordinary percipient. The presence, on his part, of a new element, that of special knowledge, has several marked effects, in an administrative point of view. Among these, it may be noted in the first place, that the *large number of data, professional reading, past observations*, and the like, usually broadens the basis of the reasoning of the skilled witness to such an extent as to make his mental deduction from his observations resemble, not so much an inference, as a conclusion." (P. 18) (Emphasis added.)

Howley v. *Kantor*, 105 Vt. 128, 163 Atl. 628 (1932). The plaintiff was struck and injured by the defendant's automobile while she was crossing the street. It was not questioned that the evidence reasonably justified a finding by the jury that negligence of the defendant proximately caused the accident. The real issue (for our purposes) was with respect to expert testimony.

An expert testified that a growth on the plaintiff's left breast was caused by trauma. Apparently it was conceded that the accident was the cause of the growth. The expert further testified that such growths may be either simple tumors, which easily are

removed and cured, or may be malignant or cancerous growths, that to determine their character it is necessary to remove and examine them microscopically. With respect to the type of growth the witness testified that they "run about eighty per cent cancerous." No evidence or testimony was offered as to the character of the plaintiff's growth; the witness was unwilling to state whether it was a simple or a cancerous growth. The trial court left it to the jury to decide, and the jury apparently found that the growth was a cancer or could become a cancer. The defendant took exception to the failure of the trial court to charge the jury that the evidence was not sufficient to justify a finding that there was a cancerous growth and that it was not to consider such a condition as an element of damages.

In reversing and remanding a judgment for the plaintiff, the court stated:

> Competent expert medical testimony was essential to lay a foundation for this claim made by the plaintiff. . . . To support such a claim, the evidence must be of such a character that the jury can find that there is a *reasonable certainty or a reasonable probability* that the apprehended future consequences will ensue from the original injury. Consequences which are contingent, speculative, or merely possible are not entitled to consideration in ascertaining the damages. (P. 133) (Emphasis added.)

In considering the expert testimony and establishing its legal effect, the court went on to state:

> The record before us does not disclose any opinion of the medical witness as to the probable future development and result of the plaintiff's breast condition. His answer, "run about eighty per cent cancerous," does not have the effect claimed for it. The witness did not say that in his opinion the chances are eighty per cent that the growth is cancerous, but, rather, as is clearly indicated, that from his experience and the history of other cases injury to the breast producing tumor developed about eighty per cent cancerous. (P. 133)

This testimony and the inferences to be drawn from it were held to be too conjectural and speculative to furnish a basis for the assessment of future damages.

Ingersoll v. *Liberty Bank of Buffalo*, 278 N.Y. 1, 14 N.E.2d 828 (1938). In this case there was clear evidence that the basement stairs in a house owned and leased by the defendant were defective. The defects had been pointed out to the defendant, but they had not been remedied. The decedent, a lessee of the house, who weighed 214 pounds and was carrying a 32-pound package was discovered by the plaintiff, his wife, at the bottom of the stairs. A piece of the tread of the second stair from the bottom was broken off. Inspection showed it to have happened at an old crack. Shortly after the accident the decedent said to his wife, "Something broke, . . . Something gave away in here," (pointing to his chest). He died several months later as a result of injuries sustained in the fall. There was evidence indicating that decedent had been suffering from a heart disease at the time of the accident. Neither was the body of the decedent much bruised, nor the package he was carrying greatly damaged.

The defendant contended that the decedent fainted or lost his footing on the stair as a result of his physical condition. He claimed that this must have happened at or near the top of the stairs and that the package broke the stair as it fell.

The trial court submitted to the jury the question as to which inference should be drawn. The jury found for the plaintiff. The appellate division reversed and dismissed the complaint on the ground that plaintiff had failed to show a causal connection between the defect and the injury.

In reversing the decision of the appellate division, the court of appeals pointed out that the defendant's inference was possible but unlikely since neither the package nor

the decedent were shown to have been bruised sufficiently to warrant the inference that they had fallen from very far up the stairway. The court went on to state that

> Where the facts proven show that there are several possible causes of an injury, for one or more of which the defendant was not responsible, and it is just as reasonable and probable that the injury was the result of one cause as the other, plaintiff cannot have a recovery, since he has failed to prove that the negligence of the defendant caused the injury. . . . This does not mean that the plaintiff must eliminate every other possible cause. . . . The existence of remote possibilities that factors other than the negligence of the defendant may have caused the accident, does not require a holding that plaintiff has failed to make out a *prima facie* [Italics by court.] case. It is enough that he show facts and conditions from which the negligence of the defendant and the causation of the accident by that negligence may be *reasonably inferred.* (P. 7) (Emphasis added.)

Applying this rule to the facts in issue the court further stated that

> In the case at bar the natural and reasonable inference is that the plaintiff was descending the stairway with the box, when the defective tread broke under his foot and caused him to fall. There was evidence that the decedent suffered from heart disease, and the jury might have reached the conclusion that he fell because of heart attack or dizziness. The question was one for the jury and the complaint should not have been dismissed. (Pp. 8-9)

Kramer Service, Inc. v. *Wilkins,* 184 Miss. 483, 186 So. 625 (1938). Plaintiff was injured while opening a door in defendant's hotel when a broken piece of transom glass fell upon his head. The wound in the temple did not heal. About two years after the accident it was found that at the point where the injury occurred a skin cancer had developed. The jury awarded a $20,000 verdict.

The only two medical experts testified that there is no causal connection whatever between trauma and cancer, and went on to observe that if there were such a connection nearly every person of mature age would be suffering from cancer.

In affirming as to liability but reversing and remanding as to the amount of damages, the court stated:

> And the medical testimony is conclusive on both judge and jury in this case. That testimony is undisputed that after long and anxious years of research the exact cause of cancer remains unknown—there is no dependably known origin to which it can be definitely traced or ascribed. If, then, the cause be unknown to all those who have devoted their lives to a study of the subject, it is wholly beyond the range of the common experience and observation of judges and jurors, and in such a case medical testimony when undisputed, as here, must be accepted and acted upon in the same manner as is other undisputed evidence. . . .
>
> In all other than the exceptional cases now to be mentioned, the testimony of medical experts, or other experts, is advisory only; but we repeat that where the issue is one which *lies wholly beyond the range of the experience or observation of laymen* and of which they can have appreciable knowledge, courts and juries must of necessity depend upon and accept the *undisputed* testimony of reputable specialists, else there would be no substantial foundation upon which to rest a conclusion. (Pp. 498-9) (Emphasis added.)

Lee v. *Blessing,* 131 Conn. 569, 41 A.2d 337 (1945). The plaintiff was injured in an automobile accident on December 24, 1942. She sustained a bad bruise over her left breast. On February 13, 1943, a cystic mastitis was discovered at the precise point of injury. Apparently none of the medical experts were willing to state that the mastitis had been either caused or aggravated by the injury with reasonable certainty. In affirming a judgment for the plaintiff the court stated:

> Only the medical testimony is printed. It is highly technical. The jury could reasonably have found that the cause of cancer is unknown; that the prepon-

> derance of medical opinion today is to the effect that cancer rarely if ever results from a single trauma; but that the exceptional circumstances surrounding this case, particularly the period that elapsed between the date of the trauma and the appearance of the cancer, and the fact that the cancer was located at the precise point of injury, justified the conclusion that there was a causal connection between the plaintiff's injury and her cancer. (P. 570)

Louisville Ry. v. *Philippina Steubing's Admr.*, 143 Ky. 364, 136 S.W. 634 (1911). The decedent fell from defendant's streetcar by reason of the negligence of the defendant's employee. In doing so the handle of her umbrella bruised her chest. Within six months after the accident a tumor developed on her breast at the point where she had been bruised by the umbrella. This tumor further developed into cancer which caused her death. The judgment was for the plaintiff.

On appeal the defendant insisted that all the evidence as to the cancer should have been excluded from the jury, as it was not shown that this was the direct and proximate result of the injury.

In affirming the judgment for the plaintiff the court pointed to evidence showing that the decedent was a strong healthy woman before the accident and that she suffered constant pain following it. The court also adverted to testimony of physicians introduced by the plaintiff "to the effect that fifteen per cent of the cases of cancer of the breast may be traced back to a traumatic injury." While these physicians admitted that the cause of cancer was unknown, they gave it as their opinion that in a glandular structure like the breast, where the circulation is very extensive, there are what are called embryonic cells, and a bruise would start an embryonic cell to growing and developing into a growth different from the original material. These experts also testified that falling from a streetcar and having an umbrella punched into her chest, would be ***sufficient or probable*** cause for the condition in which they found the decedent, that the injury might not cause the cancer, but might bring about a condition which would cause it although a cancer otherwise would not have existed, that any chronic inflammatory condition in the breast was liable to bring about such a condition, and that a large percentage of the tumors of the breast in women at some time took on malignancy. The court held that this was sufficient evidence for the issue of causation to go to the jury.

Magazine v. *Shull*, 116 Ind. App. 79, 60 N.E.2d 611 (1945). This was a claim under workmen's compensation statutes. On March 13, 1942, the claimant, while pushing a motor block up an inclined ramp to a truck bed, experienced a sharp and severe pain in the region of his stomach. He became dizzy and cold and was compelled to rest. Later, he collapsed in his employer's office. That same day he had two rectal hemorrhages, and during the following week he had recurrent spells of nausea and pain. On March 21, he had several hemorrhages, both oral and rectal. On March 24, after being taken to the hospital, claimant awakened totally and permanently blinded by bilateral optical atrophy. Prior to this time claimant had had no trouble with his eyes; however, he apparently had an incipient stomach ulcer.

A medical expert stated, "It is known on good authority that one single hemorrhage or repeated hemorrhages may exsanguinate the retinas and thereby produce death of the retinas followed by optic atrophy. That condition is rare but there are cases reported of such a happening." (P. 84) In response to the question, "Would you say, doctor, that the result *might* have occurred in this case?" (Emphasis added.) the witness replied, "Yes, it just easily could have happened." This was all the medical testimony favorable to claimant. Nothing was said as to what caused the hemorrhage. Judgment for plaintiff was affirmed.

> It is true that in many jurisdictions courts attach little evidentiary value to statements of medical experts which are doubtful and equivocal and hold that the evidence must establish a probability, not a mere possibility, of causal

> connection between an injury and disability. In this state, however, it is settled law that the opinions of medical experts using words such as *"might," "could," "likely," "possible," "may have,"* etc., in testifying concerning the causal connection between accident and disability, if coupled with other credible evidence of a non-medical character, is substantial evidence and sufficient to sustain an award. . . . In our opinion the chain of events in close sequence, such as the accident itself followed by pain, dizziness, chill and hemorrhages, at frequent intervals over a period of 11 days, together with the fact that the appellee previously had had good eyesight and no hemorrhages, is sufficient, under the rule above announced, to render Dr. Alvis' testimony substantial in character and of such probative value as the Industrial Board saw fit to give it. (P. 87) (Emphasis added.)

McAllister v. *United States*, 207 F.2d 952 (2d Cir. 1953). Libellant, a second assistant engineer, employed by the United States on a government owned vessel, operated by the War Shipping Administration, brought an action contending that the respondent had been negligent in creating conditions conducive to the transmission of polio and that the libellant contracted polio as a result of this negligence.

The vessel arrived in Shanghai from New York on September 26, 1945, where she stayed until November 1. Notice was posted and announcements were made by the master as to the existence of a polio epidemic in the area; all members of the crew were warned to avoid contact with the Chinese and to exercise care in eating and drinking while ashore.

On November 1 the vessel went to Hong Kong, returning to Shanghai on November 11. During this second stay at Shanghai Nationalist Army trucks were loaded on board the vessel with the aid of Chinese coolies; also Chinese soldiers and mechanics were taken on board. While a deck toilet was provided for them, no provision was made to keep the Chinese from using the crew's toilet facilities. The Chinese in fact did use these facilities as well as a common drinking fountain on deck. On one occasion libellant was required to flush the deck latrine. Judgment for libellant reversed. On appeal to the Supreme Court, 348 U.S. 19, 75 S. Ct. 6 (1954), judgment was reversed, the court saying:

> On evidence showing these facts, including the opinion of the experts, we think there was substantial evidence from which the District Court [no jury] could and did find that respondent was negligent in permitting these Chinese, from the infested area of Shanghai, to have the run of the ship and use of its facilities, and in furnishing the crude and exposed latrine provided on the deck of the ship, by reason whereof the petitioner contracted polio.
>
> Of course no one can say with certainty that the Chinese were the carriers of the polio virus and that they communicated it to the petitioner. But upon *balance of the probabilities* it seems a *reasonable inference* for the District Court to make from the facts proved, supported as they were by the best judgment medical experts have upon the subject today, that petitioner was contaminated by the Chinese who came aboard the ship November 11, 1945, at Shanghai. (P. 22) (Emphasis added.)

Menarde v. *Philadelphia Trans. Co.*, 376 Pa. 497, 103 A.2d 681 (1954). Plaintiff was injured on May 16th while alighting from defendant's streetcar. That evening she noticed a discoloration on her right breast. Over the period of the next two and a half months the discoloration disappeared; however, by the end of July plaintiff detected a lump at the exact spot where there had been discoloration. Plaintiff was referred to a cancer specialist who recommended removal of the entire breast. This operation was performed. Plaintiff's regular physician testified in very unequivocal terms that in his opinion the cancer was the direct result of plaintiff's injury. This witness refused to even concede that the cancer possibly could be caused by anything else. The cancer specialist, who performed the operation, testified that the trauma sustained by plaintiff caused the cancer, although in somewhat less emphatic terms. Judgment for plaintiff affirmed.

> . . . [T]he expert has to testify, not that the condition of claimant might have, or even probably did, come from the accident, but that in his professional opinion the result in question *came from the cause alleged.* A less direct expression of opinion falls below the required standard of proof and does not constitute legally competent evidence. (P. 501) (Emphasis added.)
> Where, as here, a person who has enjoyed prior good health sustains an injury to a particular member and some three months thereafter a malignant nodule appears in precisely the same location as the bruise, and two doctors conclude that the cancer resulted from the trauma, causal connection between the accident and the disease is sufficiently established. . . . (P. 503)
> . . . Since their statements [those of plaintiff's two experts] exhibit no absolute contradiction respecting the fundamental issue, it was legally competent evidence and was properly submitted to the jury. (P. 503)

Payne v. *Chandler,* 41 Ga. App. 385, 153 S.E. 96 (1930). In this case the court pointed out that the mere fact that one event chronologically follows another is alone insufficient to establish a causal relationship between them. In a remarkably elliptical opinion the court merely stated:

> . . . Evidence that a woman suffered a pain in her heart and other physical ailments after having swallowed a liquid, the nature and character of which does not appear except that it was suitable for use as a hypodermic by a dentist while operating in a person's mouth and possessed a bitter and disagreeable taste, is, in the absence of evidence as to any facts tending to show a causal relation between the woman's physical condition and the swallowing of the liquid, insufficient to authorize an inference of fact that her condition was caused by the swallowing and the ill tasting effects of the liquid. (P. 386)

Ramberg v. *Morgan,* 209 Iowa 474, 218 N.W. 492 (1928). In this case plaintiff's intestate was struck by an automobile. He was brought by the driver of the automobile to the police station. In response to a call, the doctor, an assistant police surgeon, arrived at the station about an hour after the accident. He found decedent on the floor of a cell in an unconscious condition. The doctor examined decedent. He diagnosed the case as intoxication, stating that he found no evidence of head injury. He left decedent, still unconscious, lying on the floor of the cell, and did not see him again. Decedent remained unconscious for six hours; thirty-one hours later he was taken home in a stupor, complaining of an "awful headache." His condition became worse, and he died four days after the accident.

Autopsy revealed a fracture of the sutures of the parietal and occipital bones near the base of the skull and indicated that decedent had died as a result of anemia of the brain, or medullary edema, due to pressure of fluid inside the skull.

In bringing action against the doctor for negligence, the plaintiff did not plead that the doctor's omission caused, aggravated, or accelerated the death, but apparently alleged that in all probability the decedent's life could have been saved had defendant exercised reasonable care and skill, and that this omission was the efficient and proximate cause of the death.

All the medical experts who testified suggested but one proper course of procedure when confronted with a situation such as this. Apparently there was ample variance between such a procedure and the doctor's examination. The supreme court held that the trial court was justified in overruling defendant's motion for a directed verdict and submitting the issue of breach of the standard of care to the jury.

The principal issue on appeal was that involving cause-in-fact. The court pointed out that:

> The only recognized standard in such cases is essentially within the domain of expert testimony. . . . Nor is the value of expert opinion to be determined by counting noses, as in this case two physicians were called by the plaintiff, and three by the defendant, to testify on the proximate cause of death. . . . But, if plaintiff's own medical experts are in doubt, and could not, on the

> hypothetical question put to them, state with any reasonable certainty that the death of decedent was aggravated or accelerated by the negligence of the defendant, how could a court or jury determine such proposition? (Pp. 481-82)

By way of establishing the general rule the court stated:

> There must be causal connection between death of plaintiff's intestate and the negligence of the defendant, as alleged. There must be something more than a showing that the evidence is consistent with plaintiff's theory of the cause of death. The evidence must be such as to make that theory reasonably probable —not merely possible—and more probable than any other hypothesis based on such evidence. (P. 482)

The court stated that "it was necessary for the jury to find, upon proper evidence, that the death of the decedent would not have occurred on January 25, 1926 (the 4th day), but for the alleged negligence charged against the defendant." (P. 483) All of defendant's experts testified that the head injury was the cause of death; plaintiff's witnesses testified that "the cause of death . . . was problematic"; that they did not know whether anything the doctor did or failed to do, caused the death, or that decedent would have lived if he had received other treatment. One of plaintiff's witnesses, in response to a hypothetical question containing the conditions and procedures of the doctor's examination and asking if they "probably accelerated his (decedent's) death, answered, "I would have to answer, in any *one case,* I don't know as I could say. I would say in a *series of cases* that this sort of treatment would probably accelerate or possibly cause some of them to die sooner." (P. 485) (Emphasis added.)

In discussing the testimony of the plaintiff's expert witnesses the court stated:

> It may be stated further that both of these experts, in answering the hypothetical question, stated that a person receiving a traumatic injury who lived 48 hours or more had a *better* chance of life, but admitted that the law of probability as applied to any particular individual in a class is "a mere guess." Dr. Carney testified:
>
> "There may be ninety-nine out of a hundred who receive a certain injury that are going to die, and one may recover; but nothing in those statistics enables one to tell which one is going to be the fortunate one. I believe that this man did have a severe brain injury, and a severe brain injury causes death at times, in the face of the exercise of highest degree of skill and care."
>
> It is sufficient to say that a physician, called as an expert, does not make a prognosis on statistics, because no two cases are alike; and plaintiff's experts could not say that, in any particular case, the fact that the patient lived 44 or 48 hours after the shock proved that he was not going to die. Damages may not be predicated on statistics of the character offered in the instant case. (P. 486) (Emphasis added.)

The court held that the defendant's motion for a directed verdict on the ground that causation was not shown should have been sustained and reversed a judgment for the plaintiff.

Thompson v. *New Orleans Ry. & Light Co.,* 145 La. 805, 83 So. 19 (1919). The plaintiff was injured by a fall from a railway car of the defendant. At the time of his death he was afflicted with both a cancer and tuberculosis. Autopsy revealed the cause of the death to be cancer. In disposing of this case in the plaintiff's favor the court said:

> Their [the medical experts] testimony is to the effect that tuberculosis was not the cause of Mr. Thompson's death; and that the real cause of his death was a malignant tumor, or cancer, which had resulted from a trauma or blow apparently inflicted about the time of the accident to him, as before described. They say, in effect, that such a malignant tumor as Mr. Thompson had results from a blow, as a rule, and that it generally attains its full growth and does its deadly work within 12 to 18 months' time; in just about the time between the day of the accident to Mr. Thompson and the day of his death. (P. 813)

Travelers Insurance Co. v. *Donovan,* 125 F. Supp. 261 (D.D.C. 1954). Action by an insurer to set aside an award under the Workmen's Compensation Act (33 U.S.C.A. 901 *et seq.*) made by the defendant as deputy commissioner. The claimant (to whom the award was made) was employed by the American Red Cross in Washington, D. C., and later assigned to duty in Kyoto, Japan. While at Kyoto she contracted tuberculosis. Under the stipulated facts:

(a) Kyoto	1951—incidence of TB	1,040/100,000
	1952—incidence of TB	1,090/100,000
(b) Washington, D. C.	1951—incidence of TB	221/100,000
	1952—incidence of TB	216/100,000

The Act provides: "Presumptions—In any proceeding for enforcement of a claim for compensation under this chapter it shall be presumed, in the absence of substantial evidence to the contrary—(a) That the claim comes within the provision of this chapter." (33 USCA 920) Claimant did not have tuberculosis when she went to Japan. The question presented was whether it was reasonable for the defendant to reach the conclusion that the claimant's tuberculosis was contracted not only during the employment but out of the employment, because there was an aggravated risk as a result of being sent to work in an area with a comparatively high incidence rate? Judgment for claimant.

> To a certain extent it must be realized that the inference drawn by the Deputy Commissioner results from the weighing of probabilities. *It may well be that in an action for damages governed by the principles of the common law the causal relationship between the employment and the tuberculosis could not be deemed to have been sufficiently established.* Different principles govern claims under the Workmen's Compensation Act, however. It is for the Commissioner to draw inferences from the evidence, and here the facts are stipulated and not in dispute.
>
> The court is of the opinion that the inference drawn by the Deputy Commisioner is not so unreasonable and is not so lacking in being founded on substantial evidence as to justify any interference on the part of the court. (Pp. 62-63) (Emphasis added.)

On appeal (221 F.2d 886 (D.C. Cir. 1955)) the insurer claimed that the award was void because it was based on speculation and conjecture and was not substantiated by the facts. The court held that the sole fact of the higher incidence of tuberculosis in Kyoto than in the District of Columbia "cannot support the inference drawn by defendant that claimant sustained such an occupational disease or infection as arose naturally out of her employment." Judgment for claimant was affirmed. The employment sent the claimant to Japan. The statute created a presumption for the benefit of the claimant. Absent substantial evidence to the contrary, a disability occurring in the course of employment must be presumed to have arisen therefrom. The court of appeals admitted that it is conceivable that the incidence of the disease in both places was so minimal as to require the conclusion that the 5-fold ratio was itself *de minimis.* But since the insurer offered no proof to that effect, the court could derive no such conclusion from its inspection of the record. The court concluded that it was entirely reasonable to infer, under all the circumstances, that the plaintiff contracted the disease by her contacts with the population of that country, infected as it was to a higher degree than that of the District of Columbia.

Vaccaro v. *Marra Bros., Inc.,* 130 F. Supp. 12 (D.C. E.D. Pa. 1955). Plaintiff sustained injuries as a result of defendant's negligence when he was struck under the armpit by a heavy wire cable. The injuries were alleged to consist of a wrenching and stretching of the muscles and ligaments of the shoulder and an aggravation of a pre-existing chronic inflammation inside the shoulder joint. The plaintiff also alleged

that the injury aggravated a pre-existing heart condition. The jury gave a verdict of $25,000, which the defendant claimed to be grossly excessive in that there was no sufficient showing of causal connection between the accident and the heart condition. An expert witness testified:

> . . . "Well, I believe that this strain of the accident, and what trauma he received during the accident, *most likely* contributed to a myocardial infarct.
>
> "I think it is impossible to state positively the extent to which the accident contributed towards Dr. Vaccaro's present condition. . . . I came to the conclusion that the myocardial infarct, . . . was *probably or, possibly—I think possibly*—was due to the emotional upset and trauma produced by the accident." Q. ". . . [I]sn't it true that the myocardial infarction that we are discussing now is a frequent and common complication of the hypertensive and arterial sclerotic heart condition, with added emphysema, that Dr. Vaccaro suffered from, which has no connection with the accident?" A. "That is correct." Q. "So that is the reason . . . that you use the word 'possibly' in your opinion concerning the causal connection?" A. "That is right. I wish I could use the word 'probably' for Dr. Vaccaro's benefit." (P. 13) (Emphasis added.)

The court remanded the case for a new trial, feeling the judgment to be grossly excessive.

> "In order to link [the] impaired physical condition to the defendant's conduct, the plaintiff was forced to depend on expert medical testimony because scientific knowledge was required for the elucidation of the question. * * * Moreover the expert has to testify, *not that the condition of claimant might have, or even probably did, come from the accident, but that in his professional opinion the result in question came from the cause alleged.* A less direct expression of opinion falls below the required standard of proof and does not constitute legally competent evidence." (P. 14) (Emphasis added.)

Walker v. *St. Louis Pub. Serv. Co.*, 362 Mo. 648, 243 S.W.2d 92 (1951). When four weeks pregnant, the plaintiff was injured in a collision, for which the defendant was responsible. For a number of years prior to the accident she had suffered rheumatic heart disease with mitral stenosis, which was permanent and progressive. The baby was delivered uneventfully and in a healthy condition.

The verdict for plaintiff was attacked on the ground that the court permitted the jury to award damages for permanent injuries when there was no substantial evidence of any permanent injury being proximately caused by the accident. Judgment for plaintiff affirmed upon remittitur of $4,000 of a $14,000 award.

An expert who examined plaintiff one year after the accident testified that where an aggravated heart disease of this type and extent is aggravated by any cause, the combination would make it worse; that he could not tell how much the accident had shortened plaintiff's life; that plaintiff would require treatment for the rest of her life; that pregnancy and childbirth throw a burden on the heart. Another expert testified that plaintiff's rheumatic heart disease, mitral stenosis and congestive heart failure were permanent and apt to shorten her life; that it was unusual for a woman of plaintiff's age (37) to have so severe a condition; that congestive heart failure does result from mitral stenosis, but many who have mitral stenosis do not have congestive heart failure; that plaintiff's early heart failure was a result of mitral stenosis but that the accident *might* have been the precipitating event; that where mitral stenosis exists, heart failure *could and probably would* result at any time; that any sudden and unexpected occurrence *may* precipitate congestive heart failure; that plaintiff's pregnancy *possibly* speeded up the development of congestive heart failure but that ordinarily where congestive heart failure occurs from pregnancy alone it does not occur until the 6th or 7th month, while the diagnosis of plaintiff's congestive condition was made in the 4th month of her pregnancy; that plaintiff's condition has become

progressively worse since before the accident; and that plaintiff's life expectancy was two years. He also said, "I feel that it [the accident] *has probably speeded up* the course of her development of congestive heart failure." (Emphasis added.) Prior to the accident plaintiff was able to do her housework. Since the accident she was not able to do so. The court said:

> . . . [W]e are not overlooking the facts: that plaintiff's doctors testified that mitral stenosis *would probably* cause congestive heart failure independent of any aggravation suffered at the time of the accident; that one of plaintiff's doctors testified that the aggravation caused by the accident would last not more than 8 months. . . . ; that the accident *might* have caused congestive heart failure; that plaintiff's pregnancy *possibly* speeded up the development of congestive heart failure; that any shock *might* cause congestive heart failure; that mitral stenosis probably *would* result in congestive heart failure without the intervention of an accident or other shock. (P. 656)
>
> We think there was an expert opinion sufficiently definite to constitute substantial evidence from which the jury could reasonably find that the accident hastened the development of congestive heart failure. When the entire testimony of Dr. Stubbs is considered, and when his various "might", "may", "could", "would", "possibly", and "probably" statements are analyzed with reference to the manner in which they relate to each other and to his total testimony, we believe that Dr. Stubbs did give his expert opinion that the accident . . . hastened, or caused sooner than would otherwise have been the case, congestive heart failure. (P. 656)
>
> It will be noted that this statement came after the doctor had testified to the possibilities and probabilities of other causes. Dr. Stubbs conceded that whether the accident . . . hastened or speeded up congestive heart failure was necessarily somewhat speculative; he conceded that plaintiff's pregnancy *possibly* speeded up the development of congestive heart failure; he stated that the accident *might* have been the thing that precipitated the congestive heart failure; he conceded that mitral stenosis *could* or *would* have caused it independent of any accident or other shock; but after conceding all this, the doctor then, based upon his examination and upon the facts related to him, was of the opinion that the aggravation caused by the accident in turn brought on congestive heart failure sooner than such condition would have resulted but for the accident. . . . Where, as here, it may be determined from the testimony that the doctor was expressing his expert opinion as to the cause of a condition, the form of language used will not deprive the statement of its evidentiary value. (P. 657)
>
> It is well established that before recovery may be had for permanent injuries, the permanency of the injuries must be shown with reasonable certainty and likewise that the causation of such permanent injuries must be shown with reasonable certainty; and when evidence goes only to the extent of showing that a certain condition might or could have been caused by one of two causes for only one of which defendant is liable, such is not a substantial showing of which of the causes produced the condition and furnishes no basis from which a jury may reasonably find the cause. (P. 658).

Williams v. *Reading Co.*, 175 F.2d 32 (3d Cir. 1949). The plaintiff's decedent was last seen, apparently asleep, in the car of the defendant's local train pulling out of station X, where he should have alighted. The next terminal was Y, and as the train was pulling away from it a trainman announced that Z terminal was next. It was shown that as the train left Y terminal, and when it reached Z terminal, the doors on the right side of the train were open. Before the train reached Z terminal, it made a stop at an intermediate crossing, A, to allow a train bound in the opposite direction to cross ahead of it and proceed upon a track immediately to the right of the track upon which the decedent's train was traveling. It was dark at the time that the decedent was last seen, and still dark when he was found the next morning, lying alongside the tracks at a point near the intermediate stop of the previous evening. It was stipu-

lated that the decedent had suffered a fractured skull. The defendant offered no evidence.

Under Pennsylvania law the plaintiff was entitled to a presumption of having exercised due care. Also it had been decided by the supreme court of that state that if a train, after the announcement of the next stop, stops short of or beyond that station, and no warning of the fact is given to the passengers, such omission is a negligent act on the part of the carrier.

The lower court rendered a verdict *non obstante veredicto* in favor of the defendant, saying that the evidence was too inconclusive to show causation since decedent could have left the train at either terminal Y or Z and have been walking along the tracks when struck by a train, or that voluntarily or involuntarily he might have fallen from the train while in motion, as a result of pure accident or illness. No evidence was adduced to substantiate any of these alternative theories.

In reversing and remanding with directions to enter a judgment for the plaintiff on the jury verdict, the court pointed out that the plaintiff's proof, considered in the best light, need not eliminate every possible cause other than the one on which he relies, but only such causes, if any, as fairly arise from the evidence. Moreover, the court stated that the presumption of due care remains in the case where there is no evidence offered by either side to offset it. For this reason the court felt that the jury was justified in finding that decedent did not leave the train while in motion and that he did not leave at either terminal Y or Z and walk along the tracks at night. Therefore, the court felt that the jury might find that the plaintiff's decedent left the train as a result of the clearly negligent act of the defendant, and that as a result of his having done so, he was struck and killed by the southbound train on the adjacent track.

Wood v. *Joyce Co.*, 228 App. Div. 729, 239 N. Y. Supp. 110 (1930). While in the employ of the defendant, the claimant fell from a stepladder. He continued his work as a carpenter during the rest of the day and for three weeks thereafter. Then, while at work, he suddenly became blind in his right eye. A medical examination disclosed a detached retina. The eye had been bloodshot after the accident and there had been some pain and blurring of vision. The defendant employer appealed from an award granted to the claimant.

In reversing and setting aside the award, the court pointed out that identification of the blindness with the earlier accident ***must depend upon medical testimony.*** While some of the experts had eliminated practically every other cause, except the accident, all of them ***hesitated to express a definite opinion*** that the origin of the detached retina was the accident. They merely said it was "possible." The court held that in the absence of other evidence leading to a reasonable conclusion, this was not sufficient.

(c) Kinds of Evidence Used

(i) Circumstantial

Because so many factors ordinarily enter into the determination of the causes of a particular physical ailment, it is not surprising that use of circumstantial evidence is so prominent in cases involving personal injuries. While it is impossible to catalogue the kinds of circumstantial evidence that have been accepted as helping to prove causation, there are some that stand out, particularly those dealing with the development of cancer after a trauma. Apparently good health prior to impact not only is properly admitted to show causation but it seems to be fairly

persuasive.[929] On the other hand, lack of prior good health does not seem to show lack of causation.[930] Another type of circumstantial evidence of considerable effectiveness in many cases is the near coincidence of the time of impact and the appearance of physical symptoms in the plaintiff's case, and in medical experience generally in such cases.[931] The coincidence of the injury manifesting itself at the exact point of impact of the force set in motion by the defendant also has been given considerable weight in several cases.[932]

(ii) Expert Testimony

As indicated previously in discussing the malpractice cases involving radiation injuries,[933] the language in the opinions is not consistent as to whether in areas involving scientific information it is necessary for the plaintiff to produce expert witnesses if he is to recover. It seems a fair generalization, however, that there are many cases in which the evidence so obviously points to causation from the force put in motion by the defendant that even a lay jury can rationally conclude without expert testimony that causation has been proved. But, once the evidence gets into the doubtful area, where it is of a technical or scientific nature, a plaintiff would be foolhardy to pass up the privilege of using expert witnesses. Certainly in radiation cases many questions of causation will necessarily involve evidence which only specially trained people can give and interpret. Cases dealing with biological causation in personal injury situations seem to bear this out.[934] Even in those jurisdictions in which cases are found saying that expert testimony is not necessary it is perfectly clear in general that it is admissible.[935] Whether the testimony

[929] See the Comeau, Cornbrooks, and Menarde cases, *supra* Table of Cases at end of previous section.

[930] See the Thompson, Ingersoll, Magazine, Vaccaro, and Walker cases, *supra* Table of Cases at end of previous section. Chronological coincidence rejected in suit for damage to sheep from A-bomb test; Bulloch v. United States, 145 F. Supp. 824 (D.C. Utah, 1956).

[931] See the Charlton, Cornbrooks, Lee, Louisville, McAllister, Menarde, Payne, Thompson, Walker, and Wood cases, *supra* Table of Cases at end of previous section.

[932] See the Charlton, Lee, Louisville, Menarde cases, *supra* Table of Cases at end of previous section.

[933] *Supra* discussion at notes 186 ff.

[934] See the Bearman, Comeau, Harris, Kramer, Vaccaro, and Wood cases, *supra* Table of Cases at end of previous section. See also Bennett v. Los Angeles Tumor Institute, 102 Cal. App.2d 293, 227 P.2d 473 (1951); Goodwin v. Misticos, 207 Miss. 361, 42 So.2d 397 (1949).

[935] See the Cole and Menarde cases, *supra* Table of Cases at end of previous section. See also Stanley Co. v. Hercules Powder Co., 16 N.J. 295, 304, 108 A.2d 616 (1954). *Cf.* Bucher case, *supra* Table of Cases at end of previous section, opinion at 611-12: "The testimony of experts . . . which to this court seems unjust or excessive."

given in the particular case by the expert witnesses is sufficient to support the claims of the plaintiff or defendant is a question that ordinarily is left to the jury, although occasionally an appellate court will rule that the evidence was too speculative and tenuous to justify the jury's finding.[936]

(iii) The Use of Statistics, Scientific Treatises, and Other Scientific Data

There are many cases in which the use of statistics, treatises, and scientific data, which for the most part come clearly within the definition of hearsay evidence, has nevertheless been permitted. In such cases it frequently has happened that the validity of such evidence either has not been argued or the question has been ignored by the appellate court.[937] There is considerable disagreement among the courts, however, as to whether it is proper to use such testimony. It is inevitable that the use of such material, with or without the use of experts to explain it, will become so important in radiation cases that its availability under the legal rules of hearsay and the limitations on the use of such material cannot be ignored.

The principal objection to the use of medical treatises and statistics to prove the likelihood of future injury is that it violates the hearsay rule. Where the fact to be proved with reasonable certainty is the future manifestation of an injurious impact, and statistical evidence is introduced to show that under similar circumstances the condition ultimately has occurred in a certain number of cases out of the total number of cases investigated, the defendant can argue that the evidence is hearsay, except in the rare instance in which the witness giving the testimony personally has investigated all of the cases. The argument is that the witness is unable to testify from personal knowledge as to both the accuracy of the statistics generally and as to the accuracy of the diagnosis of the individual cases specifically. Furthermore, it can be argued that the use of such evidence deprives the opposing party of his right and opportunity to cross-examine so as to test the validity of such statistics.

Wigmore, in addition to the above stated argument against the admission of learned treatises on medicine as evidence, has pointed out several other arguments which have been asserted from time to time with some

[936] See the Bearman, Bucher, Comeau, and Kramer cases, *supra* Table of Cases at end of previous section.

[937] See the Boland, Bucher, Harris, Louisville, and Ramberg cases, *supra* Table of Cases at end of previous section.

success: (1) That "science is shifting," that experiment and discovery continually are altering scientific theories and rendering them obsolete, that there is no general agreement among scientists, and that testimony characterized by such instability and uncertainty is untrustworthy; (2) that there is danger of confusing the jury by reading technical passages to them without explanatory comment; (3) that passages may be used unfairly by quoting them out of context; and (4) that the truths of medicine are to be sought chiefly in the personal experience of physicians.[938] Wigmore's answer to these four objections is summary to the point of being contemptuous. Both the danger of confusing the jury and quoting out of context can be remedied easily by the use of expert witnesses and the alertness of opposite counsel. The fourth objection is simply ridiculous, for it does not conform to the facts of the twentieth century. As to the first of the four objections, if the proponent is entirely consistent he would have to insist that the witness stand be denied to all scientific experts except the most up-to-date researchers, and even such opinions would be suspect since they might become obsolete tomorrow. In addition, science seldom refutes itself and the fact that it is an evolutionary discipline, constantly improving its methods of observation and the abstractions drawn from them, does not mean that it is "uncertain." If this is uncertainty, then the law itself is chaos.

In any event, such evidence generally is admissible, as it should be.[939]

[938] Wigmore, Evidence §1690 (3d ed. 1940).

[939] *Id.* at §665b, where the author says: "The data of every science are enormous in scope and variety. No one professional man can know from personal observation more than a minute fraction of the data which he must every day treat as working truths. Hence a reliance on the *reported data of fellow-scientists,* learned by perusing their reports in books and journals. The law must and does accept this kind of knowledge from scientific men. On the one hand, a mere layman, who comes to court and alleges a fact which he has learned only by reading a medical or a mathematical book, cannot be heard. But, on the other hand, to reject a professional physician or mathematician because the fact or some facts to which he testifies are known to him only upon the authority of others would be to ignore the accepted methods of professional work and to insist on finical and impossible standards.

"Yet it is not easy to express in usable form that element of professional competency which distinguishes the latter case from the former. In general, the considerations which define the latter are (*a*) a professional experience, giving the witness a knowledge of the trustworthy authorities and the proper source of information, (*b*) an extent of personal observation in the general subject, enabling him to estimate the general plausibility, or probability of soundness, of the views expressed, (*c*) the impossibility of obtaining information on the particular technical detail except through reported data in part or entirely. The true solution must be to trust the discretion of the trial judge, exercised in the light of the nature of the subject and of the witness' equipments. The decisions show in general a liberal attitude in receiving technical testimony based on professional reading."

Courts frequently have accepted such evidence indirectly through an expert's testimony; for example, when the expert witness admitted that his knowledge that formaldehyde in milk was injurious was acquired, not from experiments, but wholly from reading, study, and conversations with other physicians,[940] when two physicians in a criminal case admitted they derived their knowledge on the subject of poisons solely from medical books,[941] when a professor of geology based his testimony on "what I have read and the information I gathered from discussions with numerous geologists, and from my own observations,"[942] when a professor of science (mathematics and philosophy) used U. S. Coast and Geodetic Survey Maps in his calculations,[943] when a professor of

In a subsequent passage Wigmore goes on to say, in §687: "To deny the competency of a physician who does not know his facts *from personal observation alone* is to reject medical testimony almost in its entirety. To allow any physician to testify who claims to know solely by personal experience is to appropriate the witness-stand to impostors. Medical science is a mass of transmitted and collated data from numerous quarters; the generalizations which are the result of one man's personal observation exclusively are the least acceptable of all. The law must recognize the methods of medical science. It cannot stultify itself by establishing, for judicial inquiries, a rule never considered necessary by the medical profession itself. It is enough for a physician, testifying as to medical fact, that he is by training and occupation a physician; whether his source of information for that particular fact is in part or entirety the hearsay of his fellow-practitioners and investigators, is immaterial."

[940] Isenhour v. State, 157 Ind. 517, 62 N.E. 40 (1901), where the court said, at 528: "Courts have never undertaken to set up a standard of scientific knowledge by which competency of a witness may be determined, and have not gone to the extent of holding that a scientific witness can only testify from facts learned by him from personal demonstration. The general rule, in such cases, in this State at least, seems to be that where a witness exhibits such a degree of knowledge, gained from experiments, observation, standard books, or other reliable source, as to make it appear that his opinion is of some value, he is entitled to testify, leaving to the trial court, in the exercise of a sound discretion, the right to say when such knowledge is shown, and to the jury the right to say what the opinion is worth; . . ."

[941] Boswell v. State, 114 Ga. 40, 39 S.E. 897 (1901), where the court makes the following distinction, at 43: "Books of science and art are not admissible in evidence to prove the opinions of experts therein expressed. . . . But, notwithstanding the inadmissibility of the books, the opinions contained therein may come to the jury through the mouth of an expert witness."

[942] Schooler v. State, 175 S.W.2d 664, 670 (Tex. Civ. App. 1943).

[943] Pennsylvania Threshermen & Farmers' Mutual Casualty Ins. Co. v. Messenger, 181 Md. 295, 29 A.2d 653 (1943). The court said, at 298-99: "It is a familiar rule of evidence that a witness, in order to qualify as an expert, should have such special knowledge of the subject on which he is to testify that he can give the jury assistance in solving a problem for which their equipment of average knowledge is inadequate. . . . It is not a ground for excluding the testimony of an expert that he bases his statements in whole or in part upon what he has read, provided that his reading can be assumed to constitute part of his general knowledge adequate to enable him to form a reasonable opinion of his own. . . . The knowledge of an expert in any science or art would be extremely limited if it extended no further than inferences from happenings

mechanical and aeronautical engineering admitted that his calculations of the train's speed were based on experiments on similar train brakes and coefficients of friction, wind, and grade resistance to be found in handbooks on the subject,[944] and when a medical expert, who had made a blood test on the defendant and qualified as an expert in matters of blood tests and intoxication, in testifying as to a drunkometer test, stated this his conclusions were "accepted by physiologists." [945]

There is a striking similarity between cases involving the use of statistics to relate the alcoholic content of the blood to nervous response and cases involving future probability of injury from known dosages of radiation. The similarity becomes even closer when, as in the *Toms* case,[946] statistics are offered which correlate the intake of liquor with the blood alcoholic content, which, in turn, is correlated with the degree of intoxication. Assuming, for example, that similar statistics could be obtained that correlate radiation dosage with the extent of ionization in the cell, and this latter figure to such pathological effects as leukemia or cancer, there does not appear to be any reason why they would not be just as acceptable to prove the ultimate fact as are the statistics in the drunkometer cases. The one is no more hearsay than the other. The "necessity" for admitting such evidence is just as great in the irradiation cases as in the intoxication cases, and there is no greater "circumstantial probability of trustworthiness" in the latter than in the former. It is even doubtful if individual variation is any greater in the one than the other, and in the *Toms* case the court said:

> . . . [T]he competency of such evidence is not at all impaired because some persons yield more readily than other[s] to the deleterious effects of intoxicants. That fact may lessen the weight of the expert testimony with the jury, but it cannot be employed to exclude it.[947]

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within his own experience. His testimony is admitted because it is based on his special knowledge derived not only from his own experience, but also from the experiments and reasoning of others, communicated by personal association or through books or other sources. . . . His testimony was admissible, even though no maps or other records of the Geodetic Survey were produced at the trial."

[944] Los Angeles & Salt Lake R.R. v. Umbaugh, 61 Nev. 214, 123 P.2d 224 (1942), where the court said, at 223: "His technical knowledge in respect to the subject was reasonably calculated to enable him to give a considered appraisal to the values established by other recognized experts by actual experiments in answering the questions propounded. 'The judgment of a skilled witness testifying as an expert may be based, in part at least, upon the results of experiments made by himself or others.' "

[945] State v. Haner, 231 Iowa 348, 349, 1 N.W.2d 91 (1941). See also State v. Werling, 234 Iowa 1109, 12 N.W.2d 318 (1944); State v. Sturtevant, 96 N.H. 99, 70 A.2d 909 (1950); Toms v. State, 239 P.2d 812 (Okla. Crim. App. 1952).

[946] *Supra* note 945.

[947] *Id.* at 819-20.

Actually in a number of cases discussed subsequently in the section on future injuries,[948] the physician's prognosis of future injury was based largely upon the histories of similar injuries. In the *Alberti* case,[949] the court allowed testimony of a physician as to the resulting life expectancy of the injured plaintiff, when the physician stated that he could only estimate the probable length of this period from histories of similar cases. In the *Cordiner* case,[950] both the physician and the court referred to similar cases as being the basis of a prognosis as to future injury. The physician testifying in the *Riggs* case [951] referred to the experience of the profession when he said, "It is very frequent that *we* even find epilepsy, traumatic epilepsy, as we call it, following a severe brain injury." The expert in the *Coover* case [952] testified that "our medical literature is full of cases of cancer—carcinoma, that have developed upon a senile skin following an X-ray burn." Some of the cases dealing with the meaning of reasonable certainty, discussed below, include references to statistics known to a professional group.

On the other hand, the problem of direct admission of scientific source material as evidence (*e.g.*, statistics) presents greater difficulty than does its indirect admission through an expert's testimony. In discussing the subject of "learned treatises" as an exception to the hearsay rule, Wigmore has stated that they have obtained *complete* recognition on common law principles in only two jurisdictions—Alabama and Iowa.[953] Initial statutory efforts to admit such evidence in some seven or eight states met with hostile judicial attitudes, but the recent and more carefully drafted enactments of Massachusetts, Nevada, and Pennsylvania appear to preclude too much judicial obstruction.[954] Wigmore feels that, in the discretion of the court, published scientific opinions of recognized authorities should be admissible.[955] As he points out:

> It has long been unquestioned that standard *tables of mortality* (used in computing annuities, life-insurance sums, dower, and damages for loss of life), and *almanacs* are admissible in evidence. The occasional controversy has arisen, not over the present principle, but over the question how far the probability of life-expectation in the average should be taken by the jury to measure the probability for a particular decedent.

[948] *Infra* discussion beginning at note 981.
[949] *Infra* note 995.
[950] *Infra* note 1015.
[951] *Infra* note 1020.
[952] *Supra* note 452.
[953] Wigmore, Evidence §1693 (3d ed. 1940).
[954] *Ibid.*
[955] *Id.* at §§1691-92.

> It is doubtful whether a general rule in favor of standard tables of *scientific calculations* of all sorts can be regarded as established; but rulings tending in that direction are found.
>
> These almanacs and mortality tables have been explained to be admissible because they are founded on "certain and constant data" and deal with the "exact sciences." But the notion that every collection of figures savors of the exact sciences is sufficiently discredited at the present day. In fact, some of these particular tables have been among the least trustworthy of scientific efforts. . . . The simple fact is that the admission of a certain class of statistics was demanded by custom and practical convenience, and the judicial mind relented. Thus, a system of mere probabilities and working averages is not found wanting in qualities entitling it to be placed before the jury; while the substance of other collections of data, possessing at least equal inductive value, made with equal or greater thoroughness, sifted, arranged, and stated by trained observers, is by the same discriminating authority relegated to the limbo of hearsay and other judicial abominations. The error has lain, not in looking too leniently upon mortality tables, but in a misconception of the true qualities of other scientific work.[956]

As an early Iowa court put it:

> . . . [A]n appeal to medical authorities has been disallowed by some of the courts in this country; though physicians, when testifying, are permitted to refer to medical authors, and to quote their opinions from memory. Being permitted to refer to and quote authors, we can see no good reason why they may not read the views and opinions of distinguished authors. The opinions of an author, as contained in his works, we regard as better evidence than the mere statement of his opinions by a witness, who testifies as to his recollection of them from former reading. Is not the latter *secondary* to the former? On the whole, we think it the safest rule to admit standard medical books as evidence of the author's opinions upon questions of medical skill or practice, involved in a trial.[957]

Perhaps in the ordinary situation, it does not make too much difference whether or not the contents of "learned treatises" on science are directly admissible as evidence, so long as the courts either let a qualified expert testify as to their substance or allow him to express opinions based on principles and probabilities that are necessarily hearsay knowledge. In general, the expert should be adquate to this task,

[956] *Id.* at §1698.

[957] Bowman v. Woods, 1 G. Greene 441, 445 (Iowa 1848).

especially when he has been forewarned by counsel as to the course of questioning. Accurate and exhaustive scientific statistics, however, do not lend themselves to this sort of treatment. No expert can be expected to memorize the statistics of life expectancy or a table of logarithms, or coefficients of friction, to mention only a few, and the courts, where the admission of such evidence is "demanded by custom and practical convenience," have relented. Perhaps the real reason behind this judicial inertia is not really an objection to hearsay evidence, but because of a judicial reluctance to clutter up the trial with a lot of material that the court feels can be more expeditiously presented as oral testimony. As soon as there is something positive to be gained by the direct admission of medical and scientific statistics generally rather than by having an expert paraphrase them, the courts perhaps will disregard the hearsay prohibition. That point will be reached when it becomes apparent that the statistics themselves are too complex to quote or paraphrase from memory, and, what is more important, when it becomes apparent that what a physician takes as being probable from the statistics and how the law uses "probable" may be quite different.

(d) Use of Statistics in Personal Injury Cases

Assuming the admissibility of properly authenticated scientific data of a statistical nature, what use has actually been made in litigated cases of such material? It is admissible in most jurisdictions, as indicated above, at least where such information is presented as the personal knowledge of an expert witness. It might have been expected, therefore, that there would be a considerable body of legal literature analyzing the probative value of such material to prove causation and extent of injury, or at least that there would be a considerable number of cases illustrating the use of such material. Yet a search of the digests, annotations, and periodical indexes proves singularly unrewarding, and a reading of those cases in which statistical evidence surely should have been used does not prove to be much more helpful. In personal injury cases and in the face of a clear attack on its probative value, generally the only time in which statistical data is used as such is in connection with the measurement of average life span to determine the length of continued pain and suffering or to measure the future earnings of a disabled plaintiff. Many of the cases discussed or cited above in the study of shortened life span [958] either expressly approved the use of such material or by clear implication accepted the validity of statistical proof.

[958] *Supra* discussion at notes 482 ff.

Some of the cases even recognized clearly the need to relate all such statistical data to the particular fact situation rather than blindly accept the statistical average. There are a few cases in which the court clearly was aware of the statistical character of the evidence, but, in most instances, the significance of this type of evidence or an appreciation of the value and the danger in its use has escaped recognition. Venturing a statistical guess where no statistics are available, it is probable that in many, if not most, cases where legal as well as scientific conclusions are drawn, there is an underlying statistical basis used, albeit unknowingly, because so many of our conclusions really are based upon probabilities. The difficulty is that our probability assumptions are arrived at most unscientifically.

A postulation of general legal rules is based, in a very fundamental way, on the use of a statistical type of data. Unfortunately, the law is in the habit of making such assumptions as to the validity of generalities by induction from groups of particulars assumed to be understood correctly, instead of doing so only after testing them for statistical validity. Whether or not lawyers recognize it, most of our legal observations and generalizations, as is true of observations and generalizations for other purposes, in reality are probable only, not certain. A doctor, for example, is seldom if ever able to observe the course of a certain physical phenomenon in a particular individual in its cellular, molecular, or, in connection with radiation injuries, in the atomic or sub-atomic level at which nuclear energy operates; his understanding of the basic particulars of the condition is far from complete, and yet a prognosis in terms of probability, though not in terms of certainty, can be made by the doctor and is used by him, successfully in most cases, in taking medical action. In making such decisions, however, he must compare his observation and analysis of the various phenomena in the particular patient and reach his prediction on the basis of what his science teaches him has happened or is true in other similar situations. Most of his techniques of observation, experimentation, and isolation of factors in any complex phenomenon are essentially macroscopic, or, at best, microscopic. By comparing observations of enough similar situations, the doctor and the scientist as well make their evaluations and decide on courses of action on the basis of probabilities. The law must, or at least should, do likewise, because human affairs cannot wait for certainty. Lawyers should recognize, however, that the probabilities implicit and fundamental in the affairs of men are, or at least should be, based upon an empirical foundation of statistics. Unfortunately the law

has tended to ignore the fact that its Aristotelian, two-valued concept of either right or wrong really is based on probability and, therefore, upon a little articulated and less understood statistical foundation.

If the above thesis is correct, as we believe it to be, probably most of our cases involving personal injuries make use, although unknowingly, of statistical types of evidence. Usually the character of the evidence underlying the basic assumptions is obscured by the fact that it is the opinion of a living, speaking witness, or by "everyone knows" assumptions on the part of the jury or the judge without any reasonable testing of the statistical validity of the assumptions made. In just a very few cases it is perfectly clear that statistical data in the raw form, with little or no help from an expert's statement to the effect that he is expressing his own personal opinion, has been used to justify proof of injury and causation. Most of the cases cited in the last section dealing with the use of circumstantial evidence, particularly those in which similarity of lapse of time between the impact and injury in the particular case and in similar cases was used as proof of causation,[959] actually were using probabilities based on observation of similar situations, but the courts seem quite unaware of the fact that such conclusions were based on statistical probabilities. In those cases in which the statements from medical texts and treatises have been admitted, again use is being made of statistically supported conclusions or statements.[960]

The most flagrant examples of drawing legally significant conclusions on the basis of assumed knowledge are the *res ipsa loquitur* cases.[961] The assumptions in these cases usually are made without any attempt to test the validity of the statistical foundations supporting the probabilities on which the use of *res ipsa loquitur* is justified. There are, of course, many other examples where a statistical type of evidence is used, such as in the determination of market value of listed stocks and bonds, or in cases where valuation is established by evidence which really is the composite of opinions of a large number of people or of numerous transactions.[962] Our concern is rather with the use of statistical evidence to prove causation, the extent of injury, or the biological processes involved. Only a handful of cases have been found in this area which face squarely the issue of the validity of such statistical data.

[959] *Supra* note 931.

[960] *Supra* note 937. See also Bowman v. Woods, *supra* note 957.

[961] *Infra* notes 1146 ff. See also Malone, "Ruminations on Cause-In-Fact," 9 Stan. L. Rev. 60, 61-64 (1956).

[962] Wigmore, Evidence §1704 (3d ed. 1940); an early example is Sisson v. Cleveland & Toledo R.R., 14 Mich. 489, 497 (1866) (newspaper market reports permitted).

One other type of case which often involves the use of material based on statistical information and the conclusions to be derived therefrom, is that in which standards formulated by national groups or by administrative or statutory rules are used to prove either negligence or lack of negligence.[963] A clear example of this use involving what basically is a conclusion as to probabilities grounded on a foundation of statistics, is *Rakowski* v. *Raybestos-Manhattan, Inc.*[964] In the construction and operation of X-ray fluoroscopic machines the setting up of safe limits for exposure of operators unquestionably is based on much clinical data from which statistical judgments are formed, even though the court actually does not look at the question of how the code standards are established. Such evidence was used in this case to show a lack of negligence rather than to prove causation of physical injury from irradiation.

Again, *Western Assur. Co. of Toronto* v. *J. H. Mohlman Co.*[965] is a case in which the court accepted what clearly was a conclusion based upon empirical data from which the crushing strengths of different kinds of timber were reached inductively. The question in the case turned upon whether the building fell because of weakened timbers and before the fire or whether it fell as a result of the fire and so was covered by the insurance policy. The court permitted the introduction of reports from the United States Department of Agriculture, prepared by the Chief of the Division of Forestry, showing the results of two thousand tests of the crushing strength of timber. The report was stated to be by a recognized authority in the engineering profession. Also a table was introduced from an engineering treatise giving the crushing strength of timber. Similar tables from a third volume also were presented. The court said, in overruling objections to the use of this material:

> Under the rule contended for, that valuable information would be available for the use of a court of justice so long as the men who made the tests and prepared the tabulations were living and producible, but after their death or disappearance the information they had gathered would be lost to the court, although available for every one else in the community, and relied upon by engineers and builders whenever a new structure is in process of erection. Upon the precise point here presented the diligence of counsel has not succeeded in discovering

[963] *Supra* discussion at notes 77 ff.
[964] *Supra* note 175.
[965] 83 F. 811 (2d Cir. 1897).

> a single authority. We feel, therefore, no hesitancy in so modifying the general rule as to hold that, where the scientific work containing them is concededly recognized as a standard authority by the profession, statistics of mechanical experiments and tabulations of the results thereof may be read in evidence by an expert witness in support of his professional opinion, when such statistics and tabulations are generally relied upon by experts in the particular field of the mechanic arts with which such statistics and tabulations are concerned.[966]

The evidence apparently had been inserted to support the proposition in the complaint that the fire rather than failure of timbers had caused the fall, and the circuit court upheld judgment for the plaintiff.

A considerably more hostile view was expressed by the Alabama court in *Franklin* v. *State*.[967] The case was a prosecution for bastardy and the jury had found the defendant to be the father. The use of statistical tables was put in issue by the defendant's objections to the trial court's refusal to allow counsel for defendant to use tables in cross-examining a physician who had been a state witness. The nature of the tables was not described other than they came from a volume on "clinical obstetrics." The court said:

> Relevant extracts from medical treatises are not in themselves self-proving but are admissible when *recognized* and *approved* by the medical profession as *standard*. . . . The volume in question was not shown to be a standard work or recognized authority on the subject at issue, and in the rejection by the court of the table there was no error.[968]

While the court denied the use of such material because it was not a recognized work, it rather clearly assumed that tables from authoritative works would be permitted. It is not possible from this opinion to tell whether the tables were to be used as proof or disproof of causation.

The only cases found dealing directly with cause-in-fact of biological injury supported solely by evidence of probability based clearly and squarely on statistical data involve workmen's compensation situations. If these cases should be followed in ordinary tort situations (and on the cause-in-fact issue there should be no difference between workmen's compensation and ordinary torts), a whole new area of proof will be opened up applicable in the radiation cases as more scientific evidence is collected from experiments as to the causal relationship, in terms of probability, between amount of exposure and incidence of injury.

[966] *Id.* at 821-22.
[967] 29 Ala. App. 306, 197 So. 55 (1940).
[968] *Id.* at 308.

In 1933 the Court of Appeals for the District of Columbia in *Ayers* v. *Hoage*[969] decided a case arising under the Harbor Workers' Compensation Act. The plaintiff claimed that he incurred tuberculosis "arising out of" his employment in a restaurant. The deputy commissioner denied recovery and the court sustained him. While there was no reference to statistical data as such, the court leaned very heavily on the testimony of two doctors, one of whom was an expert in tuberculosis cases, to the effect that tuberculosis could spread in many ways and "that he had not found that tuberculosis was a disease peculiarly common to restaurant workers or to people waiting on tables; on the contrary, he had had only a few cases of people engaged in restaurant work. . . that there is no way of proving definitely where an individual contracts tuberculosis."[970]

The court made no reference to a decision by a California appellate court six years earlier. The California case, *Fidelity & Casualty Co. of New York* v. *Industrial Accident Commission*,[971] was for compensation under the Workmen's Compensation Act for the death of claimant's husband from typhoid fever while on a trip to Chile. On his return by way of Peru, he took sick and died. When they sent the employee into the area, the employers were aware of the unsanitary conditions and the resultant greater incidence of typhoid in both of these countries. In reviewing the compensation awards, the appellate court concluded that it could not say the commission's award was "not reasonably supported."[972] The court held that the commission reasonably could conclude from the evidence that the risk of contracting the disease was enough greater in these other countries that the disease was "proximately caused by the employment." Here the court very clearly was supporting a conclusion that exposure to an increased incidence situation as a result of employment can be used to meet the causation requirement of "arising out of the employment."

Of perhaps greater significance for our purpose is the case of *McAllister* v. *United States*,[973] decided in 1953. Under the Admiralty Act recovery could be had only on proof of negligence. In overruling the $80,000 award of the lower court for the injuries resulting from poliomyelitis, the court of appeals assumed that negligence had been shown in not keeping the Chinese laborers more adequately segregated from

[969] 63 F.2d 364 (D.C. Cir. 1933).
[970] *Id.* at 365.
[971] 84 Cal. App. 506, 258 Pac. 698 (1927).
[972] *Id.* at 510.
[973] 207 F.2d 952 (2d Cir. 1953).

the crew's facilities in the light of the known epidemic of polio among the Chinese workers. Nevertheless, the court reversed, saying:

> . . . [T]he proof here that the libellant contracted polio from the Chinese is far from satisfactory. The incubation period of poliomyelitis is not certain, as the libellant's medical witness admitted. Estimates, as shown by the record, range from a few days to 30 or 35 days. Thus the libellant might have become infected while on shore leave in Shanghai before November 1. Moreover, he might have become infected by flies or by members of the crew who were carriers of the disease. Under these circumstances to hold the respondent liable for injuries suffered by the libellant seems to be wholly speculative as the infection might well have arisen from various causes unrelated to the respondent's action. It is impossible to prove that letting Chinese come on board, assuming that conduct was negligent, was the proximate cause of libellant's disease. Since either of the several inferences was permissible, the party having the burden of proof must lose.[974]

On review by the United States Supreme Court the trial court's judgment was reinstated. The court concluded on the causation question:

> Of course no one can say with certainty that the Chinese were the carriers of the polio virus and that they communicated it to the petitioner. But upon balance of the probabilities it seems a reasonable inference for the District Court to make from the facts proved, supported as they were by the best judgment medical experts have upon the subject today, that petitioner was contaminated by the Chinese who came aboard the ship November 11, 1945, at Shanghai. Certainly we cannot say on review that a judgment which was based upon such evidence is clearly erroneous.[975]

There is one difficulty with using these cases to support the proposition that incidence figures themselves will be sufficient to support a cause-in-fact finding. In each of the cases, in the light of medical knowledge as to the incubation period from the time of exposure to the onset of such diseases as typhoid fever and poliomyelitis, it generally would be accepted that the sickness resulted from an exposure within short period of time before the illness manifested itself. In each case where recovery was allowed on the basis of the existence of an epidemic it would seem that the exposure in a particular place, though not from a particular source, was the cause-in-fact of the illness. The real question was one of proximate cause, a legal conclusion to be reached only if one can say

[974] *Id.* at 954-55.

[975] McAllister v. United States, 348 U.S. 19, 22-23, 75 S.Ct. 6 (1954).

that the fact the employment carried the person into the surroundings meant that the disease arose out of the employment. The cases suggest, of course, that exposure in a situation where there is a significant increase in the incidence of a disease can be considered a proximate cause if the defendant owes some duty to the plaintiff to save him from such exposure. The cases also suggest that it will be, or at least can be, found that a disease that might come from many sources can be considered as coming from the more likely source, *i.e.*, contact with groups in which the incidence of the disease is much higher and therefore the probabilities of catching the disease are considerably greater.

Perhaps even more significant for radiation cases is *Travelers Insurance Co.* v. *Donovan.*[976] The only evidence submitted to prove that plaintiff contracted tuberculosis in the course of employment under the Workmen's Compensation Act was that the incidence of tuberculosis was greater in Kyoto, Japan, where she contracted tuberculosis, than it was in this country, or at least in Washington, D. C., where she had been working before being assigned to Japan. The figures stipulated were that the incidence in Kyoto was five times that in Washington, D. C., being roughly a thousand cases instead of two hundred cases per 100,000 of population. Both the district court and the court of appeals upheld the compensation awarded by the defendant commissioner. Each court cited the statutory presumption that claims come within the provisions of the act and recognized the same result might not be reached under common law rules. In upholding the award the circuit court said:

> The carrier has brought forward no substantial evidence opposed to the presumption, along the lines of which we spoke in Robinson. On the contrary, the agreed statement shows that the risk of contracting tuberculosis in Japan was some five times greater than in the District of Columbia. It is conceivable that the incidence of the disease in both places was so minimal as to require the conclusion that the five-fold ratio was itself *de minimis*. But the carrier offered no proof to that effect, and we certainly cannot derive any such conclusion from our own inspection of the record.[977]

While the burden of proof applied by the courts in a workmen's compensation case may be somewhat different than that used in the usual tort case, it is extremely significant that the court found the award to be supported solely on the basis of the evidence of increased incidence. This case is more significant than the others because it is well known

[976] 125 F. Supp. 261 (D.D.C. 1954), 221 F.2d 886 (D.C. Cir. 1955).
[977] *Id.* at 888-89.

that tuberculosis bacilli can lie dormant in the body for a long period of time and become active under any number of circumstances. The court apparently accepted the increased incidence of tuberculosis in Japan as sufficient evidence that tuberculosis in this particular case arose out of exposure in Japan itself, rather than because of some internal change in the plaintiff causing dormant tuberculosis to flair up, although admittedly the court did not deal specifically with this assumption as such.

A very recent case in which the type of statistical evidence here discussed obviously was used appropriately enough involves injury to sheep from radioactive fallout as a result of bomb tests at the Nevada proving ground. The plaintiff claimed that some of his sheep were injured from the radioactive fallout but the district court denied recovery in *Bulloch* v. *United States*.[978] The court concluded that the expert witnesses for the defendant were some of the "best informed experts in the country," and that their judgment that no radiation damage could possibly have been caused by the fallout was sufficient to deny recovery. It is apparent that the evidence of the government witnesses and their conclusions were based upon scientific tests and statistical data derived from them. The court said:

> Plaintiffs argued that there were differences in the sheep involved in controlled experiments and the Bulloch sheep, and that by reason of these differences a finding that radioactivity was the cause of plaintiff's damage would be possible. But the experts maintained their opinions to the contrary for the most part with these differences in mind. It does not lie with the Court to question the great weight of the testimony that these differences were not determinative, in the absence of at least some evidence that they were. Moreover, if I could entertain a contrary view on this phase of the evidence, I would be confronted with the positive testimony from those best in a position to know that the maximum amount of radioactive fallout in any area in which the sheep could have been, would have caused no damage.[979]

The court indicated that it was odd that none of the other animals or persons in the same camp were injured and also indicated that there was evidence that radioactivity in the area after the test shot was not above normal background radiation levels. Nevertheless, the most important evidence was that of experts, clearly based on empirical data from experiments conducted on similar animals. While the court did

[978] *Supra* note 930.
[979] *Id.* at 827-28.

not discuss the admissibility of such evidence or the validity of the techniques by which the conclusions of the government witnesses were reached, this is one case in which such evidence actually was used by a court for the purpose of proving cause-in-fact or a lack of causal relationship.

The use of this kind of statistical data in determining whether the requirement of "more probable than not" has been satisfied is tremendously significant for the radiation injury case. Many of the types of diseases or injuries which are caused by radiation are also caused by other sources or forces, and the testimony of scientists and experts ordinarily will be to the effect that exposure to a certain amount of radiation, at least for many types of injuries, will increase only the risk that an injury will result. If the risk is increased sufficiently, then it would be scientifically sound to say that the damage that subsequently appears was more probably caused by the radiation than by some other possible explanation. Likewise, in the case of future injuries, and the present prediction of their likelihood, the use of incidence figures based upon the statistical calculations of past experience in similar situations will become tremendously significant if we appreciate the possibilities that follow from acceptance of some of the scientific theories and postulates supported by respected scientists and scholars. These are set out later in the chapter, as are our conclusions as to the significance of such information when combined with the rules of probability and the types of evidence that can be used to prove probability.[980]

(2) Future Injury—Standard of Certainty and Statistical Proof

The prior discussion of the standard of probability and the use of statistical evidence to prove causation perhaps will be brought into sharpest focus by looking at a problem that seems likely to occur very frequently in radiation cases; namely, whether or not to award damages for future injuries not yet manifesting themselves. Here again is an area of tort law in which radiation cases will cause the courts to analyze more carefully a problem which up to now has been simply an incidental one. A detailed study of future injuries is warranted from this standpoint alone, but it is also significant in appraising the inadequacies of our legal principles concerning damages generally in tort cases.

The very fact that many, if not most, of the physical symptoms resulting from overexposure to radiation manifest themselves only after a

[980] *Infra* discussion after note 1061.

period of delay makes the consideration of future injuries perhaps the most important of all. Not only may the effects be delayed but in many situations whether or not an injury actually will arise is a matter of probability, not certainty. With the increased use of statistical data to articulate these probabilities, the legal profession will be forced to analyze more closely the validity of assumptions as to scientific facts and the legal policy decisions based thereon, which may have been made in previous cases where such questions were for the most part only peripheral.

If a person has been irradiated negligently and some form of compensable injury soon follows, there may well be a reasonable probability that other compensable consequences of the same negligent act will become manifest at a later time. In such case the injured party is confronted with the principle which allows but a single recovery for each wrongful act. Except in the case of continuing nuisance and continuing trespass, the common law system typically provides a single lump sum judgment in the accident case. Few, if any, states will allow the plaintiff to "split" his cause of action so as to sue separately for injuries appearing at different times, if occasioned by the same negligent act. All damages, future as well as past, must be taken into account at the time of trial.[981] This principle has been well established and the applicable rules have been worked out with some precision, as will be pointed out below.

A difficult legal dilemma arises, however, when an individual is negligently exposed to radiation and no relatively immediate injury manifests itself, although there exists a reasonable probability that injury will develop in the future. One well might ask why the injured person cannot wait until the injury manifests itself before seeking damages. Certainly this would seem to be the most logical method of disposing of the matter. Unfortunately, however, some of the possible biological effects of irradiation may be considerably delayed, and this period of delay may exceed the period of the statute of limitations on such a cause of action. In addition, the injured person also faces the possibility that the negligent actor, or his estate, may no longer exist when the injury actually manifests itself. The question then is whether or not a negligently exposed person can obtain recovery before the injury becomes tangible, visible, or disabling. Both of the problems suggested, *i.e.*, splitting the cause of action and present proof of future injuries, are concerned with future damages; however, the latter is legally somewhat more perplexing.

[981] Harper & James §25.2.

(a) Future Injury Preceded by Compensable Injury

The primary notion of compensation is that of repairing the plaintiff's injury or of making him as nearly whole as may be done by an award of money; in other words, as nearly as possible placing the plaintiff in the same position he would have enjoyed had the defendant's wrongful act or omission not injured him.[982] Even if the injury exists at present in observable, disabling, and compensable form, its conversion into a pecuniary award is a highly speculative process. Unfortunately, in the absence of legislation, this situation is one which the courts cannot avoid yet it does not follow that they must accept undue speculation with respect to the existence of the injury for which compensation is sought. Under negligence and strict liability rules, whether derived from statutory or common law sources, actual injury is a prerequisite to the plaintiff's right of action.[983] The question then arises as to what is meant by "actual" injury or damage. The term suggests two elements: that the symptoms indicate an existing compensable injury as opposed to an injury yet to manifest itself in compensable form, and that its existence be proved with reasonably certainty. These two elements comprise a part of what has often been referred to misleadingly as the "rule of certainty."

> The certainty rule, in its most important aspect, is a standard requiring a reasonable degree of persuasiveness in the proof *of the fact* and of the amount of the damage. Through its use, the trial judge is enabled to insist that the jury must have factual data—something more than guesswork—to guide them in fixing the award.[984]

While the courts in practice have discarded any notion of absolute certainty if they ever really entertained it, this does not mean that there are no applicable standards. Such a standard is established in what appears to be a leading case in this area, *Strohm* v. *The N. Y., L. E. & W. R. R.*[985] In this case the plaintiff's expert witness, a physician, personally had examined the plaintiff some time subsequent to the injury. During the course of the examination, the physician received from the plaintiff a description of his symptoms following the accident. In response to a hypothetical question embodying the plaintiff's apparent

[982] *Id.* at §25.1.
[983] *Ibid.*
[984] McCormick §26. (Emphasis added.)
[985] 96 N.Y. 305 (1884).

condition and symptoms, this witness stated at the trial that possibly epilepsy, meningitis, or traumatic dementia was indicated for the future. He could not determine which of the three. As to the permanence of the existing injury, the witness stated that it was very likely to be permanent. He elaborated this by saying, "I mean that the boy will always have some remnants of this injury, some reminder of it, great or small, that is certain; how much he will retain I cannot tell, but I think it very likely he will retain." [986]

In reversing the decision and remanding the case the court held that it was error for the trial court to permit the jury, in estimating the damages, to include compensation for the mere hazard of the future injuries to which the expert testified. By way of establishing the rule as to future injury and the rule as to the admissibility of opinion evidence on this matter, the court said:

> Future consequences, which are reasonably to be expected to follow an injury, may be given in evidence for the purpose of enhancing the damages to be awarded. But to entitle such apprehended consequences to be considered by the jury, they must be such as in the ordinary course of nature are reasonably certain to ensue. Consequences which are contingent, speculative, or merely possible, are not proper to be considered in ascertaining the damages. It is not enough that the injuries received may develop into more serious conditions than those which are visible at the time of the injury, nor even that they are likely to develop. To entitle a plaintiff to recover present damages for apprehended future consequences, there must be such a degree of probability of their occurring, as amounts to a *reasonable certainty* that they will result from the original injury.[987]

A few years later, the same court, in *Tozer* v. *N.Y.C. & H.R.R.*,[988] again had occasion to rule on this point. In this case the infant plaintiff was injured in a collision between the defendant's train and a wagon in which the plaintiff was riding. Medical testimony was admitted at the trial over the defendant's objection. This testimony concerned the consequences which might result from the injury, and what results might be expected in the future. The medical witness testified that there was a possibility that some disease of the brain might set in, even after the lapse of a year, and cause the death of the person who had sustained such an injury although he had apparently recovered. Experts also testi-

[986] *Id.* at 306-7.
[987] *Id.* at 306. (Emphasis added.)
[988] 105 N.Y. 617, 11 N.E. 369 (1887).

fied that a person who had sustained such an injury to the brain might, and frequently did, become insane, that there was no limit to the period of time within which such a result might occur, and that cases were recorded where such consequences followed an apparently complete recovery. In reversing a judgment for the plaintiff and granting a new trial, the court said:

> This case falls within our decision in *Strohm* v. *N.Y., L.E. & W.R.R. Co.* . . . The testimony which was received, under exception, as to the ulterior consequences which might ensue or be apprehended from the injuries received by the plaintiff, was quite as objectionable as that for the reception of which the judgment in the case cited was reversed.[989]

The doctrine was further refined, and a distinction was pointed out, in the case of *Griswold* v. *N.Y.C. & H.R.R.*[990] In this case the defendant, relying upon the *Strohm* case, appealed from an order affirming a judgment in favor of the plaintiff. At the trial, the counsel for the plaintiff, after proving an existing injury which the plaintiff suffered from the negligence of the defendant, was allowed to inquire of a medical witness having knowledge of the plaintiff's condition as to the probability of her recovery. Defendant's objection to this kind of evidence was overruled. The judgment in the plaintiff's favor was affirmed.

Adverting to the *Strohm* and *Tozer* cases, and quoting from the case of *Turner* v. *City of Newburgh,*[991] the court stated that these decisions

> ". . . simply preclude the giving of evidence of future consequences which are contingent, speculative and merely possible as the basis of ascertaining damages, . . . [T]hey in nowise conflict with the rule allowing evidence of physicians as to a plaintiff's present condition of bodily suffering or injuries, of their permanence and as to their cause." [992]

The court then pointed out a distinction by stating:

> There is an obvious difference between an opinion as to the permanence of a disease or injury already existing, capable of being examined and studied, and one as to the merely possible outbreak of new diseases or sufferings having their cause in the original injury. In the former case that disease or injury and its symptoms are present and existing, their indications are more or less plain and obvious, and from their severity or slightness a recovery may reasonably be expected or the con-

[989] *Ibid.*
[990] 115 N.Y. 61, 21 N.E. 726 (1889).
[991] 109 N.Y. 301, 309, 16 N.E. 344 (1889).
[992] *Supra* note 990 at 63.

> trary; while an opinion that some new and different complication will arise is merely a double speculation—one that it may possibly occur, and the other that if it does it will be a product of the original injury instead of some other new and, perhaps, unknown cause.[993]

Further clarity, both with respect to the standard of certainty and as to what testimony is admissible, was furnished by the court when it said:

> Medicine is very far from being an exact science. At best its *diagnosis is little more than a guess enlightened by experience.* The chances of recovery in a given case are more or less affected by unknown causes and unexpected contingencies; and the wisest physician can do no more than form an opinion based upon a reasonable probability. . . . [B]ut necessarily the opinion must rest upon a *balance of probabilities,* inclining the medical judgment one way or the other, and the opinion given is none the worse because it expresses, and does not conceal, that it rests upon a reasonable probability strong enough to justify the formation of an opinion.[994]

In *Alberti* v. *N.Y., L.E. & W.R.R.,*[995] a case involving future consequences of an existing injury, medical witnesses were permitted to testify as to their opinion regarding the future consequences of the injury. The witnesses gave their opinion that the plaintiff would never be any better and that he would never be able to straighten his legs. A witness also was asked to state the length of time that the plaintiff might live in the natural and ordinary course of events. He answered that he could give only the probability of this period from the histories of other similar cases. The court held that this testimony was admissible under the rule of the *Strohm* case, so long as he answered in terms of reasonable probability. A judgment for the plaintiff was affirmed. It is not clear from the opinion whether or not the damages contained an element for shortened life span.

In another case in which the facts are not pertinent here and in which the statements are largely dictum but nevertheless useful, the appellate division tried to cast further light upon the doctrine of the *Strohm* case. In *Clegg* v. *Metropolitan St. Ry.* the court said:

> The evidence that was condemned in the Strohm Case as speculative and hypothetical related to the possible development in the plaintiff of diseases which were nonexistent at the

[993] *Id.* at 64.
[994] *Ibid.* (Emphasis added.)
[995] 118 N.Y. 77, 23 N.E. 35 (1889).

> time of the trial. . . . The condemnation of such proof is a very different thing from saying that evidence cannot properly be received as to the probable effects of a present condition. . . . [T]he judgment of medical experts as to the probable consequences of an injury comes within the rule of reasonable certainty.[996]

Finally, in the case of *Cross* v. *City of Syracuse*[997] the court of appeals again tried to clarify the "reasonable certainty" rule of the *Strohm* case, and, in doing so, appears to have given it a somewhat different twist. In this case a physician was asked the following question:

> Assuming Miss Cross had not had any pain in her left side previous to the time of this accident and that on March 2d she was walking north on Butternut Street and stepped into a hole with her left foot and fell on her left side, and that she was black and blue on the left side, her hip, side and shoulder were black and blue, and that since that time she experienced severe pain in that left side, are you able to state with reasonable certainty in the ordinary course of nature, how long those severe pains will continue in her left side?[998]

The question was objected to and the objection was overruled. The further question then was asked: "First answer . . . whether you can answer that with reasonable certainty." The physician answered, "I can hardly answer that question that way; I would say yes, however."

With respect to this question and answer, the defendant's brief on appeal put forth the following proposition to show error in the trial:

> "It is elementary that the proper question in a case of this character to ask a medical expert is, whether he is able to testify with reasonable certainty, upon the subject. If such a question is answered in the negative, the expert should not be permitted to testify further on that subject. If the answer is in the affirmative, he is permitted to testify, if the question is material, proper, based upon the evidence in the case, and is a proper subject of expert testimony."[999]

In affirming the judgment of the trial court for the plaintiff, the court of appeals pointed out that the defendant's proposition was based on a misapprehension which appeared to be quite general in the profession as to what was decided by the court in the *Strohm* case. By way of elaboration of this misapprehension, the court stated:

> The prevalent mistake in regard to that decision [in the *Strohm* case] is the supposition that it forbade the introduc-

[996] 1 App. Div. 207, 210-11, 37 N.Y.S. 130, 132-33 (1896).
[997] 200 N.Y. 393, 94 N.E. 184 (1911).
[998] *Id.* at 395.
[999] *Id.* at 396.

> tion of any opinion evidence as to the probable consequences of an existing condition due to injury unless the opinion could be pronounced with reasonable certainty. The *Strohm* case in fact laid down no such rule. . . . [T]he *Strohm* case applies only to the development of diseased conditions apprehended in the future but not present at the time of the inquiry. There is no intimation in that case that opinion evidence is not properly receivable as to the probable effects or duration of an existing condition. There are many subsequent cases which show that this court did not intend to hold that expert testimony was inadmissible as to the consequences likely to flow from the present condition of an injured person.[1000]

This series of New York cases has been frequently cited and followed by the courts of other states.

In analyzing the position of the New York court it first should be noted that the courts have distinguished, at least for purposes of expert opinion and hypothetical questions, between the future *consequences* of a present injury, existing at the time of trial, and a future *injury* arising out of a present condition but where there is no observable injury of this type at the time of trial. While the distinction is somewhat tenuous (and perhaps scientifically questionable), it would appear that duration and permanency, future likelihood of incapacity, possibility of recovery, and other such effects of an existing injury which are considered to ensue "in the ordinary course of nature," can be shown by opinion and hypothetical testimony of expert witnesses. Furthermore, the *Cross* case indicates that a physician may give opinion testimony or answer hypothetical questions even though the prognosis is not based on a reasonable certainty or probability that the described results will follow. In that case the court definitely ruled that the physician could answer a hypothetical question concerning the future duration of the plaintiff's pains from an existing injury, even though he apparently admitted that he could not do so with reasonable certainty.

On the other hand, future *injury* arising out of a present condition, whether or not that condition is an injury in itself, apparently would embrace those injuries which are different from the original condition or injury and do not exist at the time of the trial. As to such injuries, the rule is that the expert cannot testify at all unless he first can state that the probability of their occurrence is so great as to amount to a reasonable certainty that they will result from the original injury.[1001]

[1000] *Id.* at 396-97.

[1001] See the discussion in Richardson, Evidence §529 (7th ed. 1948).

Although this distinction is exceedingly important for trial purposes, it probably does not alter the fundamental rule of certainty as to damages. That is to say, *in theory,* it does not lighten the plaintiff's burden of proof with respect to that category of injury which has been characterized as being "in the ordinary course of nature," while maintaining it with respect to future, new, and different injuries. It would appear that the court with respect to both types must instruct the jury that they can award damages only for those injuries which they find, from the evidence, are "reasonably certain" to ensue as a consequence of the defendant's wrongful act or omission. The distinction seems to be concerned only with the evidentiary rules of admissibility; where the injury presently exists, the plaintiff is allowed to introduce evidence, in the form of expert opinion and answers to hypothetical questions, based on less than reasonable certainty that the possible consequences of the existing injury will ensue. This does not mean, however, that the jury can award damages, after all of the evidence is in, on less than reasonable certainty that such a consequence will ultimately result.

Why is the distinction observed? There appear to be several reasons why the New York courts make this distinction. The principal reason is implied by language from the *Griswold* case.[1002] There the court refers to the "obvious difference" between an objective and a subjective condition. It points out that the former is observable, while the latter is not. The objective condition is observable by the physician *and the jury* in many cases. These very appearances are additional evidence as to the dimensions of the injury; in theory anyway, the jury has something else to consider in addition to the description and the tentative, yet admissible, prognosis of the physician. This is not the case if the plaintiff claims damages for a future injury not yet manifested. In such case there is usually nothing in the plaintiff's physical condition which permits the jury to observe either the existing or future dimensions of the injury, and there is some question, at least in the mind of the court, as to whether the physician is in any better position to observe them. Thus it would seem that the courts are crediting the jurors with some prognostic abilities regarding objective, external disorders, and their duration or permanence, but they are unwilling to do so with regard to future, different, and unobservable disorders.

Another reason for the distinction is suggested by the language of the *Griswold* case when the court referred to opinion testimony of experts regarding "some new and different complication" as being a "double

[1002] *Supra* note 990.

speculation." In that statement the court expresses its concern with whether the complication will exist in fact in the future *and* with whether it fairly can be attributed to the existing, present condition caused by the defendant's negligent act or omission. With respect to the duration or permanence of an existing injury, there is little or no question of causation, assuming causation has been shown with respect to the injury itself; however, proof of causation with respect to an existing condition does not establish the second causal relationship; *i.e.*, the relationship between an existing condition and a future injury.

The case of *Cogswell* v. *Frazier* [1003] illustrates the attitude of the Maryland court toward inconclusive testimony regarding permanency of an existing injury. In this case the plaintiff had sustained a comminuted fracture of the left tibia and fibula (the two bones of the lower leg. The accident occurred in March of 1943, at which time a physician, who was the only expert called at the trial, operated on the leg. In January of 1944, when the case came to trial, no union of the bones had occurred. The physician stated that further treatment was possible, but that if union did not occur within one or two months (from the date of testifying), it probably would not take place at all. In answer to a question regarding permanency of the injuries, the doctor stated:

> "Since I have stated that the medical case is not finished, you understand, I say that this injury which he has sustained and the marks thereof will be permanent. The scar and the injury to the bone will always be able to be seen. I can't state whether he will go on and heal his bones and be able to walk without his brace at this time. I simply say that his injury is permanent but that the final effects, at this time, are not possible to be stated." [1004]

In affirming a judgment for the plaintiff that awarded damages for permanent injury, the court stated:

> In view of the full testimony which the doctor had previously given as to nature of this particular injury, the questions asked him as to the extent and probable effects of it were natural and and logical ones to follow, and were relevant and admissible under the accepted rules of evidence. The opinions sought of him, and given, were entirely within the professional knowledge which he acquired as the attending physician and as medical expert. . . .
>
> Moreover, his answers to these questions were as clear and as definite as could reasonably have been expected of any

[1003] 183 Md. 654, 39 A.2d 815 (1944).
[1004] *Id.* at 662-3.

> witness, and the jury was entitled to have the benefit of them—especially as this was the only witness called upon to furnish the medical testimony which was an integral part of the case.[1005]

With reference to this case it should be noted that the physician stated with certainty that the scar and bone deformity were permanent, but that he could not state with reasonable certainty whether the injury was permanently crippling.

A somewhat more restrictive rule is illustrated by the case of *Stevenson* v. *Penn. Sports & Enterprises.*[1006] In this case the attending physician testified that at the time of his last examination the plaintiff had a partial disability of twenty per cent. He further testified that the condition of the plaintiff's injured heel was "possibly permanent," although it might gradually improve. The testimony of another medical witness was similarly uncertain as to prognosis. In affirming a reasonable award for the plaintiff, including elements of future damages, the court said:

> The problem here involved is one of prognosis on which a doctor *cannot be required to express his opinion with the same definiteness required in a causation question.* In many cases of personal injury the honest opinion of a doctor may well be that a plaintiff will "gradually improve" or that the injury may "possibly be permanent or may possibly get better within a year." This uncertainty of honest medical opinion should not be the basis for any finding by the jury of *permanent* [Emphasis by court.] injury but is sufficient, on the other hand, for the jury to find some future disability.[1007]

Thus, the equivocal prognosis of an expert with respect to the permanency of an injury is admissible in Pennsylvania, but, by itself, will not support a jury finding of permanency.

Central Truckaway System v. *Harrigan*[1008] indicates that the New York admissibility distinction as to opinion evidence is not followed everywhere, and that such testimony is always admissible in some states even though the opinion relates to a future injury as distinguished from a future consequence of a present injury. In this case the plaintiff was injured in an automobile accident occasioned by the negligence of the defendant. An expert witness was questioned as to the permanency of the injuries and the likelihood that the plaintiff would develop traumatic arthritis in his spinal column. While the court reversed and

[1005] *Id.* at 663.
[1006] 372 Pa. 157, 93 A.2d 236 (1952).
[1007] *Id.* at 165. (Emphasis added.)
[1008] 79 Ga. App. 117, 53 S.E.2d 186 (1949).

remanded a judgment in the plaintiff's favor on other grounds, in response to the defendant's contention that the evidence or opinion concerning permanency and future injury should not have been admitted, it said:

> The testimony appears to be the professional opinion of the doctor. It is therefore not subject to the objection that it constitutes speculation on his part rather than a statement of his professional opinion. The doctor in the instant case had attended this plaintiff and was in position to be thoroughly familiar with his injuries. He was competent to give his opinion as to their permanency. A part of this opinion appears to have been based on the likelihood of the development of traumatic arthritis in some of the cervical vertebrae of the plaintiff. The evidence was admissible for this purpose. . . . "The opinion of experts, *on any question of science,* skill, trade, or like questions shall *always* be admissible; and such opinions may be given on the facts as proved by other witnesses." The weight and credit to be given the testimony of such experts is for the jury.[1009]

Wigmore takes a rather strong stand on the question of opinion testimony of physicians. As he points out, testimony as to the condition of health concerns the "internal actuality," as distinguished from external, corporeal appearances. This distinction, he has stated, is important for it affects the qualifications of the witness who will usually be required to be a medical expert.[1010] In discussing the opinion rule with respect to questions of probability and possibility, capacity and tendency, cause and effect, he further states:

> . . . [T]he reason why the Opinion rule is urged against them is in general that the thing to which the witness testifies is not anything which he has observed, but is a quantity which lies in estimate only and is the result of a balancing of concrete data.
>
> This is no sufficient reason for excluding such statements from qualified witnesses; because it must almost always be impossible for a witness to reproduce in words absolutely all the detailed data which enter into his estimate, and there can be no danger in receiving such an estimate from him. . . .
>
> It should be added that Courts sometimes misapply the Opinion rule to enforce the doctrine of Torts that a recovery for future *personal injuries* must include only the certain or fairly *probable,* but not the merely *possible,* consequences; so

[1009] *Id.* at 127. (Emphasis added.)

[1010] Wigmore, Evidence §1975 (3d ed. 1940).

> that the judge instead of covering the subject by an instruction to the jury as to the measure of recovery, excludes from evidence a physician's opinion expressed in terms of possibility only. This attempt to control the course of expert testimony is of course unreasonable in itself.[1011]

Judging by the above statement, it would seem that Wigmore certainly would approve of the court's attitude in the *Central Truckaway* case,[1012] and that he would disapprove of the distinction reached in the New York decisions. Is his criticism justified? Is this attempt to control the course of expert testimony really unreasonable?

Several factors combine here to make this control by the courts entirely reasonable *under our present system of compensation.* Everyone would agree that no person should be compelled to pay compensation when his act or omission has not or will not produce injury, even though that act or omission *could* have produced injury. While it is somewhat risky to speak in terms of universals, it does not seem too much to state that the burden of showing a compensable injury is always on the person claiming to be injured. There is no doctrine, analogous to that of *res ipsa loquitur* which raises a presumption of physical or psychological injury or shifts the burden as to this issue. Accepting this as the standard attitude and considering the sympathetic attitude of juries toward plaintiffs generally, when opposed by large corporations in general and insurance companies in particular, as well as the extreme complexity of the medical features, it certainly does not seem unreasonable to require experts to preface their prognostic opinions with the statement that they are based upon the same standard of reasonable certainty or probability as is required of the plaintiff, unless it is made clear that the award should be reduced as the degree of probability becomes smaller. In most cases of future injury this expression of opinion is the only evidence as to the occurrence of the injury which the jury has to assist them. The danger that they will accept the ominous, though remote, prophecies of the plaintiff's experts as sufficient is too great to justify such inconclusive testimony. Even assuming that neither the trial nor the appellate courts will allow the jury to find future injury upon the assertion that it is merely possible, such testimony is a waste of time. What is needed here is some clarification on the part of the courts (or possibly by legislatures) as to what is meant by reasonable certainty or probability. This would serve for the edification of both

[1011] *Id.* at §1976.

[1012] *Supra* note 1008.

the expert and the jury, and it should not be a liberalized rule of evidence that would allow the expert to discuss every remote contingency, *unless we change our rules of compensation.*

One other justification can be given for the New York distinction concerning the degree of certainty required to make expert opinion testimony admissible. This admissibility rule reflects a recognized modification of the general rule of certainty. This modifying doctrine is illustrated by a part of the opinion in *Story Parchment Co.* v. *Paterson Parchment Paper Co.*

> It is true that there was uncertainty as to the extent of the damage, but there was none as to the fact of damage, . . . and there is a clear distinction between the measure of proof necessary to establish the fact that petitioner had sustained some damage, and the measure of proof necessary to enable the jury to fix the amount.[1013]

While this case involved a Sherman Anti-Trust Act cause of action, it still is generally applicable throughout both the tort and the contract areas of law.[1014] It does not seem unreasonable to require the plaintiff to show either the present existence or the likelihood of future existence of the injury with substantial certainty; however, having proved this fact and that the injury was caused by the wrongful act or omission of the defendant, and recognizing the inherent lack of precision in determining the dimensions of the injury and converting them into a money value, it may not be unreasonable to allow the plaintiff to offer, and the jury to consider, the *best* evidence available as to the *extent* of the injuries. This does not solve the problem where there is conflict between witnesses as to the degree of certainty.

The case of *Cordiner* v. *Los Angeles Traction Co.*[1015] offers a good illustration of an intelligent discrimination between the fact of future injury and its extent. The plaintiff was injured in a collision between the streetcars of the defendant street railway companies. On appeal the defendants conceded the plaintiff's right to recover, but contended that the amount of recovery should be limited to loss that the plaintiff was "reasonably certain" to sustain. Pursuant to this attack, the defendants pointed specifically to the testimony of certain experts who were allowed to testify as to the future results of the plaintiff's injury.

The evidence showed that as a result of the collision the plaintiff had

[1013] 282 U.S. 555, 562, 51 S.Ct. 248 (1930), quoted by McCormick §27, p. 102.
[1014] Harper & James §25.3, n. 15.
[1015] 5 Cal. App. 400, 91 Pac. 436 (1907).

suffered a fracture at the base of the brain. A Dr. Dukeman, in response to a question as to whether there would be any danger of a relapse at any time in the future, stated:

> "There is some danger . . . . [he further elaborated by saying] I should look for more serious and fatal results from a fracture at the base of the brain than at any other place. I should look for this after apparent recovery, apparent recovery so far as anybody can tell; I would always look for something. . . . In the *majority* of cases I would look for future trouble. I can't tell what will happen in this case. My experience and knowledge as a physician has taught me that in a *majority* of cases of this kind, where there has been, to even the eye of a doctor, a complete recovery, . . . various symptoms, would happen. I should look for convulsions in the majority of cases of that kind where there had been a complete recovery, to the eye even of a doctor." [1016]

Another expert, Dr. Brainard, also in response to a question concerning the condition of the plaintiff after an apparent recovery, answered, " '[A]nd we might expect from the injury the symptoms that rise *frequently* from a case of suffering from a fracture at the base of the brain. There is danger of convulsions or epilepsy, danger of mental deterioration, danger of paralysis.' " [1017]

With respect to this evidence, and in affirming the judgment of the lower court for the plaintiff, which contained elements of future damages, the court said:

> The evidence here tended, in an appreciable degree, to prove the ultimate fact; that is, the reasonable certainty that future evil consequences would result from the injury, and was properly admitted for the consideration of the jury—it being its function, upon a consideration of the evidence as a whole, to determine its sufficiency as proof of the ultimate fact. . . . Testimony of duly qualified experts which shows that in a *majority* of cases where the injury . . . results in future epilepsy, paralysis, or mental deterioration, tends to prove the reasonable certainty that such consequences will follow in any given case of like injury.[1018]

Observe that Dr. Dukeman's testimony concerned three facts: (1) the present existence of a potentially injurious condition in the plaintiff's brain, (2) the future probability that injurious consequences

[1016] *Id.* at 403. (Emphasis added.)
[1017] *Ibid.* (Emphasis added.)
[1018] *Id.* at 404-5. (Emphasis added.)

would follow (based on the "statistics" of similar injuries), and (3) the type of injury which could be occasioned by such a condition. As to the first two facts, the doctor's certainty was expressed with as much precision as is generally possible. He was certain of the present existence of a potentially injurious condition, even though there had been an apparent recovery, and he stated that "in a majority of cases of this kind" injurious consequences would follow. Notice that neither doctor could predict with any kind of certainty, however, the precise character or type of future injury which would follow. As to the future existence of injurious consequences the experts were reasonably certain; but, as to the type and extent of the injury, they were not certain. The opinions as to all three facts were admissible, and were sufficient to support an award for future damages. It is submitted that, in many situations, a physician will be able to predict future injury generally, but will not be able to identify and name the precise result. As will be shown, this is particularly true in radiation exposure cases. Assuming that the plaintiff should be able to collect now for future injury (a different system really should be worked out),[1019] there does not appear to be any logical reason why he should be prevented from recovering by the lack of a name for the ultimate injury. Injury, and the science which is concerned with it, is not tied to nomenclature, and insofar as is possible, the law should be equally unrestricted.

While the above attitude illustrates a commendable one on the part of the California courts, their more recent decisions indicate that they are carrying this lenient attitude as to the admissibility of expert opinion to rather extreme lengths with regard to future, new, and different injuries. Often it seems that the courts now believe that a jury has substantial prognostic faculties of its own and needs no expert opinion as to "certainty" of future, new, and different injuries. *Any* expert opinions on such injuries are admissible, so it would appear. In *Riggs* v. *Gasser Motors* the plaintiff had suffered a severe concussion of the brain. With respect to future injury, an expert witness was allowed to state:

> My opinion of the outcome of the injury is this—it is very *likely* that in the end the result will be *some permanent* damage. It is very *frequent* [Emphasis added.] that we even find epilepsy, traumatic epilepsy, as we call it, following a severe brain injury. If the fracture of the skull is severe enough—if the injury is severe enough—*we might get that as a result, but nobody knows,* except for time, and time will only tell what

[1019] *Infra* recommendations discussion following note 1123.

> will come here. *No doctor could say with reasonable certainty* [Emphasis added.] that the results I have described would not follow.[1020]

On appeal from a $20,000 judgment in plaintiff's favor, the defendant claimed that the award was excessive, and that the testimony as to the brain injury was too speculative. Notice that the physician did not say that epilepsy was reasonably certain, but rather, that no doctor would say with reasonable certainty that it would not occur. The court affirmed the judgment, saying, "That question we think is as much within the judgment of the jury as within the province of any court, and unless we can say, with reasonable certainty, that such injuries *will not affect* the future of the plaintiff, we are at a loss to say that the damages awarded are the result of either passion or prejudice." [1021] This begins to look as if the burden of proof as to the possibility of future injury can be shifted to the defendant in California.

In *Bauman* v. *San Francisco* [1022] the defendant city appealed from a judgment in favor of the plaintiff and from an order granting plaintiff's motion for a new trial upon the issue of damages alone. At the trial a physician, who had operated on the plaintiff following the injury, was asked to give his prognosis. He stated that, "The prognosis in this case is good, providing the particular patient does not develop epileptic seizures." When asked if such result was "probable," the trial judge ruled that the doctor could not answer unless he would state that epileptic seizures were "reasonably certain" to occur. The doctor stated that he could not state whether or not this patient was "reasonably certain" to have such seizures and added that, "I would not say it was reasonably certain." The court then ruled that his testimony be stricken from the record.

In affirming the order granting the plaintiff's motion for a new trial on the issue of damages, the court said, with respect to the stricken testimony:

> The law does not require a doctor to state that future results are "reasonably certain" to occur before his testimony is admissible. Before the jury may allow a recovery for future consequences the evidence must show with reasonable certainty that such consequences will follow, and the jury should be so instructed. The testimony referred to above would not, standing alone, support an award for damages for future

[1020] 22 Cal. App.2d 636, 643, 72 P.2d 172 (1937).
[1021] *Id.* at 645 (Emphasis added.)
[1022] 42 Cal. App.2d 144, 108 P.2d 989 (1940).

> consequences. But that does not mean that such evidence was not admissible. The ultimate fact to be determined by the jury is whether it is reasonably certain that future evil consequences will flow from the injury. Any evidence reasonably tending in an appreciable degree to prove that fact is admissible. Its sufficiency to prove that fact is largely for the jury.[1023]

What other evidence is there as to the incidence of future injury besides the prognosis of experts, at least where there is no conflict between the experts? The California courts do not indicate how the jury can find a result to be reasonably certain to follow when the physicians themselves are only willing to say that it is possible, unless this is implied in the following statement, quoted from the *Cordiner* case:

> Testimony of duly qualified experts which shows that in a *majority* of cases where the injury consists of a fracture at the base of the brain, such injury results in future epilepsy, paralysis, or mental deterioration, tends to prove the reasonable certainty that such consequences will follow in any given case of like injury.[1024]

By this the court may be recognizing a distinction between what a physician is willing to state will occur with reasonable certainty and what the professional statistics disclose has actually happened in a majority of cases of similar injuries. If in a majority of cases epilepsy, paralysis, or mental deterioration has followed fractures at the base of the brain, then perhaps the jury is justified in finding such results reasonably certain to occur in the particular case, even though the attending physician is unwilling to so state with respect to the particular patient. This may be a semantic difficulty in equating legal and scientific degrees of certainty. The doctor might have answered affirmatively if asked if it were more probable than not that injury would result.

An interesting device is used in the *Cordiner* case, and in three others considered below, which may become highly significant with respect to radiation injuries, especially since it seems to enable the plaintiff to partially avoid the restrictive attitude of many of the courts toward contingent and speculative evidence. This is the technique of emphasizing and seeking recovery for a present condition which, although it is not presently incapacitating or otherwise injurious, was caused by the defendant's wrongful act or omission and has the predictable, potential effect of making the plaintiff substantially more susceptible to

[1023] *Id.* at 163.

[1024] *Supra* note 1015 at 404-5. (Emphasis added.)

particular or general injuries in the future. While in the *Cordiner* case the emphasis was on the future consequences themselves, in the testimony of Dr. Dukeman there was an unmistakable allusion to a present condition, a dangerous, yet unknown pathological condition, which remained "in the majority of cases" even after an apparent recovery. The question is, will the courts regard this condition in itself a compensable, presently existing injury when it has been wrongfully inflicted?

Crank v. *Forty-Second St., M.H. & St. N.A. Ry.*[1025] appears to indicate that the technique may be successful. In this case the plaintiff was injured while riding upon the defendant's streetcar. The nature of the injuries was not specified. On appeal the defendant conceded the proof of causation and negligence, but claimed that the award was excessive, charging error in the trial judge's instruction to the jury to the effect that, upon the subject of the permanency of the injuries, they might take into consideration the plaintiff's increased general susceptibility to disease. There was evidence that the plaintiff required medical attention for a considerable period of time and that the injury was permanent and would affect her during the remainder of her life. A physician testified that *if* she was sick from other causes, the result of this injury always would complicate other illnesses. The court stated that this evidence furnished grounds for the consideration by the jury of the results of the injury and affirmed for the plaintiff. The standard imposed was that of "reasonable certainty that they [the results] will be permanent." In concluding, the court pointed out that:

> It is true, it may be, that the plaintiff will never suffer from any other illness; but where the injury is of such a character as renders her less able to contend against the ordinary ills which flesh is heir to it does not seem to be at all speculative to allow the jury to take such a state of affairs into consideration in making compensation to the plaintiff for the injuries suffered.[1026]

The court seemed to be entirely unconcerned with whether the plaintiff would ever actually suffer from this existing condition. The condition in itself did not incapacitate her, at least in the sense for which recovery was allowed, and the plaintiff was not required to show with reasonable certainty or probability that she would be in such position in the future as to make the condition actually harmful.[1027]

[1025] 6 N.Y.S. 229 (1889), *aff'd without opinion*, 127 N.Y. 648, 27 N.E. 856 (1891).
[1026] *Id.* at 230.
[1027] See discussion *supra* at notes 452 ff.

The case of *Coover* v. *Painless Parker, Dentist,* discussed previously,[1028] warrants further consideration here. This was an action for damages for personal injuries sustained by the plaintiff as a result of overexposure in the taking of dental X-ray photographs by the defendant. The defendant appealed from a verdict in the plaintiff's favor for $10,250 on the ground that the amount, in view of the injuries sustained, was excessive. Specifically, the defendant argued that the evidence as to the possibility of cancer was wholly conjectural and uncertain and that that element rightfully could not be considered by the jury. After quoting from the record the testimony concerning the plaintiff's present condition and describing her skin, the court set forth the following portion of the record:

> "A. . . . The light (x-ray) has destroyed these hair follicles —you have a skin that is not functioning and our *medical literature* is full of cases of cancer—carcinoma that have developed upon a senile skin following an X-ray burn.
>
> "Q. You give your professional opinion to the effect that Mrs. Coover at this time might be in danger of a cancerous growth? A. I do not say that she has a cancerous growth, she has not, but a cancer *may* develop on this area—it is common."
>
> * * * * *
>
> "A. . . . That [the scars on plaintiff's face] will be permanent, and there *may possibly* be some further changes in the skin. On this senile skin not infrequently develops new growths, little neoplasm, warty growths, and from these warty growths, the carcinoma develops; sometimes that is a year, sometimes it is two years—sometimes it is three or four years before they develop."
>
> [The physician also testified that over the area affected the plaintiff had a skin that is predisposed to cancer, that she had some disturbance of the sensory nerves of her face.]
>
> "Q. In the event the sensory nerves have been destroyed, in this portion of the face that is burned or impaired, what would be the natural consequence of such a condition, in other words, what effect would that have on Mrs. Coover? A. The most important sequela from a dermatological standpoint is the *possibility* of carcinoma—of a cancer."
>
> "Q. It may happen that she can go on through life without that occurring, I suppose? A. It is possible, but we do find many times, carcinoma developing upon the scars of X-ray burns, in all of our literature they speak of that as very, very likely sequela, it is the thing to be guarded against and to be watched." [1029]

[1028] *Supra* note 452.

[1029] Coover v. Painless Parker, Dentist, *supra* note 452 at 113-14. (Emphasis added)

The trial court instructed the jury that they were to consider as elements of damage only such physical injury as they found the plaintiff was reasonably certain to suffer in the near future. In affirming the judgment for the plaintiff the court said:

> If we assume that respondent's skin condition was considered by the jury it by no means follows that this was improper. While the actual condition of cancer may have been conjectural and uncertain, the record contains positive evidence that a condition actually exists which makes this dread disease much more likely. We think *this predisposition in itself is some damage,* and when caused by the wrongful act of another it is an interference with the normal and natural conditions and rights of the other, which must be held to be a real and not a fanciful element of damage. The necessity of constantly watching and guarding against cancer, as testified to by the physician, is an obligation and a burden that the defendant had no right to inflict upon the plaintiff.[1030]

In *Leenders* v. *California Hawaiian Sugar Refining Corp.*[1031] the plaintiff's eye had been injured as a result of the defendant's negligence. A physician testified that the tear duct did not carry off the water from the plaintiff's eye, and that such a condition would result in an abnormal accumulation of bacteria and that, in the event of the eye being scratched in the future, the presence of these germs *might* cause an infection or an ulcer which *could* impair the patient to a great extent or even result in the loss of the eyeball. On appeal the defendant attacked this testimony as speculative. In affirming the lower court's judgment for the plaintiff, the court said:

> The fact that plaintiff had been physically impaired so as to increase the possibility of future infection in the eye was a proper matter to be considered by the jury in determining the extent of his present and permanent injury. The jury could not properly award him damages on such evidence on the theory that such infection with its attendant results was reasonably certain to occur. It could take into consideration the actual impairment of his eye which permanently decreased his resistance to infection with all the results that *might* be attendant thereon. The size of the verdict does not indicate that the jury awarded damages on the theory that it regarded the future impairment of plaintiff's eyesight or the loss of his eyeball as reasonably certain.[1032]

The opinion did not disclose the size of the judgment.

[1030] *Id.* at 115. (Emphasis added.)
[1031] 59 Cal. App.2d 752, 139 P.2d 987 (1943).
[1032] *Id.* at 759. (Emphasis added.)

The ramifications of these cases have great significance for radiation exposure claims. It is accepted that when a person is irradiated, there is definite "impact," whether by matter or energy is immaterial. The probability of collision between the cell matter of his body and the alpha or beta particles, neutrons, or the gamma ray photons is so great as to be almost 100% certain. If there are collisions, it must necessarily follow that some change in the body cells has taken place, some increment of ionization. Scientists, and certainly geneticists, inform us that the effects of these changes on healthy cells are nearly always deleterious and permanent. In the words of the geneticists: "Any radiation is genetically undesirable, since any radiation induces harmful mutations." [1033] Furthermore, there is substantial opinion among scientists that any amount of radiation is pathologically undesirable.[1034] It is not surprising that the court in the *Coover* case was impressed and persuaded by such an argument, that they found this a condition and a "burden that the defendant had no right to inflict upon the plaintiff." [1035]

The most startling feature of the doctrine in radiation cases is that if the plaintiff can prove the existing, irradiated condition with reasonable certainty—and he should not have too much difficulty in this connection—the probabilities of some existing effect are overwhelming, and if this condition in itself is "some damage," then both the possibility of future injurious results and the character of those results go to the amount or extent of the injury. Under the New York admissibility rule, opinions of experts on these latter facts can be stated with less than reasonable certainty. In fact, this is what happened in each of these cases. In none of them did the experts predict, with reasonable certainty, that the actual, incapacitating results would follow from the existing condition.

Consider, also, the impact of this doctrine on claims for psychological injury. The existing condition theory can be highly advantageous to a plaintiff alleging such injuries, for it gives him real, objective justification upon which to predicate his neurosis—his apprehensive suffering with regard to an untimely and painful demise. There is at least an implication in the *Coover* case that the injury for which the court allowed recovery had such a subjective element. The court said, "The necessity of constantly watching and guarding against cancer . . . is an obligation and a burden that the defendant had no right to inflict upon the plaintiff." [1036]

[1033] *Infra* notes 1072-79.

[1034] Pollard, "Fall-Out Fever," 200 Atlantic Monthly 27-32 (1957).

[1035] *Supra* note 452 at 115.

[1036] *Ibid.*

One further observation should be noted. In both the *Coover* and *Leenders* cases, the courts do not treat the "predisposition" or existing condition and the ultimate, future injury as the same thing. The court, in the *Coover* case, refers to the predisposition, for which recovery is allowed, as "some damage." Apparently, in theory at least, the measure of recovery for the predisposition would not be the same as it would be were the cancer fully developed. If the courts are willing to regard the predisposition as a compensable injury in itself, however, and if they allow opinion testimony of the *possible* consequences of the condition, it is not unreasonable to expect that the jury will award damages on the basis of the gloomiest and most pessimistic prognosis. It is one thing to distinguish between the two with respect to the question of existence and quite another for the jury to distinguish between them when considering the monetary dimensions of the injury.

(b) Future Injury Not Preceded by Compensable Injury

Thus far the cases have been concerned with the future consequences of existing injuries which may follow a past or existing compensable injury—past or existing as of the date the cause of action is brought. But what of future injuries which are not preceded by any compensable injury or incapacitating condition that has been reasonably contemporaneous with the negligent act or omission? Briefly stated, the plaintiff in such a case, due to the negligent act or omission of the defendant, will suffer injury at a future date. The first question is, When does the cause of action accrue? The second question is, Assuming that the cause of action accrues at the date of the negligent act or omission (if it does arise at this time the statute of limitations, except possibly for a recent Arkansas enactment, will preclude recovery for many injuries),[1037] how does the plaintiff prove the future injury for purposes of obtaining damages?

Cases concerning this question are very difficult to find. In most instances injuries to persons have been more or less immediately observable. There is usually little time interval between impact and initial

[1037] La Porte v. U. S. Radium Corp., 13 F. Supp. 263 (D.C. N.J. 1935). Injuries may be delayed as much as 35 years; see report in N.Y. Times, May 27, 1958, p. 21, col. 4. The Arkansas enactment, described *infra* note 1371, might be interpreted to permit tolling the statutory period on the theory that it is not known whether the potential defendant is a wrongdoer until the victim's symptoms appear in the future. This would be an unfortunate application when no provisions are made for the problems raised by long-delayed injuries.

effect. While there have been numerous instances in which plaintiffs have anticipated future injuries and claimed damages for them, this practically always has been in connection with allegations of and claims for existing injuries.[1038] A situation in which a person will not suffer recognizable and compensable injury for a considerable period after the negligent act or omission which is its cause, and in which there is no interim indication of the condition, has been comparatively rare in the pre-atomic era. Even where such a situation is possible, the fact that the person who will ultimately suffer injury is not sufficiently aware of his condition means that he will not bring suit against the person responsible. No cases involving this exact situation have been found. Inasmuch as the cases offer so very little direct light on this question, attention should be focused on the cases where, by reason of a statute of limitations, the principal question has been whether the plaintiff has been too late in bringing his action. Even these cases shed little light upon when the plaintiff *could* have brought the action.

Schmidt v. *Merchants Despatch Transp. Co.*[1039] is one case in which the court gave particular consideration to when the plaintiff could have brought his action. In this case the complaint alleged that, while in the employ of the defendant, the plaintiff inhaled foreign substances in the form of dust, and, as a result, contracted a disease of the lungs known as pneumoconiosis, or silicosis. In separate and distinct causes of action the complaint alleged first that the plaintiff's exposure constituted a breach of a common law duty which the employer owed to the employee, and, second, that there was a breach of a similar duty imposed by statute. The periods of limitation with respect to the breach of these duties were three and six years respectively. The plaintiff brought suit shortly after he became incapacitated and his affliction was identified as silicosis. This time was more than three years after the last exposure to the dust but less than six years. The New York Civil Practice Act, §49, required that "An action to recover damages for a personal injury resulting from negligence" must be commenced within three years after *the cause of action has accrued.* The defendant maintained that the duty owed to the plaintiff was negligently breached, that the plaintiff had only a single cause of action for damages for such personal injury, and that, therefore, the action was barred by the three-year statute of limitations. The plaintiff claimed that his cause of action

[1038] See cases discussed under increased susceptibility to disease, *supra* text at notes 441 ff.

[1039] 270 N.Y. 287, 200 N.E. 824 (1936).

accrued, not at the time he inhaled the dust, but at the time when the dust, so inhaled, resulted in a disease of the lungs.

With respect to these contentions, the court conceded that a cause of action accrues only when the forces wrongfully put in motion produce injury, but, by way of explanation, it pointed out that this does not mean that the cause of action accrues only when the injured person knows or should know that the injury has occurred. In answer to the question as to when the injury has occurred, the court said:

> The injury occurs when there is a wrongful invasion of personal or property rights and then the cause of action accrues. Except in cases of fraud where the statute expressly provides otherwise, the statutory period of limitations begins to run from the time when liability for wrong has arisen even though the injured party may be ignorant of the existence of the wrong or injury.[1040]

In the following statement the court indicated that the magnitude of the injury at its inception has no bearing on when it occurred:

> Consequential damages may flow later from an injury too slight to be noticed at the time it is inflicted. No new cause of action accrues when such consequential damages arise.[1041]

Applying these rules to the case before the court, Justice Lehman said:

> The injury to the plaintiff was complete when the alleged negligence of the defendant caused the plaintiff to inhale the deleterious dust. For that injury, including all resulting damages the defendant was then liable. The disease of the lungs was a consequence of that injury. Its result might be delayed or, perhaps, even by good fortune averted; nevertheless, the disease resulted naturally, if not inevitably, from a condition created in the plaintiff's body through the defendant's alleged wrong.[1042]

With respect to the question as to when the plaintiff could have brought his action and what damages he could have collected, the court went on to state:

> It cannot be doubted that the plaintiff might have begun an action against the defendant immediately after he inhaled the dust which caused the disease. No successful challenge could have been interposed on the ground that the action was pre-

[1040] *Id.* at 300.
[1041] *Ibid.*
[1042] *Id.* at 301.

> maturely brought because at the time it was commenced no serious damage to the plaintiff had yet developed. In that action the plaintiff could recover all damages which he could show had resulted or would result therefrom.[1043]

The court concluded that any cause of action of the plaintiff which must be commenced within three years after it accrued was barred for the above reasons. Nevertheless, it went on to impose liability on the defendant by finding that he had failed to provide the safeguards required by statute, that the statutory duty was imposed upon employers for the benefit of that group of persons of which the plaintiff was a member, and that the statute of limitations upon recovery for injuries arising out of the breach of such a statutory duty was six years.

Whether the court actually would allow recovery before the disease or injury has manifested itself in some form is not made clear, but it does appear that the ruling of the court in the *Schmidt* case, with respect to when the period of limitation begins to run, represents the majority rule in negligence actions.[1044] If the period of limitation has begun to run it is because a cause of action has accrued. Therefore, the *Schmidt* holding implies that damages for future consequences should be recoverable if proper proof is made. One writer takes rather strong exception to this majority rule. He states that "by no system of law giving weight to practical considerations could a cause of action accrue in respect of any mere act or neglect exposing one to disease, prior to the time when, if at all, a disease actually results—save for special circumstances, as of fright or apprehension." [1045]

Several courts have evolved a theory, however, whereby the continuing negligence is regarded as a single wrong against which the limitation period commences to run, only from the time of cessation of the wrong, or cessation of the inhalation of the dust, gas, or fumes or exposure to deleterious substances. In instances of disease contracted by employees outside of the workmen's compensation laws, some courts have established that the limitation period runs from the termination of the employment.[1046]

The United States Supreme Court in *Urie* v. *Thompson* [1047] did not follow the majority view. In this case the plaintiff, a former fireman on defendant's steam locomotive, filed suit in a Missouri court under the Federal Employers' Liability Act to recover for injuries. He al-

[1043] *Ibid.*

[1044] See cases collected in Annot., 11 A.L.R.2d 277, 283-89 (1950).

[1045] *Id.* at 279.

[1046] *Id.* at 289-95.

[1047] 337 U.S. 163, 69 S.Ct. 1018 (1949).

leged that after thirty years of service he had been forced to cease work because of silicosis occasioned by continuous inhalation of silica dust which arose from sand emitted in excessive amounts by the locomotives' poorly adjusted sanding apparatus. Urie filed suit on November 25, 1941. Under the terms of the then prevailing three-year statute of limitations, the court could not entertain the claim if Urie's cause of action accrued before November 25, 1938. Urie became too ill to work in May of 1940, and his condition was diagnosed as silicosis a week or so later. The defendant contended that Urie, having been exposed to silica dust since approximately 1910, unwittingly must have contracted silicosis before 1938, and hence that his cause of action accrued more than three years before the action was brought. Alternatively, the defendant also argued that each inhalation of silica dust was a separate tort giving rise to a fresh cause of action, and that Urie, therefore, was limited to a claim for inhalations after November 25, 1938.

The court, in ruling in the plaintiff's favor, rejected "such mechanical analysis of the 'accrual' of the petitioner's injury—whether breath by breath, or at one unrecorded moment in the progress of the disease," [1048] stating that it would only serve to thwart the congressional purpose under the Federal Employers' Liability Act. While the court simply could have ruled that the limitation period commenced to run on the date of termination of employment, as has been done in a number of of cases between employer and employee, it said that since the record contained no suggestion that Urie should have known he had silicosis earlier than May of 1940:

> . . . "It follows that no specific date of contact with the substance can be charged with being the date of injury, inasmuch as the injurious consequences of the exposure are the product of a period of time rather than a point of time; consequently the afflicted employeee can be held to be 'injured' only when the accumulated effects of the deleterious substance manifest themselves." [1049]

The statement is itself a quotation from the case of *Associated Indem. Corp.* v. *Industrial Accident Commission.*[1050]

One other case dealing with silicosis should be noted. In *Henson* v. *Dept. of Labor & Industries* the court, quoting from Reed & Emerson, The Relation Between Injury and Disease, at 183, stated:

> "Silica dust inflicts injury to the lungs, not because of the physical properties of the individual particles, as the hard,

[1048] *Id.* at 169.
[1049] *Id.* at 170.
[1050] 124 Cal. App. 378, 381, 12 P.2d 1075 (1932).

> sharp particles of quartz and carborundum; but its danger lies purely in its poisonous chemical action. Because of this, it causes tiny areas of necrosis in the walls of the lymph spaces of the alveoli in which it is deposited, at which necrotic points, by ways of healing, there develops fibrosis and a proliferation of the surrounding epithelial cells, the latter explaining the nodule formation.
>
> "Silicosis is a progressive disease, the lung changes continuing to develop for one or two years after complete removal of the individual from the silica hazard, this advance probably due to the continued chemical action of the silica stored in the lung tissues." [1051]

This court also pointed out that:

> It is evident, as shown by the authority just quoted, that, in most if not all cases, the symptoms of the disease do not manifest themselves until after a long period of exposure to silica dust and that an individual may not become aware of any disability until long after he has ceased work.[1052]

From this it would appear that silicosis is one of the types of injury most closely analogous to those frequently caused by irradiation.

Aside from the fact that in the *Urie* case the plaintiff was bringing an action under the Federal Employers' Liability Act, which the Supreme Court has often construed at least "liberally," [1053] the principal distinction between this and the *Schmidt* case appears to be the manner in which the two courts look at the injury. Notice that in both cases the courts were concerned with "injury" and not with "disability," and that both courts were concerned with when the injury occurred, for this is when the cause of action is said to accrue and when the limitation period commences to run. In the *Schmidt* case the New York court takes a very mechanical position; the injury occurs when there is an "invasion" of the plaintiff's body by the substances whose chemical activities cause the fibrosis and epithelial cell proliferation which constitute the disease itself. As in the *Crank* [1054] and *Coover* [1055] cases, discussed in the foregoing section, the incipient or initial condition caused by the defendant's wrongful act is the "injury," and the silicosis itself is regarded as "consequential damages" for which "no new cause of action accrues." Medically speaking, this view of the New York and the Cali-

[1051] 15 Wash.2d 384, 386-87, 130 P.2d 885 (1942).
[1052] *Id.* at 387.
[1053] See Neese v. Southern Ry., 350 U.S. 77, 76 S.Ct. 131 (1955).
[1054] *Supra* note 1025.
[1055] *Supra* note 1028.

fornia courts probably is the correct one. The initial "invasion" or "impact"—the inhalation of the deleterious dust or exposure to radiation —constitutes the injury, and all conditions and consequences which follow naturally therefrom, irrespective of what additional causes may concur, are simply new increments of the initial injury. In essence, the situation is really no different from that in the cases discussed in the previous section. For example, in the *Cordiner* case [1056] the plaintiff had made an apparent recovery at the time of trial; in so far as the present was concerned he probably had merely a potentially dangerous condition, which, at the time was not incapacitating. The only difference between this situation and that of Schmidt before he developed silicosis, is that Cordiner had suffered past injuries which were themselves compensable. Since there is no qualitative difference between their conditions with respect to future damages, there is no logical reason why the one should be able to collect for future damages because he has suffered past damages while the other should not be able to recover for future damages because he has not suffered past damages. Any such distinction is scientifically untenable and should be so regarded legally as well. *So long as the legislative policy is to bar claims of a certain age,* the courts must allow recovery for future damages that are reasonably certain to ensue regardless of whether there is past or present damage.

In the *Urie* case the court expressly rejected any "mechanical analysis of the 'accrual' of petitioner's injury." The court, however, did not say that petitioner could not bring an action until he was incapacitated, it used the word "manifest." It would seem that Urie was injured and a cause of action accrued "when the accumulated effects of the deleterious substance" manifested themselves to him. Depending upon his knowledge, the period of limitation could have begun running at any time between the date when his lungs contained a sufficient quantity of the silica dust to give rise to the disease and the time when he was hospitalized with silicosis. This imparts a subjective quality to injury and does not impose the objective criterion of present disability; future disabilty is still sufficient to warrant recovery if properly proved. The decision in this case is predicated on notions of "fairness" and congressional policy, and not upon any substantially different attitude toward when an injury occurs or what constitutes a compensable injury.

Admittedly the *Schmidt* and similar cases are not directly concerned with the problem under consideration and so are not too persuasive

[1056] *Supra* note 1015.

authority for the proposition that an action can be brought for future damages before any disability or other compensable circumstance or condition has arisen. Nevertheless, if cases containing such an implication are rare, cases stating the converse are even rarer, at least none have been found. This fact, plus the fact that the courts have repeatedly allowed damages for future consequences in connection with past and existing damage, should give some weight to the conclusion. Where such a cause of action is asserted, it will not fail, or at least should not, because of any absolute prohibition against the claim but rather because the prognosis in the particular case does not meet the standard of reasonable certainty.

Although distinctions could be suggested, an analogy can be drawn to certain allergy cases.[1057] These cases indicate that for purposes of an award under workmen's compensation laws, an occupationally derived allergy *may* be regarded as a "disability" regardless of the fact that upon separation from the irritant, the condition disappears. In *Arkansas Nat'l Bank of Hot Springs* v. *Colbert*,[1058] for example, the court sustained an award of the workmen's compensation commission for total and permanent disability. Claimant-appellee, a sixty year old woman, was compelled to give up her employment as a bank cashier when it was discovered that her dermatitis was caused by an allergy to nickel and carbon, substances she came in contact with in the form of coins and carbon paper. Under the Arkansas statute—"The following diseases only shall be deemed to be occupational diseases. . . . Dermatitis, that is, inflammation of the skin due to oils, cutting compounds, or lubricants, dust, liquids, fumes, gases or vapors."[1059] The court, applying the general rule of liberal interpretation of such a statute, found that the claimant was allergic to the "dust" from coins and carbon paper. Although at the time the award was given the claimant's dermatitis had cleared up entirely, an allergist testified that it would return if contact with the substances was resumed.

Surely a better system can be found to take care of such cases so as to avoid the "either-you-recover-or-you-don't" aspect of our two-value system. A suggested solution that takes greater cognizance of the statistical probabilities is suggested later.[1060]

[1057] Collected in 4 N.C.A. 3d 559 (1955) under the heading "Compensability of allergy without present disabling manifestation."

[1058] 200 Ark. 1070, 193 S.W.2d 806 (1946).

[1059] Ark. Acts of 1939, No. 319, §14(7).

[1060] *Infra* recommendations discussion following note 1123.

(3) Application of Proof Rules and Present Scientific Opinion

If the rules of proof described above are to be followed in radiation injury cases, what results might be reached based upon present opinions of responsible scientific persons? The postulation of some of the results should bring into focus much more sharply the inadequacies of the proof concepts and standards now applied by our courts. Some of the results may be startling to say the least. A warning is necessary therefore, lest the discussion that follows be misunderstood. The same warning will be repeated at the end to emphasize the purpose of the discussion and to place it in proper perspective, taking account of the limitations that are inherent in the information available.

First, it should be remembered that our knowledge of the biological effects of radiation is still quite inadequate. The expert opinions used in the examples below are in many cases tentative and admittedly less than certain. Likewise, in many cases there is responsible scientific opinion to the contrary. In each case, however, the opinion expressed is that of a responsible, respected scientist who is speaking without regard to legal concepts, particularly without reference to those involved in tort litigation. In each case the eminence of the expert is such that, to the extent expert witnesses are permitted to testify, his testimony would be submitted to the jury and whatever our differences of opinion as to what is the best policy, the jury under our present system would be permitted to decide which of the opposing views was to be accepted as "true." As pointed out previously, therefore, while the results are startling in some cases, it is submitted that each of the postulates could actually lead to the result suggested on the basis of existing rules of proof.

Before plaintiffs' lawyers make too much of the examples to be discussed, it should be indicated that to use present scientific information in the manner allowed by the jurisdiction most liberal in its admission, and under our present rules, would be quite premature and lead to absurd results. Our thesis in fact is that as yet scientists do not know enough about the biological effects of radiation to place too much dependence upon their conclusions, arrived at for scientific and not legal purposes, except in the most obvious cases, until more is known about these effects. It is our view that such scientific information should be admitted in evidence in actual litigation only if we change our present system of trying and proving the damage and causation elements in tort cases. Since in most cases the understanding of the lawyer, and

even more certainly that of the jury, as to the validity and weaknesses of scientific evidence is so inadequate, and since the likelihood of serious injustice is so great, it seems most unwise to allow the laymen on juries to evaluate scientific opinion of the kind now finding its way into print.

Our thesis is that radiation cases will show how completely inadequate is our present system of proving causation and damages, and this is particularly so in the kind of cases likely to arise in the event of overexposure to radiation. They clearly should not be used to award damages or to assign causality for future injuries. We suggest there is a better way to do it.

Our tentative conclusions probably will not be acceptable initially to either plaintiffs' or defendants' lawyers. On reflection, however, both groups may come to feel there is merit in the suggestions. In any event the possibilities in radiation cases, if present rules are used, should be set forth, even though the results themselves may be too startling to be accepted as a method of measuring and allocating the losses that seem inevitable as we expand the use of atomic energy sources. *We believe that the case is clear for initiating a combined scientific-legal study* of the proper legal use of the most valid, presently accepted scientific information. In this way the proof problems as to causation and damages can be identified and dealt with intelligently on same other basis than the happenstance of an isolated case and the information available to the lawyers who happen to be trying it. This well may be an area in which there must be legislation if we are to arrive at anything like a just scheme for taking care of radiation injuries through the litigation process.

(a) Specific Types of Radiation Injuries

(i) Leukemia

Leukemia is the injury about which we have the most scientific data bearing upon the certainty of causal relationship. There is responsible scientific opinion as follows: (1) Radiation "will produce an increased incidence of leukemia. At present the rate of leukemia for the few most heavily exposed survivors at Hiroshima is about 1.3 per cent. Radiologists, some of whom have received chronic irradiation on the order of 1,000 r. have 7 to 10 times as much leukemia as has the general population."[1061] (2) The ratio of observed cases of leukemia among the sur-

[1061] *Hearings Before the Special Subcommittee on Radiation,* Joint Committee on Atomic Energy, 85th Cong., 1st Sess., 1957, p. 981 [hereinafter cited as Radiation Hearings]. See also figures at 986 on English study, indicating increase of from 4.1 per 10,000 persons irradiated to 17.6 per 10,000. Also at 988, 916, 1791.

vivors at Hiroshima in the zone where supposedly fifty rems exposure was received was 2.6 times greater than should have occurred normally during the period observed.[1062] (3) "[T]he data obtained from surveys of exposed human populations indicate that there is a clear association between leukemia and previous radiation exposure."[1063] (4) Of the survivors at Hiroshima, in the region estimated to have received only twenty-five rems (with a maximum possible dose of 100 rems), ten persons died of leukemia, four of whom would have been expected to die on the basis of spontaneous incidents.[1064] (5) Out of a group of 1,400 children treated with from 100 to 300 units of radiation, seven developed leukemia where only one would have been expected from the natural incidence of leukemia.[1065] (6) "[R]adiation induction of leukemia is proportional to the radiation exposure and . . . for whole-body radiation exposure the number would be entirely consistent with an estimation that *50 r. doubles the chance of development of leukemia.*"[1066] (7) Two hundred roentgens exposure to children has been found to induce cancer in later life. It also has been found that exposure to *as little as three to five roentgens during the last two months before birth* has caused cancer a few years later.[1067] (8) "The laboratory evidence for the leukemogenic action of ionizing radiations is overwhelming, the Hiroshima—Nagasaki experience dramatic, and the evidence for an increase in carcinoma of the thyroid after therapeutic irradiation of supposed enlargement of the thymus highly suggestive. More disturbing than all this, however, is an English publication . . . indicating that the fetuses of women subjected to x-ray pelvimetry during pregnancy develop leukemia and malignancy during childhood *twice as frequently* as do non-irradiated. . . . Of course, it is total body radiation that the fetuses receive, but the dose probably does not exceed 2,500 mr. [2.5 rems]."[1068] (9) No one has yet been able to demonstrate an increased incidence of leukemia or other cancer of the person living in a brick house in Denver who is exposed to 4.5 rems in a thirty year period as against 3 rems for a person living in a frame house at sea level, nor among the inhabitants of Travancore, India, where the thirty year

[1062] *Id.* at 989, table 1. But note limitations on accuracy. See also pp. 1554, 1624.

[1063] *Id.* at 992. Compare scepticism as to such conclusions at 906-07, 909.

[1064] *Id.* at 957.

[1065] *Id.* at 958.

[1066] *Id.* at 1132. (Emphasis added.) See also 1791.

[1067] *Id.* at 1264. Effect from fall-out alone enough to double rate of leukemia in some places; 1292.

[1068] Hodges, "Health Hazards in the Diagnostic Use of X-Ray," 166 J.A.M.A. 577, 578-79 (1958). He warns our proof is not very accurate. (Emphasis added.)

accumulation may be as high as fifty rems.[1069] (10) Natural background radiation may be responsible for ten to twenty per cent of the observed leukemia,[1070] (which *might* be taken to mean that *a dose of less than twenty rems would cause a doubling of the leukemia rate.*) (11) "The evidence is increasingly in" the direction that there is no threshold for either the somatic or genetic effects of radiation.[1071]

Assuming for purposes of analysis the accuracy and relevancy of these statements (which actually should not be done in our opinion at the present time, if present rules are followed), observe the case that could be made for a plaintiff. If as little as 2.5 rems exposure of a foetus and from 25 to 50 rems exposure of an adult *doubles* the incidence of leukemia, then a person so exposed could claim (ignoring the statute of limitations problem) that if he should develop leukemia at a later date the chances are *better than fifty-fifty* that his leukemia resulted from the radiation exposure, rather than from all other causes together. Therefore "more probably than not" his leukemia was caused by the radiation to which he was exposed. It is submitted that prognostications of this kind are every bit as good as, if not better than, the opinion of just any doctor or even an expert in the field, offered in the form of testimony, that "more probably than not" or that "there is a reasonable probability" that the injury resulted from a particular exposure. Yet this is the conclusion to which the present tort rules concerning proof of causation and damages would lead us if applied logically to radiation cases on the basis of present scientific information.

(ii) Pre-Birth Injuries—Genetic Damage

The following statements have been made by responsible persons: (1) "Radiation, whether acute or chronic, has a definitely damaging hereditary effect, because, in contrast to most cells of our bodies, there is no threshold for damage to the hereditary material and there is no recovery from injury in them."[1072] (2) "While the majority of these genes [mutated genes] may have no recognizable effects for a number

[1069] *Id.* at 581-82. See also Burnet, "Where Is Science Taking Us?" 41 Sat. Rev. 38-39 (Aug. 2, 1958).

[1070] Neel, "The Delayed Effects of Ionizing Radiation," 166 J.A.M.A. 908, 912 (1958).

[1071] *Id.* at 914.

[1072] Radiation Hearings 981. See also 998, 917. See also excerpts from U.N. Commission's Report on Effects of Nuclear Radiation, reported N.Y. Times, Aug. 11, 1958, p. 8, cols. 1-8. *Cf.* statement reported in N.Y Times, Aug. 16, 1958, p. 3, col. 4, that chronic doses have less genetic effect than acute doses. See also more extended report in N Y Times Feb 8, 1959, p 32, cols. 3-8.

of generations, practically all are potentially bound to result eventually in undesirable conditions."[1073] (3) *Thirty to eighty roentgens are estimated to be the doubling dose for mutation.*[1074] (4) "[M]utations produced by radiation are probably as a class much worse in nature than those which arise spontaneously."[1075] (5) Minor mutations are as important in the long run if not more so than gross mutations and the mutations are *directly proportional to the radiation dose* except for very high levels of radiation.[1076] (6) *There is no threshold level of radiation below which radiation damage does not occur.*[1077] (7) *There is no recovery with a time lapse so far as genetic damage is concerned.*[1078] (8) "Man may prove to be unusually vulnerable to all ionizing radiations including continuous exposure to low levels, on account of his known sensitivity to radiation, his long life, and the long interval between conception and the end of the period of reproduction."[1079]

Here again if we accept the validity of such scientific opinion, at least to the point of admitting it for consideration, a jury would be justified in finding that exposure to radiation of an amount which already has happened in a number of cases has the effect of *doubling* the mutation rate. If the jury should then find that the deformity in the child is a result of a gene mutation and that the defendant exposed either one of the parents before conception, or the mother while carrying the child, to something less than 100 rems the chances are *more likely than not* that the mutation is the result of radiation rather than some other natural cause. It is perfectly clear that a certain number of such malformations would occur even without the particular radiation exposure that resulted from defendant's negligence or the operation of an ultra-hazardous source, but if one relies upon *probabilities,* such evidence would justify a jury's reaching the conclusion that "more probably than not" it came from defendant's source.

One cannot help but ask whether this is the kind of evidence that can

[1073] Radiation Hearings 799.

[1074] *Id.* at 917, 1017-18, 1603. See also Neel, *supra* note 1070 at 912; Hodges, *supra* note 1068 at 579-80. May be as low as ten roentgens; Radiation Hearings 1033, 1036.

[1075] Radiation Hearings 1032.

[1076] *Id.* at 1013. See also 1757; Neel, *supra* note 1070 at 909, 914. But see doubts indicated in Radiation Hearings 1755, and statement of Dr. Warren of UCLA, reported N.Y. Times, April 21, 1958, p. 25, col. 1.

[1077] Radiation Hearings 1090. At least the burden of proof is on one who argues that there is threshold; Neel, *supra* note 1070 at 909.

[1078] Radiation Hearings 1095.

[1079] Excerpts from U.N. Commission's Report on Effects of Nuclear Radiation, *supra* note 1072 at col. 4.

be intelligently considered by a jury or even by lawyers in the present state of scientific knowledge. To make the case turn on whether the percentage is forty-nine or fifty-one, illustrates the unfairness, in an individual case, of our system of awarding damages on the basis of probability. It is true that the defendant can introduce expert testimony casting doubt on the validity of the statements made by the plaintiff's scientists, but this may not have the desired effect on the jury which probably will be permitted to decide the question if there is a conflict between the scientists or experts.

In such cases, defendant can find such statements as (1) "The radiation dose necessary to double the mutation rate appears to be about 50 roentgens. It should be clearly understood that this is an *estimate,* and competent geneticists have submitted proposals from 5 to 150 roentgens." [1080] (2) "With respect to the genetic effects which have been extensively studied by biologists, there are sufficient uncertainties even in these data so that *it is not possible to accept them as entirely unassailable.* These include the fact that data at low levels do not exist, that data are confined at present to Drosophila and to a few small mammals such as mice, that the mutation rate due to ultraviolet radiation appears to be nonlinear, and there is reason to believe that some of the energy transfer with ionizing radiation is in part of the same character as that with ultraviolet radiation. *Man has existed since time immemorial in a sea of radiation* where fairly large differences because of altitude and special geographic places also are present. It is difficult to reconcile some of the conjectures to be made at very low levels with the natural radiation doses to which man has already been subjected." [1081] (3) "It is our contention . . . that *available data . . . are so inadequate* that *semi*-quantitative treatments are ill advised since, except to the relatively few who have made a detailed study of the problem, *they impart an error of mathematical exactitude* and scientific accuracy to an area *where the errors are sometimes large and often indeterminate.* There is doubt concerning the advisability of calculations which have the appearance of mathematical exactitude to persons not thoroughly indoctrinated in genetics and unfamiliar with the shaky basis of the primary examinations (but) exposures to radiation of all types should undoubtedly be minimized until we have a clear idea of just how harmful these effects are." [1082] (4) It is extremely difficult to

[1080] Radiation Hearings 910. (Emphasis added.)

[1081] *Ibid.* See also 1780, 1785-91. See also Hodges, *supra* note 1068 at 581-82.

[1082] Neel, "Effect of Exposure to Atomic Bomb on Pregnancy Termination in Hiroshima and Nagasaki," Wash. D.C., Nat. Res. Council, National Academy of

measure the dosage to the gonads or reproductive organs to the point *of being almost speculative.*[1083] (5) "In ordinary circumstances only a small fraction, perhaps one or two per cent, of the hereditary abnormalities which appear in a generation can be attributed to fresh gene mutations. For the offspring of any given parents the risk from increasing the mutation rate is very slight." [1084]

The question is again presented, should juries be allowed to "play" with this kind of material, which even the scientists are accused of mishandling?

(iii) Shortened Life Span

That radiation exposure will shorten the life span of the exposed person seems to be generally agreed upon by scientists. Certainly a plaintiff can find not only ample expert testimony to support this general conclusion but also he will find a considerable body of expert opinion which will reduce into *disarmingly* certain estimates the correlation between exposure dosage and the length of shortening. One finds such statements as: (1) "Human beings are too variable in their responses to radiation and in their state of health to permit any direct correlation, but it is *probable* that an acute dose of about 300 r. or repeated small doses totaling 2 to 3 times that would produce up to 5 years shortening of life span." [1085] (2) "[I]t may be shown that an appreciable shortening of the lifespan occurs in mice and rats exposed daily to doses of X-rays in the neighborhood of 0.1 r. Whether this extrapolation is justified or not cannot be decided at the present time. Experimental data on lifespan obtained with other laboratory animals are quite fragmentary and extrapolation to low daily doses is even more uncertain. No quantitative information is available in the case of man. Because the possibility of a shortening of the lifespan in man by small daily doses cannot be excluded, the available experimental data may be assumed to indicate the desirability of lowering the permissible daily dose for lifetime exposure of the whole body to penetrating radiation." [1086]

Sciences, publication 461 (1956) at 205. (Emphasis added.) In the same vein is Wright, "Discussion on Population Genetics and Radiation," 35 J. Cell. & Comp. Physiol. 187-204 (June, supp. 1) (1950) [quoted by Hodges, *supra* note 1068 at 580]. See also Neel, *supra* note 1070 at 913.

[1083] Hodges, *supra* note 1068 at 580-82. See also Neel, *supra* note 1070 at 913; Radiation Hearings 1785-91.

[1084] Radiation Hearings 1603. See also 1789.

[1085] *Id.* at 981. (Emphasis added.) 1,000 r. to radiologists has lowered life span five years; 814.

[1086] *Id.* at 800.

(3) "[M]ost mutations in man would produce various body impairments leading to increased susceptibility to disease, lower life expectancy, increased embryonic death rate and similar things."[1087] (4) "[T]here is growing reason in infer that this shortening of life and the other long delayed damage done to an exposed individual have their basis in damage done to the genetic material—the chromosomes and their contained genes—of the body's ordinary cells, those of the blood, skin, glands, and so forth, similar to the damage done in his reproductive cells that is passed on to later generations."[1088] (5) *Any damage* to the chromosomes or the genes results in a decreased resistance to disease and the consequent shortening of the life span *no matter how small the dose.*[1089] (6) "It is almost certainly through the individual cell deaths and impairments that minute doses of radiation, long continued or repeated, exert their action in *shortening the life-span* of the exposed individual. This effect, first analyzed by Boche and then by Sacher, had been calculated to cause a reduction in length of life in the order of *several days for every roentgen* unit received by the body as a whole during a person's lifetime."[1090] (7) Assuming a loss of ten days for each roentgen of exposure, 400 r. would shorten a human life by eleven years.[1091] (8) *There is no threshold effect so far as shortening of life span* from radiation is concerned, it being proportional to the dose.[1092]

If these facts, or rather opinions are accepted, they lead inevitably to the conclusion that exposure to radiation, even at a very low level, reduces the life of an exposed man to some measurable degree. The opinions even have considerable significance in connection with proving certainty of damages to the genes which unite and become the embryo, later born as a child. Accepting the usual rules of evidence expressed in terms of probability, a tenable argument can be made that exposure of the parents would create a very good chance that the life expectancy of the child, later conceived and born, has been reduced. Considering the accidents that already have happened, as in the recent incident in the Oak Ridge Laboratory where a workman was found to have received

[1087] *Id.* at 1012.

[1088] *Id.* at 1052.

[1089] *Id.* at 1054.

[1090] *Id.* at 1067. (Emphasis added.) See also 1093 (five to thirty-five days for each unit of radiation received by the father).

[1091] *Id.* at 1094. See also 1103 (1½ years per 100 r.); 1122-24.

[1092] *Id.* at 1110, 1118. See also N.Y. Times, Oct. 2, 1957, p. 35, col. 1. (One to fifteen days per r.)

320 rems full body exposure,[1093] how many cases for damages for a shortened life span are actually possible at the present time, not to mention the future, assuming the law permits recovery? Argument can be made to the contrary, of course, as in the case of incidence of leukemia and genetic damage. Yet the statements of experts to the effect that shortened life span probably results from irradiation are certainly sufficient to go to the jury, and in fact there seems to be general agreement that there is some shortening of the life span, the question being only as to amount.

There are statements to the contrary, such as: (1) The difference in life span found between the normal white male population and radiologists in America can be explained on differences in age composition of the two groups, rather than on the basis of exposure to ionizing radiation.[1094] (2) "From the point of view of the span of life, I feel for projections to low levels this falls in exactly the same kind of category. *We cannot determine what is happening at very low levels.*"[1095] (3) "All data presented at the present time are either presumptive or speculative for very low doses. They rest in hypotheses derived from the theoretical aspect of dose effects at high levels. I believe there is *sufficient uncertainty* so that it would be unwise, and *in fact nonscientific,* to make conclusive decisions on the basis of these extrapolations."[1096] (4) There has been no reliable evidence yet of a shortening of life span in people living in Denver or more importantly in Travancore, India,[1097] and studies in the United Kingdom have failed to demonstrate a shortened life span effect.[1098]

The defendants also can point out that there are many other factors which cause an equal or in some cases greater shortening of life span than exposure to high amounts of radiation. For example, it is estimated that life expectancy is reduced five years for living in the city instead of the country, three and one half years for being twenty-five per cent overweight, and seven years for smoking one pack of cigarettes

[1093] See articles in N.Y. Times, June 17, 1958, p. 23, col. 2; June 20, 1958, p. 11, col. 1; June 28, 1958, p. 2, col. 5; July 4, 1958, p. 28, col. 7; Aug. 1, 1958, p. 42, col. 7; and Sept. 9, 1958, p. 24, col. 4. See also discussion of shortened life, *supra* notes 482 ff.

[1094] Seltser & Sartwell, "Ionizing Radiation and Longevity of Physicians," 166 J.A.M.A. 585, 587 (1958).

[1095] Radiation Hearings 906. (Emphasis added.)

[1096] *Id.* at 910. (Emphasis added.)

[1097] Hodges, *supra* note 1068 at 581-82.

[1098] Excerpt from U.N. Commission's Report on Effects of Nuclear Radiation, *supra* note 1072 at col. 7.

a day.[1099] Even assuming that recovery should be allowed for shortening of life span, how can it be determined whether the shortening of the life span is caused by one factor or another? On the other hand, every factor has its own effect independently of the others. When scientists differ as to the quantitative effect of exposure on length of life, the case typically is taken to a jury in our tort system, on the assumption that it can resolve the conflict which experts cannot.

(iv) Increased Susceptibility to Disease

Most scientists agree that exposure to radiation increases the susceptibility to disease or other bodily injury from a later force other than radiation. We find responsible scientific opinion to support the following: (1) Studies of patients who have received radioactive material in the course of medical treatment have been found to have much more fragile skeletal systems in which the bones break much more easily than would otherwise be the case.[1100] (2) Exposure from ingested radium may be much worse for older people because the body is not able to repair damage as well.[1101] (3) "[S]ubclinical changes may cause a reduction in the reserve function of organs. This may go undetected in most instances. The combined effects, however, of an intercurrent disease and the reduced function from the effects of radiation may cause more severe effects than either the disease or the radiation separately."[1102] (4) Most of the testimony of the geneticists indicates that one very likely effect of the exposure of genes before conception is that the resultant child will have a lower resistance to disease.[1103]

The general agreement among most scientists that exposure to radiation does lower resistance to disease again leaves to the jury the duty of determining not only which scientific conclusions as to the degree of increased susceptibility to accept but also the monetary value of such increase. It may be one thing for a jury to determine the value of such a loss, but it is quite another for it to determine the meaning of the data which scientists use to draw their conclusions that there is a certain increase in susceptibility.

[1099] See table set out in Radiation Hearings 1107. Some authorities doubt that mutations are mechanisms for causing radiation aging. N.Y. Times, Aug. 14, 1958, p. 4, col. 6.

[1100] Radiation Hearings 1153-54. See also 1167-68.

[1101] *Id.* at 1173.

[1102] *Ibid.*

[1103] *Supra* notes 1072-79.

(v) General Somatic Effects

Related more or less directly to the specific diseases just listed is the effect of radiation on the general physical well being of the irradiated person. Again there seems to be general agreement that there is some such effect, although it is not easily measured. Among the types of injury mentioned in this category are lowered growth rate among exposed children,[1104] damage to the blood producing bone marrow[1105] by doses as low as one roentgen per week,[1106] a change in the normal ratio in the sexes of newborn children,[1107] damage to the ability of body cells to divide and replace old cells,[1108] premature aging,[1109] and lowering of the intelligence quotient of children whose parents' genes have been exposed.[1110] One estimate has been offered to the effect that exposure to two roentgens a year of the population generally would cancel all the gains made in general health level and life span by modern medical science.[1111]

It should be remembered, of course, that such effects can be shown only by the use of statistics. Conclusions apply to averages, and there is a statistical risk only for a specific person. At the present time there seems to be no way of knowing whether the injury will be suffered by a specific individual, or even whether an injury manifesting itself in a specific person came from a particular source, such as radiation. If one uses probabilities as the test, however, such lack of preciseness for individual cases does not refute the validity of the assertion that the injury was caused *more probably by radiation than by all other sources.* Here again we see the effect of our accepted system involving either full recovery or no recovery at all.

(b) Other Legally Significant Scientific "Facts"

There are certain other responsible scientific opinions (not facts) which will have significance in the handling of the legal problems aris-

[1104] Radiation Hearings 1136.

[1105] *Id.* at 1151.

[1106] *Id.* at 1560.

[1107] *Id.* at 1780.

[1108] *Id.* at 1052-53, 1104.

[1109] *Id.* at 1105-06, 1122. *Cf.* opinion reported in N.Y. Times, Aug. 14, 1958, p. 4, col. 6.

[1110] Excerpts from U.N. Commission's Report on Effects of Nuclear Radiation, *supra* note 1072 at col. 1. Damage to the brain may result from small doses of radiation, N.Y. Times, Sept. 6, 1958, p. 4, col. 5.

[1111] Radiation Hearings 1121.

ing in radiation cases. Any lawyer, in dealing with the kind of evidence which inevitably seems part of a radiation case that is well-handled, should be aware of these as well. In the first place, there is a considerable difference of opinion of experts as to whether experiments conducted with relatively high doses of radiation can be extrapolated on a linear basis to low doses.[1112] This in turn is closely related to the question whether there is a threshold level below which radiation does not cause injury, or at least does not cause irreparable injury.[1113] It also should be recognized that much of the contemporary scientific opinion is supported by experiments on other organisms, such as fruit flies and, in a few cases, mice. Doubt exists as to what extent the experience with these other organisms can be extrapolated and used in predicting the effect on man.[1114] There has been very little experience in exposure of human beings in sufficient numbers to give a statistically sound basis for conclusions.[1115]

It must be remembered always that opinion as to the correlation between exposure and present or potential future diseases or injuries is statistical in nature and that as yet there is no way of tying down a particular injury to a particular exposure, or to radiation exposure as against other forces, natural or human.[1116] Equally important, because it may be a contributing or even a sole cause of certain injuries, is the background radiation to which all people are subjected at all times, not only from cosmic rays but also from surrounding material including the earth upon which we live.[1117] The fact that the manifestations of exposure may be delayed for considerable periods of time, up to at least thirty-five years,[1118] is also significant, particularly for purposes of the statute of limitations question. In considering the legal significance of radiation dosage standards that have been established by one or another group (private or official), it also must be remembered that the standards set have been merely estimates on the basis of the best

[1112] *Id.* at 902-03, 906-07, 909, 910.

[1113] *Id.* at 1113, 1116, 1138, 1141; excerpts from U.N. Commission's Report on Effects of Nuclear Radiation, *supra* note 1072 at col. 6.

[1114] Radiation Hearings 1096, 1144, 1808.

[1115] *Id.* at 807, 945, 957, 958, 963, 965-66, 968, 981, 986, 1115, 1122, 1264, 1554, 1624, 1780. See also Hodges, *supra* note 1068 at 578-79.

[1116] Hodges, *supra* note 1068; Radiation Hearings 1106; Neel, *supra* note 1070 at 913.

[1117] Hodges, *supra* note 1068 at 581-82; Radiation Hearings 1292, 1429. Brazil nuts and cereal are reported to have higher concentrations of radiation than other foods. N.Y. Times, Aug. 18, 1958, p. 45, col. 1.

[1118] N.Y. Times, May 27, 1958, p. 21, col. 4; Radiation Hearings 1168, 1171, 1557-58, 1560.

existing knowledge.[1119] They represent, *at best,* a balancing of interests, recognizing that some damages may result, but that the advantages outweigh the disadvantages, although always with the basic premise that it is better to err on the side of safety. On the other hand, experience over the last ten years has indicated that our earlier estimates of safe levels probably were too high.

(c) Conclusions

As indicated at the beginning, the foregoing is not an exhaustive collection of all the scientific information that is available to a lawyer trying a radiation case. The information here referred to, however, particularly that collected in the congressional hearings, literally is a gold mine of such information, and undoubtedly is the most extensive collection of the most authoritative opinions to be found anywhere dealing with the problems of radiation injury. If the law continues to insist upon the tort liability concepts that "you either recover total damages or you recover nothing at all," and uses the weight of probabilities to determine whether there is to be recovery or no recovery, the lines drawn are arbitrary in the extreme, particularly as to future injuries not yet manifested.

The results that may be reached under our present system can be almost ridiculous in atomic energy situations. If a person has been exposed to radiation to the extent that the best scientific opinion would indicate that his chances are sixty to forty of developing cancer or some other radiation injury, then it is perfectly clear, in the long run, that many of those who recover damages will never actually suffer the injury. The closer the percentage is to fifty per cent the more will be compensated unjustifiably, and the closer it is to a hundred per cent the more will recover justifiably. It is equally a hardship to the plaintiff who actually suffers injury in cases where the law of probabilities comes out at something below fifty per cent. He may be able to show only that the probabilities are one out of three that an injury will occur. It is possible that he will be the one who was damaged. It actually can be said under these circumstances that only at the extremes, perhaps between ninety and one hundred per cent and between ten and zero per cent, is anything like "substantial" justice done.

While the system in the long run may work out favorably in terms of the law of averages for society as a whole, this is purely coincidental

[1119] Radiation Hearings 808, 811, 831-32; N.Y. Times, Dec. 5, 1957, p. 6, col. 4; Dec. 11, 1957, p. 14, col. 6.

and has nothing to do with justice between the individual parties. A defendant who has to pay damages to a person who proves a fifty-five per cent probability but who does not develop the injury later has been forced to pay without good cause. Likewise, a plaintiff who could show only a forty-five per cent chance that he will be injured in the future as a result of present exposure, but develops the injury later, surely feels no better merely because others who proved a fifty-five per cent chance may have recovered unjustifiably. The results have little to do with compensation in any true sense of the word. Even as to present, as distinguished from future, injuries, the chances that factors other than radiation are the real cause of the condition are very great and the results are almost as capricious. The difficulty is that there is no way of knowing whether the particular plaintiff or the particular defendant has been treated fairly in the specific case. It will be purely happenstance.

By taking just one extreme although not impossible example, it can be shown how completely unrealistic and arbitrary the results will be if present tort rules are applied. While the chances of a major reactor burn-up are extremely slight and the possibility that significant amounts of radioactive material will be discharged over heavily populated areas is even less, there is no responsible scientist who will give assurance that it can never happen. The insistence of business interests that the federal government adopt the indemnity program evidences the fact that industry believes such a disaster could take place and it is willing to pay very high premiums for insurance coverage up to the point where the federal government will take over liability. What are the legal consequences under existing rules, assuming the "impossible" becomes a reality? They are ridiculous! Even if this kind of major accident never occurs its possibility serves to dramatize the results we will get in minor accidents. It is a matter of statistical incidence whether the number exposed be large or small; the large number just makes the application of the law of averages in a particular case more dramatic, not any less accurate.

The number of persons and the extent of exposure in the event of a major reactor burn-up with a resultant discharge of radioactive material under circumstances which carry it over a city in concentrated form has been the subject of two scientific studies.[1120] Laying aside the most unlikely case of 100 per cent discharge, where literally scores of thou-

[1120] Gomberg, Bassett & Velez, Report on the Possible Effects on the Surrounding Population of an Assumed Release of Fission Products into the Atmosphere from 300-Megawatt Nuclear Reactor Located at Lagoona Beach, Michigan, Eng. Res. Inst., University of Michigan (1957).

sands conceivably might be killed and many more exposed to 300, 100, 50, or 25 rems, what would happen if it were assumed that only twenty-five per cent of the accumulated fission products were discharged over a large city? Even with this amount large numbers would be exposed to whole body irradiation of 100, 50, and 25 rems, and untold numbers to 5 rems. Using the estimates of biological effect set out above,[1121] the legal results in damage cases will have only a lottery-like chance of being just, even under present statutes of limitations. If these were changed (as they ought to be) to take care of the long-delayed injuries known to result from radiation, the results could be fantastic!

Fifty-five rads is a general average of the estimates scientists have made as to what constitutes a doubling dose for mutations in human beings. By hypothesis this means that twice as many mutated genes have been created and therefore the chances are just as good, or better if more than this amount of radiation was received by the parents of a mutation-deformed child, that the mutated gene was caused by the particular radiation exposure rather than by all other causes added together. This is inevitable unless the defendant can show something in the individual case that increased the chance of a mutation from these parents above the normal expectancy. But this means that *every single genetic deformity* in like fashion can be "legally proved" to have come from this one exposure, unless the defendant can show a greater than normal chance of mutation for a particular couple. Yet, scientifically only half or a little more than half of them are attributable to the radiation exposure from the reactor accident. Legally all are so attributable. Every baby, born within the period of the statute of limitations after the exposure of his parents to fifty-five rads or more, and whose deformity is the result of a mutation can show "more probably than not" that his deformity was "caused" by the particular exposure.

Every case of leukemia that occurs within the succeeding decade or so in children who were conceived but not yet born at the time of the exposure of the mother to more than 2.5 rems can also be "proved" legally to have been "caused" by this exposure. The same case can be made, of course, against any person who negligently exposes an expectant mother to a dose which results in the embryo's or foetus' receiving as little as 2.5 rems, and this could happen under any number of quite possible, in fact likely, circumstances.

Not so absurd but equally stunning will be the liability for shortened life span resulting from the incident. Present scientific opinion sup-

[1121] Scientific information cited *supra* notes 1061-1119.

ports the proposition that *every* irradiated person loses something from his life span, one estimate placing it at ten days for each roentgen. *Every* person who receives 200 units of radiation can claim a loss of 2,000 days, or five and one half years, those who receive 100 can "prove" loss of almost three years, those who receive fifty can claim one and one-half years, and those who receive twenty-five can assert a claim for two-thirds of a year. In the case of shortened life span this is actually an effect on each person, and individual differences in susceptibility to radiation exposure certainly are no greater, if as great, as the variation present in most cases where life expectancy is determined by life insurance tables.

The amounts claimed for shortened life span and even increased susceptibility to disease will be striking if all are asserted, and there is at least some fairness in allowing such claims to each person so exposed. The claims for mutation-caused deformities, leukemia, and many other similar injuries whose incidence is substantially increased by radiation exposure, are truly fantastic. Nevertheless, they are recoverable under our present theories of proving causation and damages. Moreover, this is true in all jurisdictions, not just the most liberal, if recovery is allowable whenever it is "more probable than not" that a particular source is the cause of an injury.

Other equally objectionable results will be reached from the plaintiff's standpoint. These can be demonstrated dramatically by reference to possible *future* injuries, rather than *existing* injuries as in the immediately preceding examples. Taking figures from the English study of irradiated children who developed leukemia, let us assume that 28,000 children are exposed to enough radiation to cause seven instead of one out of 1,400 to develop leukemia sometime in the future, mostly after the statute of limitations has run. Even though the incidence in leukemia has been increased seven-fold, for each child exposed the chances are nevertheless only seven out of 1,400, considerably less than a fifty-one per cent likelihood, not "more probably than not," far less than "reasonable certainty." Yet, if the scientific studies are accurate, the defendant's negligence has "caused" 140 cases of leukemia that will show up sometime.

The doubling dose for mutations, possibly not so high as for leukemia in adults, certainly could be received by many thousands of persons should there be discharge of radioactive fission products over a city as a result of a major reactor burn-up. Assuming that fifty-five rems is the doubling dose, perhaps 50,000 would receive this amount.

The incidence of genetic mutation from all causes is low so that doubling the number still does not come close to a fifty-one per cent chance that a radiation-induced mutation will result in a *particular* case. In fact, it would mean only an increased incidence of about one or two per cent in the first generation, hence, no recovery for this kind of *future* possibility. Again, however, it is assumed by geneticists that, if a large group of people is exposed, a fair number of mutations actually will show up in children born not only in the next generation but for many succeeding generations as well.

These examples should suffice to show that the unfairness of our present damage concepts cuts both ways—for and against plaintiffs and defendants as a group. From this it can be argued that in the overall picture the system works satisfactorily. But this is so only in the same sense that a lottery is fair—it has nothing whatsoever to do with whether a particular plaintiff will suffer injury and so should or should not recover. The defendant's obligation to compensate will be determined "correctly" only by coincidence.

While certainly this same problem is found in many tort cases, particularly in connection with proof of causation, it is peculiarly pressing in the radiation cases. A better system can be worked out, one having a more realistic relationship to the real probabilities, to the benefit of both plaintiffs and defendants, even though it may involve difficulties in administration. Since one of the peculiar characteristics of overexposure to radiation is that only the statistical chances that damage will result are increased, we have a perfect opportunity for experimenting with a different system of proving causation and awarding damages to a possibly injured party. The use of statistics and probabilities involves inaccuracies, of course, but for all of its inaccuracy it comes much closer to both reality and justice than the present system. A system can be worked out that will not make too many changes in the present manner of handling tort cases so far as concerns proof of duty, breach, and even the evaluation (in money terms) of the injury received, and which still will preserve most of the traditional roles of judge, jury, and lawyers.

(4) Some Recommendations

While absolute "truth" and "certainty," are unattainable legal goals, this is no justification for judicial nihilism. Despite their elusive character, the law should not be content with anything less than a reasonable approximation of practical justice. The results reached by applying present theories of proof are remarkably close to those obtained in a lottery.

(a) Inadequacies in the Present System

The best that can be said for the present situation is that it tends to allow, in the aggregate, the successful assertion of more claims for future injury that ultimately may develop. In individual cases, however, justice often depends on luck. Many tragically injured persons will be denied recovery because the probabilities are a little less than fifty per cent. On the other side of fifty per cent, many will receive "windfalls" for injuries that never develop. In such cases the award is bound to be too much when no injury results and too little when it does. None will receive compensation at the time when it is actually needed, and, from the standpoint of the state, there is little assurance that even the fully compensated individual will not become a burden to society when the injury actually does develop.

Likewise, the technique of seeking recovery for an existing predisposition or predilection toward future injury which is not a present disability, is an unsatisfactory solution to the problem. An award whose amount is reduced in proportion to the degree of probability, as suggested by one or two cases discussed in connection with increased susceptibility to disease, will never be adequate in cases where the condition does become an actual disability. Nevertheless, the proportionate award idea suggests a solution to the problem of future injury. As presently used, however, this method is little better than the more generally accepted solution because no recovery is needed if no injury results, and total recovery is needed if the injury does develop.

As pointed out previously, the rule against splitting a cause of action and the statute of limitations concept are the principal legal obstacles to a more adequate approach to the problem of future injury. As to splitting a cause of action the plaintiff's natural desire is to recover as much as he can immediately, perhaps while he can still find a solvent defendant. If he has to wait, he may recover nothing because the injury does not develop. The defendant also has a natural desire to have his liability determined as soon as possible and therefore he favors a short statute of limitations.

The principal argument favoring a "wait-and-see" doctrine for recovery of damages for future injury is a resultant greater degree of certainty, and, thereby, a fairer treatment of both the plaintiff and the defendant. In addition, society's interests are better served by a system that makes compensation available when the injury actually becomes disabling. At least in the field of radiation injuries an attempt should

be made to modify the present system enough to see that these advantages are achieved.

The changes recommended could be limited to avoid affecting recovery for past or existing injury. Clearly they should not affect the size of the recovery for an existing fully manifested injury or the "guesstimate" as to the value of a fully manifested impairment. The changes should affect the recovery only for those injuries which may possibly arise in the future, both those which may follow an existing manifestation of injury and those which are not preceded by any disabling or otherwise observable condition.

The future injuries dealt with here presuppose knowledge on the part of the victim that he has been irradiated. There scarcely can be any problem of anticipatory recovery for future injury when the injured person is not even aware of his exposure. It seems reasonable to expect that the vast majority of irradiation injuries are going to be suffered by persons connected with the nuclear industry. Most of these persons, through the use of film badges, monitoring, and other detection devices,[1122] will know, within limits, when they have been exposed and the magnitude of the exposure.[1123] The only other sizable group will include those involved in a disaster of some proportions so that publicity will follow and exposed persons will be duly advised of their exposures. It is reasonable to say that science can now predict, to some extent, and will later be able to do so with even more precision, both the probability of future injury and the extent of the injury should it develop. Since we are dealing with a reasonably measurable quantity, the injury usually being statistically fairly well correlated with the amount of exposure, future radiation injury cases lend themselves to even greater accuracy of prediction than is to be found in the ordinary case of future injury, where there are no quantitatively determinable, causative factors.

(b) Suggestions for Modification of Our Present Rules

The changes here recommended represent an attempt to obtain greater certainty while preserving the desirable features of the present system. They are made with full recognition of the policy considera-

[1122] Hutton, "Evidentiary Problems in Proving Radiation Injury," 46 Geo. L. J. 52 (1957).

[1123] The authors have been told that there may have been an error in monitoring devices in the plant Y-12 accident at Oak Ridge, the error perhaps off by a factor of 10. Discussed *supra* at note 1093.

tions which militate against a "wait-and-see" approach. A minimum of change is desirable for several reasons. We are as yet somewhat uncertain, both quantitatively and qualitatively, as to the nature of radiation injury. Also it is recognized that we are dealing with legislative, judicial, professional, and business attitudes that are conservative and inclined to regard the existing order as somewhat sacrosanct.

The basic concept is a simple one. We would deny any right to recover at the time of exposure for any injury that will occur, if at all, only in the future. We would allow, or even require, however, that the plaintiff bring an action at once to establish the duty owed to him by the defendant, the breach of the required standard of conduct, and the fact of the plaintiff's exposure to radiation. The present statutes of limitations could remain applicable to this part of the proceeding, at least where the possibilities of exposure are presently known. In addition, the plaintiff should have the burden of proving (1) the percentage probability of occurrence of a future, disabling injury and (2) the probable monetary dimensions of that injury, should it develop. Should a duty be found to exist and should the defendant be found negligent and to have irradiated the plaintiff, there would then be a determination of the percentage of probability of future injury and the amount of probable damages. For purposes of these preliminary determinations all reliable medical statistics in both oral and published form should be freely admissible.

Departure from the present system would come at the point of judgment. No award for future injury should be paid to the plaintiff at this time, except, possibly, the amount necessary for minimum attorney's fees. Instead, the defendant should be ordered to pay into a fund or to obtain insurance coverage to protect the plaintiff for as long as there is real danger that the injury will develop, payment to be made only if the injury actually develops. The amount which would be made available by the particular defendant for the future contingency would be measured by the total damages predicted by the trier of fact multiplied by the percentage probability of the injury's occurrence. For example, if it is determined that the plaintiff, as a result of the exposure has a twenty-five per cent chance of developing cancer, and that, should such injury develop, his damages will be $20,000, the defendant, at the time of the first proceeding, need only contribute $5,000.

The suggested result is far from certain justice in view of the uncertainty of the base for our statistical calculations, but it is far more nearly accurate and therefore fairer than our existing system because

it is based on the injury actually manifested. Admittedly, the defendant has had to pay something upon some claims that may never be justified and upon some claims that he would not have been required to pay at all under the present system, but, if the number of cases is large enough, he is no worse off than before, since he will never pay the full amount of the future damages. Those contributions to what might be called the "contingent injury fund" by other defendants, for injuries that never develop, will be used to meet the cost of those that do and for which full contribution has not been made. From the standpoint of the plaintiff, the suggested system is far more certain. He will be able to recover damages for any negligent exposure to radiation which gives rise to a probability of future injury when that injury does develop. This feature would provide compensation for many who previously could not have recovered because the probabilities were less than fifty per cent, and would deny recovery where subsequent events disclosed that there should not have been any recovery even though the probabilities of occurrence were more than fifty per cent. There is also the advantage that this system provides for compensation at the time when it is needed—at the time when the injured person becomes disabled, a burden on his family or society.

Upon compliance with the order of the court, and payment for any existing damages the plaintiff has shown, the defendant should be absolved from further liability for injury arising out of the negligent exposure in question. Thereafter, the plaintiff will have to seek recovery from the fund at such time as the predicted injury actually develops. Should the injury never develop, the plaintiff should not recover anything. In the event the injury occurs, the plaintiff can then proceed directly against the fund for an amount no greater than that determined by the trier of fact in the first proceeding—$20,000 in the above example. In recovering from this third party or fund, the plaintiff would have to prove the fact of his injury, the dimensions of the injury, and the fact that the injury was caused by the negligent exposure which was proved in the earlier action. All issues of law and fact, decided in the first proceedings, as to duty, breach, and exposure, would be *res judicata* at this later determination. The earlier determination of damages should be *res judicata* as to the maximum limit of the award, to give some certainty to the base upon which all statistical calculations must be made.

Let us consider these suggestions in light of the arguments pointed out earlier for and against a delayed recovery for future injury. Stat-

utes of limitations are enacted to prevent the assertion of stale claims with the consequent opportunity for plaintiffs to wait until the tactically opportune moment when witnesses for the defense may no longer be available, although plaintiffs may well have preserved their own evidence. The suggested system will not disturb this desirable goal. Only those issues of fact determined at the initial trial require witnesses with first-hand knowledge of the circumstances of the injury, and the ordinary period of limitation can be applied to this proceeding. The issues of fact determined at the second proceeding require, for the most part, expert witnesses whose ability to testify will be little affected by lapse of time; in fact their testimony will be improved because the symptoms will have manifested themselves.

In addition, the suggested system will enable the plaintiff to establish a source from which he may be certain to recover later. The plaintiff need not run the risk of subsequent bankruptcy or disappearance or hiding of assets by the wrongdoer; such actions will not affect the plaintiff's ability to recover. This seems only fair if the plaintiff is to be denied present recovery. At the same time the defendant's liability will be established and fixed within a reasonable time, and he will be absolved of further liability. The burden of waiting for future uncertainties will be shifted to insurance companies or to a fund, and there will be no present and highly contingent liability for uncertain future injuries.

The suggested modifications are intended to preserve the incentive to maintain the highest standards of care and safety. Atomic energy users, whether strictly liable or liable only for negligence, who are responsible for the greatest number of possible injuries will be required to contribute the largest amount. Admittedly, even this system does not maintain exact correspondence between those who actually cause injury and those who have to pay, but the approximation is as close as other considerations permit and probably closer than under workmen's compensation programs. The resemblance of the present tort recovery to a lottery draw would be obviated.

(c) Administration of the "Contingent Injury Fund"

Obviously the most difficult question that arises in connection with the suggested scheme is that concerning the nature of the fund or other source out of which damages ultimately will be paid—How and by whom is it to be handled? Whether the fund is to be administered by

a government agency or by private insurance carriers, a larger amount of money must be provided than ultimately will be available to claimants. The costs of administration alone, not to mention the profit margins that insurers would require, are going to make inroads on each dollar contributed by the defendants. For this reason there will be a degree of probability above which it will be less expensive for the defendant simply to pay the plaintiff immediately and directly. If, for example, the defendant has to pay one dollar to provide ninety cents of compensation (the remaining ten cents going into overhead), he is just as well off if he pays immediately when the probability is greater than ninety per cent. This of course assumes that the ten cents administration cost should be paid by the defendant. For this reason, direct payment to the plaintiff should be made optional in cases involving more than a certain percentage of probability. It also may be fair to provide that if the probabilities are less than ten per cent or perhaps five per cent, plaintiff should be obliged to take his chances; *i.e.,* no recovery should be allowed.

The principal requirement to assure success of the "contingent injury fund" is that it accumulate a sufficiently large number of proportional contributions to permit application of the theory of probability. The fund itself will represent the accumulation of all sizes of contributions for all degrees of probability of future injury. Its effectiveness will depend in large measure upon the number and variety of claims it represents. Thus, the least effective method would be found in a system wherein each defendant obtained insurance from carriers acting individually and with no pooling of risk between them. Conversely, the most effective method so far as statistical probability is concerned would be a single, nationwide pool or fund, either governmentally or privately administered. Self insurance would seem unworkable.

If a government administered fund were used, it probably should cover the risks arising in more than one state. It could be administered by the federal government and the amount contributed in each case still could be determined by state law and trials in state or federal courts in the same way as is now the case with tort actions. The judgments, however, would be paid into the federal fund rather than to the plaintiff and later the fund would pay full damages to a plaintiff who later contracts the disease. The fact determination that the disease exists at that time could be made by an appropriate state or federal court, or perhaps by an administrative board.

Perhaps a nationwide fund could be created by interstate compact if

a large enough number of states would agree, rather than have the fund administered by the federal government.

A third alternative, of course, would be for Congress to create the fund and lay down the rules to govern liability and recoverable damages for all radiation injuries, superseding all state laws perhaps. The "contingent injury fund" could function, however, without accepting this degree of interference with traditional state control of tort law.

The theory suggested could be adopted so as to make use of private insurance carriers and avoid a government administered fund, whether federal or interstate. This plan might even make it possible to avoid jury determination of the percentage of risk created by defendant's radiation source, a determination not wisely left to a lay jury. Once liability and the amount of recovery were found, the defendant might then provide an insurance policy for the full amount, payable if and when the possible future injury occurs. The insurance company would charge a premium based upon an expert judgment of the probabilities, and if enough radiation risks were pooled by private insurance companies and the statistics were valid, the premiums should cover the total that would be claimed by all plaintiffs who actually suffer the injury in the future. The effect on such premiums of interest earned before payment to the victim is required and of death of some victims by other non-radiation causes could be worked out by the insurance companies, and the premiums charged defendants adjusted accordingly.

In any event, once defendant makes his contribution to the "contingent injury fund," or takes out an appropriate insurance policy if this plan is used, his liability ceases completely. Thereafter the victim, if and when the disease occurs, looks to the fund created by the contributions of many defendants on behalf of many plaintiffs. If the injury does not materialize or if plaintiff dies of other causes first, the amount contributed for him helps defray the awards to other plaintiffs who do suffer the injury.

If the federal indemnity fund described in the last section of this chapter has to be used because claims from a large reactor accident exhaust private insurance coverage, the federal government contributions for future injuries should be made to the contingent injury fund or be used to take out a paid up insurance policy for each plaintiff who proves his case.

Some Experience in Administering Injury Funds. It is not meant to suggest that a workmen's compensation plan of recovery for each injury regardless of tort rules of liability should be adopted and based

on a fixed schedule of awards for each type of injury. Nevertheless, workmen's compensation plans involve some administrative problems not too dissimilar to some posed by our "contingent injury fund." It is worthwhile, therefore, to look at the financing and experience rating aspects of workmen's compensation plans.

In all state and territorial jurisdictions, except Louisiana, employers to whom the workmen's compensation laws are applicable are required to give assurance of their ability to meet their compensation obligations. This may be done by insurance with a private carrier (in all but eight jurisdictions), or with a state fund (in nineteen jurisdictions), or by furnishing proof of ability to carry one's own risk, called "self-insurance" (seven states excepted).[1124]

Private insurance is written by casualty companies of three types: stock companies, which are generally non-participating corporate enterprises in which profits are paid to stockholders and policy holders do not directly participate; mutual companies in which the policy holders are shareholders automatically, and generally they divide the profits as dividends; and reciprocals, which generally are unincorporated groups of employers organized to sell insurance to each other. The reciprocals do less than two per cent of the total private compensation business. In 1951, as indicated by net premiums written, private carriers did about 80.6 per cent of the compensation business, state funds covering the remainder. These figures have been relatively constant since 1917, with the state funds gaining a little during the depression period and losing again during times of greater prosperity. The only really significant proportional change is that which has taken place between the stock and the mutuals, the latter having gained appreciably at the expense of the former—from 12.4 per cent of the total in 1917 to 30 per cent in 1951. Stock company carriers have generally recruited from the relatively smaller and middle-sized risks, doing business through brokers operating on a commission, selling a more expensive type of insurance, but giving greater service. The mutuals have tended to attract the larger firms and higher grade risks, escaping some of the overhead inherent in the large sales organizations of the stocks. There is a noticeable tendency for each type to adopt the competitively advantageous features of the other, so the differences between them are disappearing.

On the basis of premiums, state funds account for 19.4 per cent of the compensation business. These funds are of two types: exclusives

[1124] The statements here made are based on Chapter 4, Somers & Somers, Workmen's Compensation (1954).

(in eight states), and competitives (in eleven). The latter are in competition with the various forms of private carriers but the statutes setting up such funds compel acceptance of every grade of risk, so they tend to cover the highest risks where they are in competition with private carriers.

On the basis of benefits paid in 1952, private carriers accounted for 62.3 per cent, state funds 24.5 per cent, and self-insurers 13.2 per cent. Mutual, stock, exclusive state fund, and competitive state fund carriers are to be found among the ten largest carriers in the country.

The subject of rate making is far too complicated to allow elaboration here; however, some consideration must be given to it, for its very complexity reveals a significant problem or weakness in the suggested "contingent injury fund" scheme to cover radiation injuries. Essentially, rate making, whether by state insurance supervisors, individual carriers, or the National Council on Compensation Insurance, is a statistical study in which optimum probability determinations are the goal. Periodically the various classes of risk, by industry and occupation, are assigned a compensation rate per payroll unit (*e.g.*, $100), which is determined from recent past experience with the class. This "manual classification gross rate" contains two elements: "pure premium" and "expense loading." Pure premium is that portion of the rate to be used to pay claims, and includes reserves for future benefit payments. It may be adjusted up or down periodically, depending on class experience— and educated guesses. Expense loading is the portion of the rate set aside to defray anticipated underwriting expenses or overhead. These expense loadings have been state approved and are uniform for all private carriers. Traditionally they have stood at or above forty per cent of the total rate, with acquisition costs, brokers' commissions (17.5%), general administration expenses (7.7%), and claims adjustment (8.2%) comprising the major portion. Generally they have reflected the higher costs of the stock carriers. While in recent years both stock and mutual carriers have managed to reduce their *actual* expense ratios, established expense loadings have remained constant or even increased slightly. The periodic revisions of these "gross rates" mainly have been changes in the "pure premium" figure and not the "expense loading." Needless to say, this feature of the rates has occasioned considerable criticism from both employers and labor, and is one of the principal arguments favoring the state fund.

"Merit rating" has been proposed as a solution to many of the inequities of the "gross manual rating," and is being adopted widely. This

type of rating is intended to distinguish between individual employers within the same industrial classification so that the rates imposed upon each will reflect that employer's accident record with respect to the average. There are three main types of merit rating with an indication of an emerging fourth type: schedule rating, prospective experience rating, retrospective rating, and interstate experience rating. Schedule rating was an early attempt to predicate the individual employer's burden upon the safety installations in his plant. It is of no practical significance today. Prospective experience rating is based on the actual accident experience of the individual employer over the past one to three year period. It attempts to reward the employer with a relatively good safety record, and is both simple and expedient to administer. Unfortunately, it has not affected the "expense loading" and has proved impractical with respect to low-risk, small employers. Retrospective rating, which was originally intended to help the stocks recapture from the mutuals who paid dividends to policy holders, uses only the employer's current policy year experience. He is rated tentatively, at the beginning of the year, by the prospective method. At the end of the policy year a final audit is made of his accident costs, and his final premium is established. This type of rating has also been used to reduce the carrier's expense loading, primarily by striking at brokers' commissions, which have been reduced to as low as six per cent in some cases. This type of rating has been available only to employers paying fairly substantial premiums (*e.g.,* about $5,000 in New York), but has represented a large saving to them. It is criticized as being discriminatory with respect to small employers and as not being in harmony with the concept of a workmen's compensation program. The fourth and most recent development with regard to individual risk rating is interstate experience rating for employers in interstate operations.

Most of the state funds, whether exclusive or competitive, set their rates in a fashion substantially similar to the method described for private carriers. They often utilize the manual gross rates set by the private rating organizations. The competitives may be found giving advance discounts or dividends or both to employers on an individual basis, and also they may charge above the manual rates for the undesirable risks which they must accept. The really significant difference between the private carriers and the state funds is to be found in their expense ratios. "Over the years competitive funds have devoted, on the average, about 14 per cent of premiums to expenses, exclusives about 6 per cent," as opposed to 29 per cent for the stocks and 16 per cent for

the mutuals.[1125] In connection with these comparisons it must be remembered that the competitives tend to get the worst risks and the exclusives get all grades of risk. The Ontario fund, which is an exclusive and must pay all the costs of administration, adjudication, etc., has paid eighty-nine cents in benefits for every dollar of receipts. No part of the Ontario workmen's compensation program is supported by taxes. Of the eleven cents per dollar that goes for expenses, 2.5 cents goes for safety and mine-rescue work.[1126]

Two features of these workmen's compensation rates are significant in a consideration of our "contingent injury fund." The first of these is the fact that the carriers themselves, whether private or public, who are liable for the benefits the law requires, are the determiners of the probability of injury. Their techniques for doing so are exceedingly complex and intricate. It is extremely doubtful if any jury or administrative tribunal could do the job with equal accuracy. It is obvious that no carrier is going to accept a judicially determined probability of future injury as a basis for insuring against the risk of liability; it would be financial suicide for it to do so. Before accepting a proportionate contribution from a defendant, and agreeing to accept the possible future liability, the fund administrator will have to make an independent determination of probability, and charge accordingly. From the standpoint of the private insurer, at least, a determination of probability by the trier of fact in a judicial proceeding is somewhat superfluous, although it might be mentioned that both jury and insurer will be inclined to err in the same direction—*i.e.*, toward greater probability.

The second feature of the workmen's compensation rates that reveals a substantial problem in connection with the suggested "contingent injury fund" is the high cost of the insurance. The high level of expense ratio, especially that of the stock companies, may be prohibitive. Perhaps private insurance is out of the question, but our system of justice should not be absolutely bound to existing insurance programs.

(d) Some Not Dissimilar Experience in New York

An experiment tried in New York presents a very interesting analogy to our suggestion. In 1933 the New York legislature amended its workmen's compensation law to include a "fund for reopened cases."[1127] The purpose of this fund is to establish a method by which risk of claims

[1125] *Id.* at 125-26.
[1126] *Id* at 314.
[1127] 64 N.Y Consol. Laws Ann. (McKinney 1946) §25-a.

recurring beyond the statutory period shall be borne by all employers and carriers,[1128] and to insure in proper cases the benefits of the workmen's compensation law to injured workmen regardless of prior denials and time limitations. It also serves to cushion the burden on the employer and carrier by relieving them from a continuing liability.[1129] Under New York law a person whose case is closed may come back later and state that he is still disabled or that his condition has worsened and that he can no longer work, in which case his right to additional compensation can be reopened if he presents medical proof of his condition and of the fact that it was caused by an industrial accident or occupational disease. The fund was created as a result of a recognition that there were numerous cases of industrial injury and disease which were arising, returning, or worsening after an award of compensation. Under existing law the courts had held that, when a case was closed, as to the type of injury, it could not be reopened upon this issue after three years from the date of injury. If the injury had been classified, for example, as "temporary partial disability," such a finding could not be disturbed after three years, no matter what tragic developments might ensue. In a remarkable illustration of industry responsibility, employers and insurance carriers withdrew their objections to allowing the Commission to reopen cases even after an unlimited number of years—provided they got some relief in return.

As a result of these conditions, the law was amended to provide that in a reopened case, if the award was made more than seven years from the date of accident and more than three years from the date of the last payment of compensation, the award would not run against the employer or his insurance carrier *directly,* but would run against the "fund for reopened cases." This fund, in effect, became a reinsurer of all employers and private carriers for "stale" cases.

Initially, it was thought that there would be comparatively few cases requiring compensation seven years after the date of accident and more than three years after the date of the last compensation payment. Therefore, only $250,000 was set aside to initiate the fund, and it was further provided that in the case of an industrial death, where the deceased had no dependents to whom compensation was due, the employer or carrier would pay $1,000 into this fund. These funds soon were found to be insufficient, so the act was amended to require a $1,500 contribution for each "no dependency" case. The amendment also

[1128] Casey v. Hinkle Iron Works, 299 N.Y. 382, 87 N.E.2d 419 (1949).

[1129] Watkins v. Cornwall Press, Inc., 270 App. Div. 615, 63 N.Y. Supp.2d 23 (1946).

authorized the chairman of the Workmen's Compensation Board to examine the fund periodically and calculate its liabilities. If the fund does not exceed those liabilities by $250,000 he is authorized to make assessments against all private insurance carriers, including self-insured employers, to make up the deficit.

Because of the understandable popularity of this fund, two subsequent modifications were found necessary. The first of these was a rather generous statute of limitations. Under the present law, no case may be reopened and charged against the fund more than eighteen years after the date of accident or more than eight years after the last payment of compensation, whichever may be the longer. It also was found necessary to provide for a defense for the fund. A Special Fund Conservation Committee was created with five members, one from the stock companies, one from the mutual companies, one from the State Insurance Fund, one from the Compensation Insurance Rating Board, and one self-insurer. In any reopened case the chairman of this committee is authorized to designate the employer or insurance company that was primarily responsible for the compensation to act as defender of the fund and represent it with respect to the particular claim.

Apparently, the New York "reopened case fund" is unique among the workmen's compensation laws of the United States. The similarities between it and our "contingent injury fund" recommendations for radiation injuries are clear. Each is intended to meet the same problem—the problem of delayed injury. The fund provides one source from which recovery for delayed injury is made available. It should be noted that in New York employers and private carriers were willing to accept the right of the employee to have his case reopened and the injury reclassified, for purposes of additional compensation, if their direct liability was cut off at a reasonable time, even though *as a group* they paid in any event. The private insurance companies apparently had no desire to insure indefinitely and they did not object to a state administered fund. The method of financing this fund is especially significant. The requirement of contributions up to $1,500 from carriers and insurers who are liable for "no dependency death" cases, is essentially arbitrary from the "fault" standpoint, but it is expedient and it can hardly be termed "unjust." Notice that the "reopened case fund" was faced with the same problem that confronts the "contingent injury fund," *i.e.*, the problem of lack of correspondence between predicted liabilities and reserves and actual liabilities and payments. If anything, the New York fund encounters a larger problem, for no attempt is made

to predicate individual contributions upon the probability of injury for which the individual may be responsible. This problem has been resolved by authorizing the Board to levy assessments upon *all* carriers to make up the deficit. If employers and private carriers will accept this arrangement, there is no reason why they should not be equally willing to accept liability to the proposed "contingent injury fund" for radiation injuries. In connection with this latter fund, problems of solvency of the fund can be resolved in the same way. Thus, the individual found to have been negligent could be required to make a present contribution to a national, public fund. The amount would be determined by the monetary dimensions of the possible future injury, multiplied by the percentage probability of its occurrence. This contribution could be augmented by a pro-rata payment for the expense of administration of the fund. Furthermore, any deficits that arise in the fund as a result of inaccurate predictions by the triers of fact at the initial trial could be made up by the use of assessments against all users of nuclear energy sources. These assessments could be made proportionate to the amount of radiation (both as to intensity and quantity of source) used by the different operators.

There are some very vital distinctions between the New York "reopened case fund" and our "contingent injury fund." The New York scheme takes care of future injuries only where there is present injury for which recovery can be had within the time and coverage limitations of the regular workmen's compensation provisions. Our fund would be available to those whose only injury is possible future damage and defendants would contribute to the fund every time they are legally responsible for exposure which may cause future harm. This should be fairer, not only to the injured but also to the members of the defendant's group as well, because each will contribute an amount based on his own fault or liability and in proportion to the amount his activities increase the possibility for future recovery against the fund. This preserves much more realistically the concept of individual responsibility for harm caused by a particular activity and also takes care of what in radiation cases may prove to be a very large group of plaintiffs who can show no present compensable symptoms but of whom a statistically predictable number will suffer serious injury.

The fairness of the "contingent injury fund" is only as great as the degree of validity of the statistical evidence used. They are not completely reliable by any means, but the results from their use will be infinitely more "just" than those reached in ordinary tort cases today.

Many of those within the "more probably than not" group will die long before a feared injury manifests itself and from completely unrelated causes. This will be a "saving" to the "contingent injury fund" which can be passed on to those other plaintiffs who actually suffer the future injury feared and deserve fully adequate financial help.

The "contingent injury fund" concept has another important advantage in multiple wrongdoer or causation cases. Advantage can be taken of the merits of contribution between joint tortfeasor ideas in normal tort cases and of last-employer concepts found in some workmen's compensation plans. In radiation injury cases the "amount of damage" caused by each source can be approximated much more closely than in the usual accident case for the reason that the damage done, particularly as to future injury, correlates rather closely with the amount of radiation received, although it may be difficult sometimes to determine this amount. By making each source, if there is legal liability for radiation from that source, contribute its share to a common fund there will be no need to hold each fully liable and subsequently make the one against whom a judgment is entered find and recover from the others legally liable.

The multiple causation situation suggests one of the most important possible inequities and perhaps the greatest difficulties inherent in the "contingent injury fund" plan. Since most of the injuries which radiation can cause also may arise from other forces for which the particular defendant may not be responsible, what assurance can be given that a future injury that manifests itself will not have been caused by some source which has made no contribution to the fund; *e.g.,* cosmic rays, other background radiation, or radiation properly used in medical treatment? The short answer is that such assurance cannot be given. This does not justify rejection of the plan, however, because the same objection is even greater as applied to present tort liability rules. The same multiple causation possibilities exist whichever damage system is used, and the "contingent injury fund" idea lends itself much more readily and justly to a solution than does our present rigid two-value scheme of "recovery in full or no recovery at all." Possible shortages in the fund when the injury is attributable to causes making no contribution could be avoided in one of three ways: (1) the number of exposed persons who die for other reasons before the future injury manifests itself may be sufficient to offset those injuries actually caused by other forces, somewhat as in the New York "reopened case fund"; or (2) the government can make a lump-sum contribution annually representing

the statistically estimated contribution of such non-liable sources; or (3) the plaintiff will be allowed to recover only such proportion of the total damages as is represented by the contribution to his injury by contributing sources, the remainder to be taken care of by his own resources, which in many cases today might include his own medical, hospitalization, and loss-of-income insurance. Each of these solutions within the "contingent injury fund" scheme is much more acceptable than our present system of making the result depend upon "more probably than not" which gives a black-or-white result depending on whether the particular case falls on one side of fifty per cent or the other. Under our present system, by hypothesis, in cases in which the probability falls between twenty-five and seventy-five per cent, the result reached in the particular case is "more probably than not" wrong!

(e) Concepts of the Civil Law Concerning Principles of Damages [1130]

The problems involved in awarding damages are universal. Accordingly, advantage should be taken of experience under other systems of law. The civil law has taken a somewhat more realistic approach than that followed in the common law countries.

Specific Performance. In France the principle of specific performance allows for reparation of losses caused by tortious interference with property. The remedy is strictly within the discretion of the judiciary, but where the interests of justice are best served, and a lessening of burdens of evaluation may result, a court may order the "restitution" to the victims of a lost, destroyed, or damaged item, the substitute to be equivalent in quality, quantity, or general serviceability and value. The court may permit the defendant to choose between giving the plaintiff a like item or paying a certain sum. An impartial officer of the court will decide whether the object delivered by defendant to plaintiff substantially corresponds to the lost, damaged, or destroyed article. A court may also insist on specific "restitution" as the only just remedy, and effective enforcement is generally assured by a judicial device called "astreinte," which corresponds roughly to a pecuniary penalty which increases as the defendant delays performance. For example, in a case in which the defendant tortiously had cut and harvested the plaintiff's

[1130] This section is based on research in the original language done by Rinaldo L. Bianchi, J.D., Mich. 1955. Mr. Bianchi served on the staff of The University of Michigan Law School from February 1955 to June 1957. He is currently with the firm of Covington & Burling, Washington, D.C.

hay, the court ordered that an equivalent amount be delivered by the defendant.[1131] The same kind of automobile wheels has been ordered delivered to the plaintiff,[1132] as have tires,[1133] and where the defendant accidentally destroyed the plaintiff's truck, the court ordered him to obtain and deliver to the plaintiff a truck of the same quality and make.[1134] The judge is free to choose between a money judgment and specific performance. As for the availability of the concept of specific performance in tort cases, an eminent French author has remarked that, since the remedy is used in contract cases, there is even more reason (*à plus forte raison*) that the court should have similar powers in tort cases.[1135] This might be a very appropriate remedy where personal property has been contaminated by radioactive material and can be replaced with something quite similar thus eliminating any concern about the salvage value in determining damages.

Money Judgments. Other types of damage that do not lend themselves to specific restitution, such as personal injuries, are subject to the unlimited power of the courts in matters of remedy. A judge, in his discretion and depending on the circumstances of the case, can set the date and the place of payment of a judgment of indemnity. He can decide whether the judgment should be in the form of one lump sum, or in installments, or as an annuity. The requests of the parties are not binding on the court.[1136] The only limitation on the powers of the courts in the choice of remedies is the prohibition against judgments that encroach on the freedom of the defendant or upon his civil rights.

Provisional Decrees. The discretionary powers of the courts in France are broad enough to include all possible claims within the cause of action together with the power to render a provisional decree designed to allow reopening for later discovered damages. Periodic revisions of a judgment may also be ordered to diminish or terminate as well as to increase the installments of an annuity granted to a plaintiff, according to whether his condition has improved, disappeared, or deteriorated.

It is remarkable that no article of the French Code directs the courts

1131 Verdot v. Fusis, Besançon App., Dec. 4, 1946, Gaz. Pal. 1947, 1, 20.

1132 Soc. aut., du Centre Gatty v. Dymerias, Lyon App., July 30, 1946, D. 1947, 377.

1133 Etabl. Compte et Dupriet v. Malaval, Tr. Com. Seine, June 23, 1947, Gaz. Pal. 1947, 2, 195.

1134 S.N.C.F v. Guillou, Caen App., March 2, 1943, Sem. Jurid. 1944, II 2657.

1135 Savatier, 2 Traité de la Responsabilité Civile 171, n. 5 (1941).

1136 S.N.C F v Ulma, Paris App., March 1, 1945, Gaz. Pal. 1945, 1, 155

to follow such procedures. The system has developed by case law from the implications of a single word in Article 1382 which states the general theory of tort liability based on fault. The article merely states that the defendant who is found liable must make *reparation.* From that point it has become a matter of judicial development, subject to limitations of personal freedom, to decide the techniques best suited to the particular case. The French Court of Cassation repeatedly has affirmed that the courts are free to choose the mode of compensation in tort cases according to their own judgment, taking into consideration all of the circumstances of the cases.[1187]

An annuity, in personal injury cases, may often correspond more accurately to the extent of the defendant's damages than will a final lump sum which must be adjusted to take into account the permanency of the particular loss. In addition, as previously noted, judging the possibility of future new injuries or the aggravation of a present injury is guesswork at best. Atomic energy injuries probably will present this dilemma in many cases. Should there be a major radiation disaster, a defendant may be better able to stand the imposition of smaller periodic payments over a period of years than a huge lump sum if, as expected, the federal indemnity program is dropped in the future. The French experience at least shows that delay in determining the exact nature and extent of future damages can be administered.

Another French technique throws light on the feasibility of our suggested "contingent injury fund." It is a process of distribution of the damages according to the respective liability of the parties. In *Correia* v. *Lucet* [1188] the plaintiff was found one-fourth responsible for an accident and the defendant three-fourths. An impartial expert established that plaintiff had suffered a two months' total disability and a continuing twenty per cent disability, which condition, however, could improve in time. The trial court granted an award of three-quarters of the medical expenses, plus the cost of plaintiff's bicycle which was damaged, and two months' salary. The "moral damages" (*pretium*

[1187] Cie des Forges de Châtillon-Commentry v. Auclert, Req. May 21, 1928, D.H. 1928, 366, Gaz. Pal. 1928, 2, 354 (Damages to land from exploration and mining operations subject to probable increase in time. The judge was allowed to assess the extent of existing damage and wait to determine later damage); Schmitt et al. v. Adret, Cass. Ch. Criminelle, Feb. 25, 1928, D.H. 1928, 239, S. 1928, 1, 153, Gaz. Pal. 1928, 1, 515 (Court allowed to order defendant to purchase a temporary annuity for plaintiff in bodily injury case); Veuve Deglaire v. Hubert, Req. July 11, 1938, Gaz. Pal. 1938, 2, 671 (Court could award a lump sum or installments at its discretion). See also C. c. dame M, Req. Feb. 5, 1940, Gaz. Pal. 1940, 1, 471.

[1188] Angers, April 2, 1935, Gaz. Pal. 1935, 2, 36.

doloris), based upon aesthetic prejudice from disfiguration, plus the twenty per cent continuing disability were assessed at a yearly pension of 1,000 francs, account being taken of the victim's station in life. The appellate court affirmed the judgment saying, however, that the defendant was entitled to request that the judgment include a reservation of his right to petition at a later date for a reduction or discontinuance of the installments if the plaintiff's condition should improve or be cured. The civil law does not use the concept of contributory negligence but instead uses a system of apportionment based upon relative "contributory causation."

Again, in *Cugno* v. *Parzy* [1139] the victim of a car accident suffered brain injuries accompanied by diminution of mental powers, muscular atrophy of the left arm, and other injuries of the left hand. The court decided that since these conditions might improve in the future, a final judgment would not be in character with the nature of the injury. An annuity was granted, made subject to periodic revision every two years depending upon whether the plaintiff's condition improved, deteriorated, or remained the same.

Similarly, in *Abram* v. *Petit* [1140] the victim of a motor car accident was left with a nervous disorder persisting after his other wounds had healed. An expert witness declared that the condition was curable and that it might disappear leaving no traces. The court ruled that it would be unjust to award a final sum. An annuity was granted, made subject to revision every two years, and subject to discontinuance if the plaintiff's condition should be cured.

The procedural difficulties that these techniques would encounter under the common law are overcome rather nimbly by the French courts. It is the theory of the French doctrine that a judgment passes only upon the damages actually submitted to the court at the time of trial and not on "new damages" stemming from the same cause. To be sure, a court can make an express, final decision that all possible claims from a cause are merged in the judgment, but, short of that, "new damages" give rise to a new cause of action. It is not always easy to decide when "new damages" exist which were not present and claimable in the first instance; but, for example, the loss of a second eye after the judge has passed on the loss of the first one is "new damage." [1141]

[1139] Riom, Feb. 8, 1939, D.H. 1939, 269.
[1140] Dijon, May 5, 1933, D.H. 1933, Gaz. Pal. 1933, 2, 314.
[1141] Teissère v. de Gasquet, Aix App. April 2, 1870, D. 1871, 2, 241.

The courts have also shown a tendency to regard an injury which was not definable nor perceivable at the time of the first judgment as "new damage," sufficient to support an action for supplemental indemnity. In *Corné* v. *Pozzi*[1142] the initial judgment rendered in 1946 granted the plaintiff a lump sum of 125,000 francs. A few years later he petitioned for a re-examination. As to an objection of *res judicata* the court said that the aggravation of an injury suffered in an accident in itself is a new cause of action for damages, distinguishable from the cause of action first litigated, and supplemental damages may be requested. Experts must be called, of course, to testify as to whether the aggravation is a direct consequence of the accident, and to determine its extent.

Again, in *Canac* v. *Abline*[1143] the argument of *res judicata* was rejected in a case involving subsequent aggravation of damages, even though there was no reservation of the right to reopen the original judgment. The French courts have gone so far as to say that *res judicata* is always subject to an exception, even in cases where the injuries constitute only an aggravation of a condition existing prior to the the first judgment at which time they were either unpredictable as to their future extent or not perceivable by normal means of investigation.[1144]

The right to revision of judgments and awards is by no means automatic in French law. The courts are merely empowered to use sound judgment to achieve equitable disposition of particular cases; they actually make rather sparing use of this prerogative. Generally a party cannot reopen a case if the first court purported to adjudicate the entire damages in a lump sum and made no reservation as to the reopening of judgment. This is so in most cases even if a party has expressly reserved the right to open the case and the court recorded this reservation in the judgment. The appellate courts generally oppose the tendency of trial courts to award indemnities subject to future modifications based solely on a rise in the cost of living. In general it is said that variations in the cost of living are not attributable to the tort and thus should not be taken into account in a judgment awarding future compensation.

[1142] Paris, Dec. 8, 1949, D. 1950, J.C.P. 1950, 2, 5459.

[1143] Grenoble, Jan. 20, 1936, 154.

[1144] (Ex Parte) Blandin, Conseil d'Etat, July 1, 1949, Gaz. Pal. 1949, 2, 305, in which the plaintiff was given a supplemental income to compensate for the devaluation of the currency at the time of the second trial in a case arising out of government liability for injuries caused by an army vehicle.

(f) Conclusions

If the French can administer their provisional judgment system there would seem to be no real, insurmountable obstacle to administering the "contingent injury fund" plan which actually should be much more satisfactory from the defendant's point of view since, if he is successful, he will be discharged at the first trial. Plaintiffs should gain because they do not have to pursue a defendant who perhaps at a later date may be bankrupt or who may have disappeared. Also, provision would be made for the case where there is as yet no observable injury to be compensated. The necessity of enormous awards, increasingly frequent in recent common law decisions, may in part be due to the "now or never" approach to tort liability. In the case of radiation injuries, results in keeping with this liberal trend under the present system may even lead to an impossible situation.[1145] It is time we changed our damage rules as well as re-evaluated our concepts concerning proof of both causation and damages.

The suggested "contingent injury fund" might seem to do harm to interests of lawyers handling tort cases, yet even here it should call only for an adjustment of their way of handling fees and planning income. There should be no reduction in total income over a period of years. Perhaps the greater degree of certainty of outcome would make it possible even to increase total professional incomes because the cases could be handled more expeditiously.

In any event it seems that a fairer system between the important parties in tort actions, the plaintiff and defendant, can be worked out, and this is the most significant consideration, a concept which the profession will surely applaud.

If the suggested plan proves to be adequate for future injuries, there is every reason to believe it also might be made applicable to present injuries where there is less than real certainty that a particular force or cause is responsible for a specific injury. If it works, this should do much to increase the lay public's respect for law as a means of achieving justice in tort cases, something the public and non-legal experts often doubt, and rightfully so in many cases.

[1145] See text *supra* at notes 1120-21 for a discussion of possibilities should there be a major reactor incident and the "more probable than not" rule applied.

6. Application of *Res Ipsa Loquitur* Concepts

a. In General

Assuming that negligence rather than strict liability rules are applied in radiation cases, (and surely this should be true in a large percentage of the cases) the plaintiff may seek to invoke the doctrine of *res ipsa loquitur*. If so, his burden of proving the defendant's negligence and that it caused his injury will be made easier.

Without help from this doctrine it may prove to be extremely difficult to establish by direct evidence that a particular radiation accident was the result of negligence. The plaintiff may find himself totally unable to pinpoint precise negligent acts or omissions, probably because of (1) ignorance on both his part and the defendant's as to exactly what happened, or (2) death of potential witnesses and destruction of material physical evidence, or possibly (3) assertion of government secrecy restrictions. Therefore, while he stands an excellent chance of recovery once his case is placed in the hands of a sympathetic jury, the plaintiff in these three situations may lose on defendant's motion to dismiss.

Res ipsa loquitur, literally translated, means "the thing speaks for itself." In terms of legal practice, the phrase connotes a method of proof by circumstantial evidence. In most jurisdictions, the plaintiff is given the advantage of an inference that the defendant was negligent and thereby he escapes a nonsuit. *Res ipsa loquitur*, however, can be used only in restricted circumstances. To speak for itself, an accident must be one that normally does not occur without negligence, and it must arise from a force or instrumentality "controlled" (in a loose sense) by the defendant.[1146] Establishing these conditions precedent to the application of *res ipsa loquitur* may frequently be almost as difficult as establishing negligence directly; but, in the usual case, the plaintiff's burden on the negligence issue is substantially lessened by resort to the doctrine, and at least a psychological obligation is placed on defendant to offer rebutting evidence.[1147] Hence the doctrine is extremely popular with plaintiffs' attorneys.

There is no logical reason why *res ipsa loquitur* should not be applied in radiation injury situations, and a number of writers have

[1146] See Prosser 199-211. Additional conditions, that plaintiff eliminate the possibility of his own contributing conduct as the responsible cause and that the evidence be more accessible to defendant than to plaintiff, are also frequently listed. *Ibid.*

[1147] See the discussion of the procedural effect of *res ipsa loquitur* in the text accompanying notes 1197-1204 *infra*.

noted its possible application to such cases.[1148] Seldom, however, has more than a superficial treatment been given to the doctrine's possibilities in this context,[1149] and for this reason, a relatively extensive discussion of *res ipsa loquitur* is warranted here.

(1) Development

In the past quarter-century, practically all of our leading tort authorities have attempted definitive examinations of *res ipsa loquitur*.[1150] In spite of or perhaps because of this, confusion reigns to a considerable extent, at least as to the refinements of the doctrine. General unanimity among commentators and courts exists, however, on many of the major principles.

There is wide concurrence, in the first place, that *res ipsa loquitur* is an evidentiary rule which, at least in its original state, was based on common sense.[1151] Early English jurists recognized that in some instances, circumstantial evidence on the issue of negligence might be such that a jury reasonably could exclude every hypothesis other than that defendant's negligence was a proximate cause of the accident. Plaintiff was allowed in these cases to use *res ipsa loquitur* as a form of circumstantial evidence. This proved, of course, to be of great assistance to him.

One of the early statements, defining the cases in which *res ipsa loquitur* would be permitted, is found in *Scott* v. *London & St. Katherine Docks Co.* The court said:

> But where the thing is shewn to be under the management of the defendant or his servants, and the accident is such

[1148] See *e.g.*, Dunlap, "Medicolegal Aspects of Injuries from Exposure to X-Rays and Radioactive Substances," (footnotes by Smith) 11 Mo. L. Rev. 137, 150, n. 25 (1946); Hiestand, "Compensation for Injury to Life or Property," Lectures on Atomic Energy Industrial and Legal Problems (Univ. of Mich.) 216, 223 (1952); Seavey, "Torts and Atoms," 46 Calif. L. Rev. 3, 13 (1958).

[1149] Becker & Huard, "Tort Liability and The Atomic Energy Industry," 44 Geo. L. J. 58 (1955); Cable & Early, "Torts and the Atom: the Problem of Insurance," 45 Ky. L. J. 3, 17-20 (1956); Hutton, "Evidentiary Problems in Proving Radiation Injury," 46 Geo. L. J. 52, 64-69 (1957); Hutton, "Res Ipsa Loquitur and Actionable Radiation Injury," 25 Tenn. L. Rev. 327 (1958). All of these articles, in greater but mostly lesser degree, consider the applicability of *res ipsa loquitur* to the industry.

[1150] Malone, "Res Ipsa Loquitur and Proof by Inference—A Discussion of the Louisiana Cases," 4 La. L. Rev. 70 (1941); Prosser, "Res Ipsa Loquitur in California," 37 Calif. L. Rev. 183 (1949); Seavey, "Res Ipsa Loquitur: Tabula in Naufragio," 63 Harv. L. Rev. 643 (1950); Prosser 199-217; Harper & James §§19.5-19.12.

[1151] See *e.g.*, Prosser, "Res Ipsa Loquitur in California," *supra* note 1150 at 184-85.

> that as in the ordinary course of things does not happen if those who have the management use proper care, it affords reasonable evidence, in the absence of explanation by the defendants, that the accident arose from want of care.[1152]

Use of the doctrine was limited, therefore, to instances where the reasonable inference to be drawn from the facts adduced by the plaintiff was that the defendant, or someone for whose acts he was legally responsible, had been negligent in causing plaintiff's injury.

In the years that followed the *Scott* decision, this original "pure" statement of *res ipsa loquitur* became clouded by judicial efforts to identify the doctrine with responsibilities of carriers, since most of the cases in which it was applied involved railroads or other common carriers.[1153] It remained for Dean Wigmore to clear the air in this country with a careful definition of the situations in which the rule should be applied:

> (1) The apparatus must be such that in the ordinary instance no injurious operation is to be expected unless from a careless construction, inspection, or user; (2) Both inspection and user must have been at the time of the injury in the control of the party charged; (3) The injurious occurrence or condition must have happened irrespective of any voluntary action at the time by the party injured.[1154]

The fifty-odd years that have passed since Wigmore's statement first appeared have witnessed relatively unanimous judicial acceptance of his formula in determining when to apply *res ipsa loquitur*. Nevertheless, it is no more than a guidepost. The three conditions precedent to application have been gradually both eroded and expanded, and today, while commentators' catchphrases bear remarkable similarity to Wigmore's, the doctrine must be examined in greater detail if its contemporary nature and extent are to be pictured accurately.

In examining the conditions, however, it is important to keep in mind one traditional limitation on its use. *Res ipsa loquitur* traditionally is said to deal only with the question of proof of breach of duty in a negligence action. It has no application to actions based on intentional wrongdoings or to actions based on some form of strict liability. The doctrine is thought not to apply to any issue in a negligence action other

[1152] 3 H. & C. 596, 601, 159 Eng. Rep. 665 (1865).

[1153] See Prosser, "Res Ipsa Loquitur in California," *supra* note 1150 at 185-89 and cases cited therein.

[1154] 4 Wigmore, Evidence §2509 (1st ed. 1905).

than breach of duty, although some of the cases are beginning to corrupt the doctrine's purity in this latter regard.[1155]

There are two principal aspects of the *res ipsa loquitur* conditions. The first deals with the probability that the accident would not have happened without negligence; this is strictly a matter of the nature, scope, and breach of a particular duty to use care. We ask whether this kind of accident normally would happen without negligence; if not, the accident speaks for itself. This is the first condition precedent to the use of *res ipsa loquitur.*

The second aspect involves the second and third conditions precedent to application—*i.e.,* connecting defendant with responsibility for this particular accident and discounting plaintiff's responsibility. These inquiries must range beyond a strict duty analysis; indeed, the question becomes specifically one of causation-in-fact. Generally, on these issues the question is whether defendant most probably is the person to be held accountable for the accident, and this involves examination of the various other possible causes.

Thus, in a sense, this second aspect of the *res ipsa loquitur* prerequisites is really an inquiry as to cause-in-fact: Did defendant's action cause the injury? Typically, *res ipsa loquitur,* however, applies only to that part of the cause-in-fact question dealing with whether it was a particular defendant who set the injurious force in motion, but not whether a given type of force did in fact cause the particular injury which plaintiff suffered.

The difference between these two quite separate aspects of *res ipsa loquitur* has not always been kept in mind. The doctrine that the accident speaks for itself can be applied only when both are satisfied, and they call for fundamentally different evaluations of the facts. The reader should keep this in mind in analyzing each of the three conditions precedent.

(2) Prerequisites for Applying

(a) Nature of the Accident

Prosser rephrases Wigmore's first condition in these terms:

> The requirement that the occurrence be one which ordinarily does not happen without negligence is of course only another way of stating a principle of circumstantial evidence, that the accident must be such that in the light of ordinary

[1155] See text following note 1189 *infra.*

experience it gives rise to an inference that some one has been negligent.[1156]

At the extremes the appropriateness or inappropriateness of *res ipsa loquitur* under this definition is frequently obvious. If a boiler explodes,[1157] or impurities are found in a food product,[1158] there is a rather strong tendency to infer that someone has acted negligently. If, on the other hand, a car skids,[1159] or a person falls alighting from a public conveyance,[1160] it is eminently possible—absent contrary evidence—to conclude that no one has been negligent. Nevertheless, in many instances, the decision whether *res ipsa loquitur* is appropriate is of the "hairline" variety, ultimately turning on the subjective process of weighing the various possible causes of the accident. While there is considerable disagreement on the matter,[1161] it is perhaps fair for our purposes to generalize that courts will deem this first condition satisfied if it appears "more probable than not" that someone's negligence was a proximate cause of the accident.[1162]

In most instances involving ordinary accidents, the layman is fully qualified to decide this question of probability. Cases often arise, however, in which expert testimony would appear valuable in determining whether the incident is one in which negligence ordinarily would be involved. Because of an early conception that an accident could not speak for itself before a jury unless a layman were fully qualified to weigh the probabilities, some courts have excluded expert testimony on this issue.[1163] The commentators generally agree today, however, that experts should be permitted to give opinion testimony on the negligence probability issue in appropriate cases,[1164] and there is a growing trend in this direction.[1165] Expert testimony has been permitted in a variety

[1156] Prosser 202.

[1157] Kleinman v. Banner Laundry Co., 150 Minn. 515, 186 N.W. 123 (1921).

[1158] Dryden v. Continental Baking Co., 11 Cal.2d 33, 77 P.2d 833 (1938). *Cf.* Ash v. Childs Dining Hall, 231 Mass. 86, 120 N.E. 396 (1918).

[1159] Lithgow v. Lithgow, 334 Pa. 262, 5 A.2d 573 (1939).

[1160] Greeley v. Baltimore Transit Co., 180 Md. 10, 22 A.2d 460 (1941).

[1161] See *e.g.*, Jaffe, "Res Ipsa Loquitur Vindicated," 1 Buff. L. Rev. 1 (1951).

[1162] Prosser, "Res Ipsa Loquitur in California," *supra* note 1150 at 194. See discussion generally of test of probability, *supra* notes 923 ff.

[1163] For a modern reflection of this view, see Costa v. Regents of University of California, 247 P.2d 21 (Cal. App. 1952), *modified* 116 Cal. App.2d 445, 254 P.2d 85 (1953).

[1164] See Morris, "Res Ipsa Loquitur in Texas," 26 Tex. L. Rev. 257, 761 (1948); Harper & James §19.6.

[1165] See the supplementary opinion of the California appellate court modifying Costa v. Regents of University of California, cited at note 1163 *supra*. For a careful study of *res ipsa loquitur* cases in which expert testimony has been admitted, see Note, 106 U. Pa. L. Rev. 731 (1958).

of cases, particularly those involving complex or dangerous instrumentalities, both for the purpose of invoking *res ipsa loquitur* and for showing it inapplicable.[1166]

In addition to expert testimony, the question of probability undoubtedly is further affected by a considerable number of peripheral factors not involving the immediate circumstances of the accident. The safety record of an industry, for example, for certain types of operations can be of considerable importance. This is evident when one considers that, while in the early cases the courts held *res ipsa loquitur* inapplicable to aircraft accidents, there is today a growing acceptance of the conclusion that this type of incident is appropriate for imposition of the doctrine.[1167]

Another contributing factor affecting the balancing process may be the relationship of defendant and plaintiff. Once defendants in litigated cases begin to be held liable in certain fact situations, "the inference of negligence becomes all the easier to draw. As the precautions that defendant must take to avoid injury increase there is a proportionate increase in the number of available hypotheses involving carelessness." [1168] Thus in situations involving the carrier and his passenger,[1169] or the conduct of hazardous activities [1170] by the defendant, *res ipsa loquitur* is more likely to be applied than in typical negligence situations.

In the final analysis, these latter tendencies represent no more than specialized manifestations of basic policy decisions. It is inevitable in any subjective process that fundamental conceptions of policy will affect a court's decision, and the application of *res ipsa loquitur* is no exception. Thus if the nature of a person's activity is such that society demands that he assume an insurer's responsibility, *res ipsa loquitur*

[1166] See cases cited in Note, 106 U. Pa. L. Rev. 731, 736-37 (1958). See also discussion of X-ray cases in which *res ipsa loquitur* has been at issue, text accompanying notes 1213-1245 *infra*.

[1167] See McLarty, "Res Ipsa Loquitur in Airline Passenger Litigation," 37 Va. L. Rev. 55 (1951); Goldin, "The Doctrine of Res Ipsa Loquitur in Aviation Law," 18 So. Cal. L. Rev. 15 (1944); Note, 106 U. Pa. L. Rev. 731, 739-740 (1958).

[1168] Malone, *supra* note 1150 at 78. "It should be noted that this reasoning applies not only where there is a relationship which calls for great care, but whenever the dangerous nature of the defendant's conduct calls for commensurately great precautions. This does not mean (logically) that an inference of negligence may be drawn in all cases calling for great care, but that it may be more easily drawn from facts that otherwise might be regarded as equivocal." Harper & James 1084.

[1169] *E.g.*, Osgood v. Los Angeles Traction Co., 137 Cal. 280, 70 Pac. 169 (1902).

[1170] *E.g.*, Atlas Powder Co. v. Benson, 287 Fed. 797 (3d Cir. 1923); Cratty v. Samuel Aceto & Co., 151 Me. 126, 116 A.2d 623 (1955). See, however, the discussion of the explosives cases in text accompanying note 1258 *infra*.

becomes the "poor cousin" of liability without fault. A court unwilling to accept and apply the latter doctrine can often accomplish the same end result by easing the plaintiff's evidentiary burden with *res ipsa loquitur*.[1171] Conversely, when the defendant is engaged in an activity which, although it is potentially dangerous, society desires to foster, considerably less judicial enthusiasm for application of *res ipsa loquitur* should be encountered.[1172]

(b) "Control" by the Defendant

It would be erroneous to read literally Wigmore's second condition, that the instrument be in defendant's control at the time of injury. Myriad cases have presented fact situations in the past fifty years which do not involve exclusive physical control by defendant, but the application of *res ipsa loquitur* nevertheless is considered appropriate. The most famous of these are the "exploding bottle" cases in which the defendant normally relinquishes physical control long before the accident takes place. Indeed, the plaintiff himself usually has exclusive physical control at the time of injury. In these and similar cases, the concept of physical control at the time of accident ceases to effectuate its original purpose, and it generally is held sufficient that the defendant, or one for whose acts the defendant is legally responsible, had dominion over the instrumentality at the time when, more probably than not, the negligent act took place.[1173] Other difficult cases are solved merely by requiring that the defendant have the "right to control" as opposed to actual

[1171] "In a system where the adoption of an agnostic position will deny recovery to the accident victim (who has the burden of proof) the practical impact and importance of res ipsa loquitur has probably consisted in its tendency to invite or encourage the assumption of broad and doubtful postulates favorable to liability in many situations where the courts would otherwise be understandably reluctant to adopt them, at least without the aid of expert opinion. If the foregoing is true, the persistence and expansion of the 'doctrine'—in spite of trenchant and penetrating logical criticism—may well be attributable to the strong general trend towards strict liability and social insurance—a trend which is corroding a system of liability nominally based on fault. This would also account for the greater readiness to invoke the doctrine in certain kinds of situations, and within certain relationships, where the pull towards absolute liability has been particularly strong, or where the accident victim's burden of proof has been particularly forbidding." Harper & James 1079-81.

[1172] For this reason, a number of courts have declined to apply the doctrine to malpractice actions. See Note, "The California Malpractice Controversy," 9 Stan. L. Rev. 731, 737 *et seq.* (1957).

[1173] *E.g.*, Escola v. Coca Cola Bottling Co. of Fresno, 24 Cal.2d 453, 150 P.2d 436 (1944); Zentz v. Coca Cola Bottling Co. of Fresno, 39 Cal.2d 436, 247 P.2d 344 (1952); Weidert v. Monahan Post Legionnaire Club, 243 Iowa 643, 51 N.W.2d 400 (1952).

physical control,[1174] or by stating that defendant's duty to control is non-delegable in law.[1175] Prosser has termed the control concept as "pernicious and misleading" and suggests that the second condition precedent to application of *res ipsa loquitur* be phrased that "the apparent cause of the accident must be such that the defendant would be responsible for any negligence connected with it."[1176] This latter suggestion is broadly accepted by the commentators and the tendencies may be in this direction. The courts, however, generally display greater conservatism, and it is seldom, in a *res ipsa loquitur* opinion, that the control theory in some form is not at least mentioned by name.

A further aspect of the second condition, tacit in what already has been said, is the requirement of exclusivity. The control or right to control the harmful instrumentality by the defendant must be such that other causes may reasonably be discounted. These other causes need not be eliminated, but "their likelihood must be so reduced that the greater probability lies at defendant's door."[1177]

As was the case with the first condition, this process involves a balancing of probabilities. Here, however, the court deals in terms of probable *causation*-in-fact, whereas for the first condition, an entirely different evaluation—probability of *negligence*—was required. The general judicial approach to the causation question, nevertheless, should not diverge substantially from that indicated previously, and we may equally expect courts to bring similar policy considerations into play when the strict logic of *res ipsa loquitur* fails in a particularly appealing case.

The principal area in which such considerations have arisen is that involving multiple defendants. The plaintiff often may find it impossible to narrow the reasonable hypothetical causes of an accident to an instrumentality in the exclusive care of one person. At first glance, logically *res ipsa loquitur* cannot be applied, since the probabilities do not point toward the defendant. If, however, the plaintiff has discounted all causes but two or three, each independent of the others but all in some way within the defendant's legal responsibility, there is no

[1174] *E.g.*, Crump v. Montgomery Ward & Co., 313 Ill. App. 151, 39 N.E.2d 411 (1942); Robinson v. Atlantic & Pacific Tea Co., 184 Misc. 571, 54 N.Y. Supp.2d 42 (1945); Hogland v. Klein, 49 Wash.2d 216, 298 P.2d 1099 (1956).

[1175] *E.g.*, Motor Sales & Service, Inc. v. Grasselli Chemical Co., 15 La. App. 353, 131 So. 623 (1930). See cases cited in Prosser, "Res Ipsa Loquitur in California," *supra* note 1150 at 199-200.

[1176] Prosser 206.

[1177] Harper & James 1086.

reason for refusing *res ipsa loquitur*.[1178] True, causation is not proved precisely, even by probabilities, but the question is of no importance when the defendant is responsible for all the probable causes. Similarly, where there are several defendants operating in a joint enterprise, so that each is legally responsible for the others' negligent acts, the courts are willing to apply the doctrine to defendants as a group.[1179]

The difficult case, and the one evoking the most discussion, involves multiple defendants who operate independently. Even if the plaintiff is injured under circumstances making it probable that negligence was the cause of the accident, there may be more than one possible source of the negligence and more than one defendant possibly responsible for several sources. It may be that the plaintiff will be unable to give circumstantial proof indicating that the injury resulted "more probably" from any single defendant's negligence. For this failure to pin exclusive responsibility on one defendant in a case where the enterprise is not joint, is the plaintiff to be denied the use of *res ipsa loquitur?* Again, logically the answer must be in the affirmative, since application of *res ipsa loquitur* is predicated on the assumption that *at least* it is more probable than not that the defendant was responsible. When the plaintiff fails to sustain this logical burden, he should not be allowed the use of *res ipsa loquitur*—in the traditional view. In several decisions, however, this logic has been overlooked in judicial response to certain fundamental conceptions of social policy, and *res ipsa loquitur* has been extended beyond the original and logical limits, implied by "the situation speaks for itself."

The most significant of these cases is the California decision of *Ybarra* v. *Spangard*.[1180] During an operation for removal of an appen-

[1178] "There are, indeed, cases in which a showing that every instrumentality to which a given injury could with reasonable probability be attributed was under a defendant's management has been accepted by the courts as, for practical purposes, the equivalent of a showing that the defendant controlled the particular instrumentality that did cause it." Hubbert v. Aztec Brewing Co., 26 Cal. App.2d 664, 687, 80 P.2d 185 (1938). See also Judson v. Giant Powder Co., 107 Cal. 549, 40 Pac. 1020 (1895).

[1179] The famous case of Summers v. Tice, 33 Cal.2d 80, 199 P.2d 1 (1948), is illustrative of this point. In that case, plaintiff was on a hunting expedition with the two defendants. Plaintiff was shot in the eye with a single shotgun pellet after defendants had fired at a quail almost simultaneously. The court approved a trial court finding that "defendants were jointly liable and that thus the negligence of both was the cause of the injury or to that legal effect." *Id.* at 84. Without mentioning *res ipsa loquitur*, the court held that the circumstances of the injury required "that the burden of proof . . . be shifted to defendants. . . . They are both wrongdoers—both negligent toward plaintiff." *Id.* at 86. The court cited Ybarra v. Spangard, 25 Cal.2d 486, 154 P.2d 687 (1944) as authority. *Cf.* Cook v. Lewis, (Canada) [1952] 1 D.L.R. 1.

[1180] *Supra* note 1179.

dix, the plaintiff received an injury to his shoulder. The precise cause of the injury was unknown, but apparently it resulted from an external trauma occurring while the plaintiff was under anesthesia. The plaintiff brought suit against the hospital and all of the persons who had been present at his operation. He sought to apply *res ipsa loquitur* against each of them. The court held that the doctrine applied, stating:

> The control, at one time or another, of one or more of the various agencies or instrumentalities which might have harmed the plaintiff was in the hands of every defendant or of his employees or temporary servants. This, we think, places upon them the burden of initial explanation. Plaintiff was rendered unconscious for the purpose of undergoing surgical treatment by the defendants; it is manifestly unreasonable for them to insist that he identify any one of them as the person who did the alleged negligent act.
>
> The other aspect of the case which defendants so strongly emphasize is that plaintiff has not identified the instrumentality any more than he has the particular guilty defendant. Here, again, there is a misconception which, if carried to the extreme for which defendants contend, would unreasonably limit the application of the res ipsa loquitur rule. It should be enough that the plaintiff can show any injury resulting from an external force applied while he lay unconscious in the hospital; this is as clear a case of identification of the instrumentality as the plaintiff may ever be able to make.[1181]

While there is some indication in this language that the court's holding may have rested on a theory of mutual legal responsibility among defendants, the court purportedly goes on to apply *res ipsa loquitur* without reliance on this theory. In essence, the justification is merely that under the circumstances it would be "manifestly unreasonable" to call upon the plaintiff to identify the instrumentality or the person controlling it. The circumstances appearing significant to the court were (1) that the defendants had rendered the plaintiff unconscious for the purpose of performing an operation, (2) each had a duty of care toward plaintiff, and (3) each of them at one time or another had control of instrumentalities that could have caused the injury. Thus, the court reasoned, the defendants—rather than the unconscious plaintiff—were in a much better position to pinpoint the negligence and should be required to do so.

The *Ybarra* decision naturally has evoked considerable comment and

[1181] *Id.* at 492-93.

some criticism.[1182] Seavey, the principal critic, argues that it is error to "impose liability upon all the members of the group where it is evident that the harm was not the result of group action and that most of the members of the group were innocent of wrongdoing." [1183] This argument has considerable force if we assume that none of the defendants except the negligent party knows how plaintiff was injured, since the chances are that all defendants will be found liable by the jury. If, on the other hand, we assume that the defendants have knowledge as to the particular act of negligence, but are withholding it out of a sense of mutual protectiveness, Seavey's suggestion loses some of its vitality. The court could use *Ybarra* reasoning only to force out of defendants an explanation for the accident, in a situation in which very likely *they all do know* what happened. It need not hold innocent defendants liable, unless they refuse to testify as to what they know and did. If every defendant testified he was not responsible, all might still be held liable under the *Ybarra* rationale.

Prosser, while not specifically approving the result in *Ybarra,* justifies it on the ground of a "special responsibility for the plaintiff's safety undertaken by everyone concerned." [1184] He visualizes other situations in which courts might reach similar results because of the special relationship between the defendants and the plaintiff.

A second rationalization is possible. The court may have felt that while the relationship *inter se* of defendants was not sufficiently strong that the application of *res ipsa loquitur* could be based on a theory of joint venture, neither were the acts so completely separate that the court should not attach some group responsibility to their conduct. All of the participants in the operation, together with the hospital, could be said to have entered consciously on a course of conduct which included cooperation and mutual reliance in handling plaintiff. This conscious unity of purpose thus might have been, at least for the California court, a sufficiently strong substitute for exclusivity that the second condition could be said to be reasonably satisfied. It may be one way of forcing each of the group in effect to assume responsibility for the actions of all, and therefore force them to check on each other.

[1182] Commenting on the decision, see *e.g.,* Prosser, "Res Ipsa Loquitur in California," *supra* note 1150 at 223 *et seq.;* Harper & James 1091; McCoid, "Negligence Actions against Multiple Defendants," 7 Stan. L. Rev. 480 (1955). For a criticism, see Seavey, *supra* note 1150.

[1183] Seavey, *supra* note 1150 at 648.

[1184] Prosser 208. See also Prosser, "Res Ipsa Loquitur in California," *supra* note 1150 at 224.

If either this explanation or Prosser's analysis is accepted, we transcend traditional *res ipsa loquitur* concepts. The doctrine's prerequisite of causal probability in fact is left unsatisfied, since the plaintiff has shown only that (most probably) one of several persons, not acting in legal concert, acted negligently. He does not show *which* one. Theories of "special responsibility" or "moral interrelationship" on the defendants' part do not fill this logical vacuum, they merely circumvent it. Rather than attempting to fulfill the traditional conditions precedent to *res ipsa loquitur,* these theories proceed fundamentally on a different social policy. At most, this is "quasi" *res ipsa loquitur,* by which a convenient evidentiary tool is wielded liberally to effectuate an overriding conception of just result.

As Seavey points out, all of the defendants in *Ybarra* were probably insured.[1185] If we take this one step further and assume that all were insured by the same company,[1186] the *Ybarra* result becomes irresistible. In practical effect, when this is the case, the situation is no different as to ultimate liability (of the insurer) than if one defendant were responsible for several negligent forces. Although the plaintiff cannot precisely denominate the offending force, the courts need not be troubled, since the defendant (or the insurer) is going to be liable in any event. Reasoning such as this becomes another rationalization for *Ybarra,* if we can assume coverage for all by a single insurer, something that should be proved, not assumed.

Harper and James pass off the result as a manifestation of the general trend toward strict liability and social insurance.[1187] It is clear, however, that there may be many occasions on which a court would be willing to shift the burden of explanation to the defendant, yet refuse to impose strict liability. A traditional argument underlying imposition of *res ipsa loquitur* has been that the defendant has superior knowledge of the precise facts of the accident and that use of the doctrine will force these facts out.[1188] *Ybarra* certainly is a case of this

[1185] Seavey, *supra* note 1150 at 648, n. 15.

[1186] Hospitals normally obtain insurance for their "employees," which could often mean that all the persons present at an operation were covered by the same policy. See generally, McGibony, Principles of Hospital Administration 207 (1952); Hines, "Hospital Malpractice Liability Insurance," 34 Chi. B. Rec. 135 (1952).

[1187] "This is no retreat from individualizing the finding and treatment of fault, but rather a retreat from insistence upon fault (in accident law) and from the fiction that damage claims are paid out of the pockets of individual wrongdoers. It is simply a recognition both of the fact and the desirability of spreading accident losses according to the principles of insurance." Harper & James 1089.

[1188] The superior knowledge of defendant has frequently been listed as a prerequisite for application of *res ipsa loquitur.* While courts and commentators roundly discount

nature—one feels (and the court felt) a spontaneous urge to call upon the defendants to explain. This is different from holding the defendants strictly liable as a group. It is to be admitted that often, when only one defendant is involved, imposition of *res ipsa loquitur* has the same effect as applying strict liability. When there are multiple defendants, however, acceptance of the doctrine frequently may mean only that the defendants will be forced to introduce evidence against one another, particularly when they are insured by different companies. This evidence may be sufficiently strong that the logical exclusivity requirement eventually will be satisfied in reverse, *viz.*, causation is established after, not before, *res ipsa loquitur* is applied.

Ideally, faced with a situation like *Ybarra* where it is obvious that someone has been negligent, the court would like to see liability imposed on that one person and no others. Since plaintiff's evidence does not reveal that person's identity, the court must choose between two alternatives: (1) deny application of *res ipsa loquitur* and in effect nonsuit plaintiff; or (2) apply the doctrine and wait for defendants to fight out the causation issue. Choice of the latter alternative, of course, creates the risk that innocent defendants may be as ignorant of the precise facts as the plaintiff and thus ultimately may be held liable despite their innocence. In *Ybarra,* however, the strong possibility that the defendants actually had superior knowledge—plus the presence of insurance, the unconscious state of the plaintiff, and the special relationships involved—probably served to make the choice an easy, if logically questionable, one.

In any event, the *Ybarra* doctrine today is firmly entrenched in California malpractice law, having been applied on several recent occasions.[1189] The doctrine was considerably extended, however, in *Litzmann* v. *Humboldt County,*[1190] a lower court decision deserving special mention. There the plaintiff, a nine-year-old boy, found an unexploded aerial bomb on certain fairgrounds. The bomb exploded, and the plaintiff sustained severe injuries. There were two companies located on the fairgrounds who owned and had used such bombs, but there was no evidence indicating that one company more probably than the other was

such a rule today, there is no doubt that the suspicion of such superior knowledge is a strong factor influencing courts to apply the doctrine. Prosser 209-210.

[1189] See, *e.g.*, Bowers v. Olch, 120 Cal. App.2d 108, 260 P.2d 997 (1953); Seneris v. Haas, 45 Cal.2d 811, 291 P.2d 915 (1955); Leonard v. Watsonville Community Hospital, 47 Cal.2d 509, 305 P.2d 36 (1956).

[1190] 273 P.2d 82 (Cal. App. 1954), hearing granted Cal. Sup. Ct., Sept. 30, 1954, dismissed Nov. 16, 1954, noted in 3 U.C.L.A. L. Rev. 122 (1955) and discussed in McCoid, *supra* note 1182 at 497.

the source of the particular offending bomb. The companies were entirely independent of one another; there was in no sense the cooperative undertaking or conscious unity of purpose present in *Ybarra*. *Res ipsa loquitur* was held to apply even though it was clear that one of the defendants was entirely innocent.[1191] If *Ybarra* is read in its broadest terms without regard to the particular fact situation involved, *Litzmann* follows the pattern. In the latter case, however, there was not even a semblance of concurrence of action among defendants, and it would seem that *Ybarra* has been stretched further than the actual opinion would justify. Statements of law and of fact are so interspersed in *Ybarra* that it is somewhat difficult to say that the case stands for any particular abstract propositions,[1192] without reference to the facts on which the propositions are based.

Prosser's justification for the *Ybarra* decision, that of "special responsibility" on the part of the defendants toward the plaintiff, could perhaps be stretched to cover the *Litzmann* situation. This could mean that the possessor of any unusually hazardous instrumentality would run the risk of the imposition of *res ipsa loquitur* against him any time the plaintiff sustains injuries for which his instrumentality *might* have been a cause. Discounting the possibility of superior knowledge on the part of the particular potential defendant, such a broad doctrine would appear unwarranted.

Litzmann also might be said to stand upon another ground that under particular circumstances would not make imposition of *res ipsa loquitur* against independent defendants seem quite so unjust. The facts show that there were only two defendants, one of whom clearly was negligent, the other of whom clearly was innocent. In other words, the probability of one or the other being the responsible negligent person was "50-50." Although *res ipsa loquitur* is phrased logically in "more probably than not" terms, who is to measure the difference between "50-50" and "51-49"?[1193] Some might argue that since the probabilities are only a guess in a close case anyway, we should be willing at least to extend our thinking to the case where we *know* the probabilities are equal.

The theoretical difficulties with this type of argument are fairly obvious. In the traditional sense, the justification for having the *res ipsa loquitur* doctrine at all is the fact that we can reasonably denominate the defendant as the responsible cause. In essence, then, the question be-

[1191] Litzmann v. Humboldt County, *supra* note 1190 at 85.

[1192] See the quoted portion of the opinion accompanying note 1181 *supra*.

[1193] For a critical discussion of this type of approach to the probabilities question, see Jaffe, *supra* note 1161.

comes whether to take what was once a legitimate evidentiary tool and make it an instrument of social policy. Many courts would argue that even the "51-49" probability is not good enough to justify imposing *res ipsa loquitur* upon the defendant, for the reason that they do not feel qualified in such a close case to say flatly that the defendant's negligence is the more probable cause. These courts are acutely aware, it would appear, that our system of justice (for better or worse) requires the plaintiff to prove his case, or lose,[1194] Dilution of the *res ipsa loquitur* requirement to the "50-50 line" theoretically, if not practically, works contrary to this basic principle.

If *Litzmann*-type thinking is accepted for cases involving two named defendants, the next question is what to do when there are six or seven defendants or more, only one of whom is negligent and none of whom is connected in any way with his fellow defendants. This would be the case if, instead of two companies at the fairgrounds, there had been several. The plaintiff clearly cannot invoke *res ipsa loquitur* in its true sense, for our assumption is that he has no evidence which points more strongly to one defendant than any of the others. The "50-50 probability" thesis of *Litzmann* is unavailable, of course, and there is no room for argument, as in *Ybarra,* that the defendants engaged in a joint enterprise or conscious mutual undertaking to treat the plaintiff with care. Nor is there nearly as good a basis for assumption of superior knowledge on the defendants' part, since they are independent operators with no knowledge of how others acted or perhaps even of their existence. Indeed, application of *res ipsa loquitur* to these facts—"calling upon defendants to explain"—can only be predicated on an argument that the defendants are possessors of dangerous instrumentalities and probably are insured against public liability. This, of course, begins to sound like strict liability talk. But, in one sense, it goes much further than that: it eliminates the causation requirement from the plaintiff's cause of action as well. Assuming no superior knowledge on the defendants' part which eventually would force liability on the one negligent party, *Litzmann*-type thinking would make innocent parties—without proof of negligence *or* causation—liable for the acts of an unrelated wrongdoer. This is surely a curious result and not likely to be approved by too many courts or commentators. Any attempt to so "liberalize" the second *res ipsa loquitur* requirement is dangerous and improper.

[1194] The validity of our present scheme of tort liability, as applied to radiation injuries, is discussed elsewhere in this chapter. See text following note 1060 *supra.*

Ybarra may be justified on the ground of joint undertaking, or group responsibility, or revealing concealed common knowledge. The line between a joint venture and the concept of conscious unity of purpose that we may distill from the opinion necessarily is a hazy one. Can we not say that when the relationship between each defendant and plaintiff is such that the defendant's duty of due care also includes guarding the plaintiff from the negligence of the other defendants, this will be sufficient to satisfy a group unity requirement for multiple defendant cases? This stays within the legitimate extremes of the *res ipsa loquitur* doctrine since, although detailed causation is admittedly not proved, neither is such proof important, inasmuch as each member of the group is responsible for the others' misconduct.

If Prosser's "special responsibility" thesis is adopted, *res ipsa loquitur* can easily get out of hand. A court might find that all the fireworks companies on the fairgrounds owe nine-year-old boys special responsibility. Then *res ipsa loquitur* could be applied despite a lack of any other relationship among the defendants and, in effect, the causation requirement is eliminated.

As long as insurance is not compulsory for all business and professional enterprises and as long as all insurance is not derived from a single source, causation remains a legitimate element of a tort action. In taking what was once a logically justifiable evidentiary device and converting it into a lever for forcing evidence out of multiple defendants, the courts run the danger of eliminating causation as a prerequisite to recovery in this type of case. Probably not many courts would be willing to say, "We will shift the burden of going forward to defendants in the hope that their evidence, reluctantly divulged under the threat of liability, will narrow the cause-in-fact to the one responsible defendant; but if it appears from their evidence that their knowledge of the circumstances is no greater than plaintiff's, he must be nonsuited for failure on the general issue of causation." Courts are much more likely to apply *res ipsa loquitur* against independent multiple defendants on the breach of duty issue, in the sense that *somebody* was negligent, and upon the defendants' failure to pinpoint the source of negligence, permit the jury to find all the defendants liable, for "failing to rebut the inference of negligence," without further regard for the issue of causation-in-fact. Depending upon how one chooses his words, this process either eliminates causation or permits *res ipsa loquitur*—if we may still call it that—to solve the general causation issue as well as the breach of duty issue.

This is valid, of course, if plaintiff predicates his cause of action on a theory of group responsibility—he need trace negligence only to the group. However, if the plaintiff's case is such that not all the members of the group are responsible for the negligence, a mere tracing of causation to the group is insufficient. It should be insufficient whether done by direct evidence, or indirectly, by way of inference.

In any event, whatever one's conclusion as to the legitimacy of the *Ybarra-Litzmann* trend, the lawyer must be prepared to recognize clearly the existence of such deviations from a logical application of *res ipsa loquitur*. The device is logically used only when it is more probable than not that a particular legal entity is responsible for the negligence connected with an accident. When it is used without this foundation—either to force out evidence under a threat of liability or to impose liability because of overriding social conceptions—*res ipsa loquitur* is a different concept than that traditionally accepted by American and English courts.

(c) Eliminating the Party Injured

The final basic requirement for application of *res ipsa loquitur*, as stated by Wigmore and as generally accepted by modern writers, is that the accident must have happened "irrespective of any voluntary action . . . by the party injured." [1195] This is an obvious corollary of the second condition, that the defendant be responsible for any negligence connected with the accident. The plaintiff therefore must eliminate himself, as well as third persons, as reasonably probable causes before an inference of negligence through *res ipsa loquitur* is available against the defendant.

This does not mean, however, that the plaintiff must not have been an active participant when the accident occurred. Indeed, as in the exploding bottle and collapsing seat cases, he may be in exclusive control of the instrumentality. But it is sufficient for the plaintiff to show that he was using the instrumentality in an ordinary manner such that the inference of the defendant's negligence is still reasonably probable.[1196]

[1195] 4 Wigmore, Evidence §2509 (1st ed. 1905). Prosser states this condition: "The possibility of contributing conduct which would make the plaintiff responsible is eliminated." Prosser 199. This is logically a different issue than that of contributory negligence and must be demonstrated by plaintiff even in states where generally he is not given the burden of proof as to absence of contributory negligence. See Harper & James §19.8.

[1196] Prosser, "Res Ipsa Loquitur in California," *supra* note 1150 at 201-02.

(3) Procedural Effect

Should the plaintiff satisfy a court's conditions precedent to the application of *res ipsa loquitur,* the pertinent question becomes: What procedural advantage, aside from the fact that he is temporarily relieved from proving negligence directly, does the plaintiff gain from the doctrine? Initially, of course, he escapes the possibility of a nonsuit, but what then?

There is considerable disagreement among the courts on this question. The vast majority of American courts—supported by the commentators—hold that successful invocation of *res ipsa loquitur* creates an *inference* of negligence on the part of the defendant.[1197] This is an inference which the jury may or may not accept, as it chooses, just as the jury decides the weight to be given to other forms of circumstantial evidence. No legal burden is placed upon the defendant to introduce rebutting proof. His failure to do so will not result in a directed verdict against him, and the jury may even find in his favor upon completion of the case.[1198]

If this were the only effect of *res ipsa loquitur,* one might wonder why claimants' attorneys seek so tenaciously to bring it into every possible case. The answer lies in a general feeling about how juries react in negligence cases. Lawyers seem to feel that in the great majority of these cases all the plaintiff needs is to get beyond nonsuit, to place his case in the jury's hands; the vision of a rich, heavily insured defendant will do the rest. The end result, if this is an accurate description, is no different than if strict liability had been applied formally in the first place.

A minority view holds that *res ipsa loquitur* has an even greater effect on the procedural burden. Some courts say that it creates a legal *presumption* which, if the defendant does not offer some probative evidence to the contrary, will permit a directed verdict for the plaintiff once all other elements of a negligence cause of action are shown.[1199]

[1197] Prosser 211-12.

[1198] Sweeney v. Erving, 228 U.S. 233, 33 S.Ct. 416 (1913). In California, however, while the courts hold that application of *res ipsa loquitur* created only an inference of negligence, "in all res ipsa loquitur situations the defendant must present evidence sufficient to meet or balance the inference of negligence, and that the jurors should be instructed that, if the defendant fails to do so, they should find for the plaintiff." Burr v. Sherwin Williams Co., 42 Cal.2d 682, 691, 268 P.2d 1041 (1954). A procedural effect such as this, as we shall indicate, traditionally is reserved for the presumption. See text preceding note 1199 *infra.*

[1199] Prosser 212. Dean Prosser notes that this doctrine derives from early cases involving injuries to passengers caused by common carriers, where the latter had the

In addition, a few decisions have given *res ipsa loquitur* the effect of shifting the *burden of proof* from the plaintiff to the defendant, requiring that the latter show a preponderance of evidence in favor of non-negligence.[1200] Under the inference and presumption views, the burden of proof of course does not shift from the plaintiff, although the presumption view temporarily does shift the burden of going forward with the evidence to the defendant.

There is disagreement, as well, on the question of the effect to be given to evidence introduced by the defendant to show non-negligence. This depends, of course, on the effect originally given *res ipsa loquitur*. In states where application of the doctrine permits only an inference of negligence, the defendant can introduce no evidence and hope that the jury will find in his favor anyway, or he may introduce whatever evidence he has to show non-negligence.[1201] This normally will consist of proof of safety precautions taken in the particular manufacturing or operational process, and the jury will be free to weight the inferences suggested by this evidence against the original *res ipsa loquitur* inference. In presumption states, on the other hand, the defendant must provide probative evidence showing non-negligence or suffer a directed verdict.[1202] It is to be doubted, however, that the mere introduction of probative evidence will cause the presumption of negligence to disappear entirely from the case, as is often said to happen with presumptions other than that created by *res ipsa loquitur*.[1203] Finally, in those states in which the burden of proof is said to shift, the defendant himself must introduce enough evidence of non-negligence to sustain the ultimate burden of persuasion, *i.e.*, the evidence must preponderate in his favor.[1204]

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burden of proof on the negligence issue. *Id.* at 213. A controversy concerning the proper procedural effect of *res ipsa loquitur* has raged for years. *Id.* at 213, n. 2. See also Harper & James §19.11.

[1200] Prosser 212. For a decision going even farther than this position, see Thomas v. Lobrano, 76 So.2d 599 (La. App. 1954) discussed in some detail in text following note 1229 *infra*.

[1201] Harper & James §19.11.

[1202] "A presumption, in other words, gives to evidence an artificial effect over and above its logically probative effect. The difference is far more theoretical than real. Few defendants fail to offer some defense by way of explanation or rebuttal in litigated res ipsa cases. And if no defense is offered, defendant is usually gambling on a court ruling that the doctrine does not apply. He does not expect to win from a jury and almost never will. Plaintiff does not need a directed verdict and is ill-advised to move for one except under a procedure for reserving decision on such a motion until after verdict. For these reasons few of the cases which use the language of presumption actually deal with a situation where it would affect the result." *Id.* at 1101-02.

[1203] See McCormick, Evidence §311 (1954).

[1204] Harper & James §19.11.

b. In Radiation Cases

(1) Radiation Injury Characteristics

As indicated previously, there is no generic reason why courts should refuse to apply *res ipsa loquitur* to cases involving radiation injuries. On the other hand, certain characteristics of radiation injury will perhaps make application of the doctrine more difficult than in the normal tort actions. The obstacles posed by these characteristics will be most formidable when the plaintiff attempts to satisfy the second condition precedent, that of the defendant's responsibility. In view of the fact that there exists only limited (and in this respect, not very helpful) judicial precedent for application of *res ipsa loquitur* to radiation injuries, a brief reminder of the characteristics of radiation which will cause the most trouble is warranted.

First, ionizing radiation, unlike other forms of injurious force, cannot be detected by the usual senses.[1205] Unless an individual wears a film badge or similar device, or unless the event through which he receives radiation is so dramatically apparent that he cannot escape the realization, a person may be injuriously exposed without ever being aware that he is in danger. Any demonstration of defendant's "control," even in a loose sense, over the harmful instrumentality is obviously made more difficult when the plaintiff cannot, upon discovering his injury at a later time, pinpoint the incident of exposure. If the plaintiff has been subjected to more than one potential source of substantial radiation, less than all of which are within the defendant's control or responsibility, he may have an extremely difficult task in reasonably discounting other sources as probable causes.

This picture is further confused by a second consideration— the fact that even though the plaintiff may suspect that he has received radiation from a defendant's source, resultant injuries may not appear for years. Particularly is this true when the emissions are of low intensity, but periodically repeated.[1206] The greater the lapse of time between the defendant's act and discovery of injury by the plaintiff, the more difficult it becomes to conclude that the injury was caused by the defendant.

Proof of causation-in-fact becomes even more difficult when account is taken of the fact that a number of injuries caused by radiation—in-

[1205] See Chapter I, Section C. 4.

[1206] *Ibid;* Dunlap, *supra* note 1148 at 140; National Research Council (Report of Committee on Pathological Effects). The Biological Effects of Atomic Radiation, reported at CCH, Atomic Energy Law Rep. ¶4028.

cluding cancerous conditions—can be caused by other forces.[1207] To a considerable extent, scientists and medical men have established rational predictions of injury resulting from radiation,[1208] but this typically is a matter of greater likelihood of injury, not of known direct causal connection with a particular person's injury. This often means that the plaintiff must discount, besides emissions of radiation controlled by other persons, the remaining possible causes of the condition of which he complains.

Despite this rather bleak picture, one further characteristic of radiation may assist plaintiffs seeking to invoke *res ipsa loquitur*. In some respects, the effect of multiple and continuing radiation is cumulative in nature, so that each new radiation incident serves to aggravate latent injury potential.[1209] Let us assume that a plaintiff has received exposure from several sources in a given period of time. None of these sources emanates from the defendant. Their effect, however, has been cumulative, and when the defendant appears on the scene, the plaintiff's body tolerance for radiation is nil. The plaintiff receives just enough radiation from the defendant's instrumentality to result in perceptible radiation injury. He sues the defendant, and seeks to invoke *res ipsa loquitur*. Assuming the incident is one which ordinarily would not occur without negligence, can the plaintiff satisfy the second condition precedent—reasonably discounting those causes of injury for which the defendant is not responsible?

The answer apparently is "yes." It is not to the fact of the plaintiff's injury that *res ipsa loquitur* is applied—that is an entirely separate issue of proof. *Res ipsa loquitur* deals only[1210] with the questions of breach of duty: whether it can be said, more probably than not, that the circumstances indicate that the defendant has violated his duty to use due care in his relationship to the plaintiff. This being the case, it would appear that the plaintiff, to employ *res ipsa loquitur*, only must show that the defendant more probably than not was responsible for the single instrumentality charged to him. While perhaps not the exclusive cause of injury, the defendant's act is at least a cause-in-fact—it is a substantial factor. The exclusivity aspect of the second *res ipsa loquitur* prerequisite does not require that the defendant's negligence

[1207] See Chapter I, Section C. 4. e. (4) *et seq.*

[1208] Chapter I, Section C. 4.

[1209] See discussion of cumulative effect, *supra* Chapter I and discussion *supra* text following note 750.

[1210] N. b. discussion concerning use of *res ipsa loquitur* to obviate the causation-in-fact issue as well, text following note 1191 *supra*.

be the sole cause of the plaintiff's injury. Conceivably, *res ipsa loquitur* might be applied to the separate but contributing acts of several defendants—each of whom could be shown to have been negligent in his relationship with the plaintiff. Such a finding is not to be confused, however, with the *Litzmann* and *Ybarra* situations,[1211] where the probabilities indicated that only *one* of the named defendants in fact caused the injury. Here, to the contrary, the assumption is that the cumulative nature of radiation injury means that possibly more than one "negligent" radiation source, over a period of time, could concur in the ultimate injury. This concurrence should be sufficient basis for liability under normal tort rules.[1212] The plaintiff, therefore, while faced with the problems of non-detectability, latency, and unidentifiability in solving the question of probable cause-in-fact, need only establish that the defendant's radiation source was probably *one* cause-in-fact. *Res ipsa loquitur* is then presumably available.

(2) Precedent: The X-Ray Cases

Judicial consideration of the applicability of *res ipsa loquitur* to radiation injury accidents has been confined to malpractice actions for negligent use of X-ray machines.[1213] These decisions to some extent turn on the special physician-patient relationship, and their value as precedent for other nuclear energy enterprises must be discounted accordingly. Nevertheless, it appears likely that the medical use of radioisotopes may be one of the most fertile sources of future negligence litigation in the atomic energy area. The X-ray cases thus assume considerable importance, since there should be no appreciable legal difference between radiation injury induced by over-exposure to X-rays and that caused by other radioactive substances.

Regrettably no general rule of thumb can be distilled from the decisions either permitting or denying application of *res ipsa loquitur* to X-ray accidents. Unequivocal affirmative precedent favoring use of the

[1211] *Ibid.*

[1212] "If defendant's conduct was a substantial factor in causing the plaintiff's injury, it follows that he will not be absolved from responsibility merely because other causes have contributed to the result. Nothing occurs in a vacuum, and the event without multiple causes, numbered in the thousands, is inconceivable. In particular, the defendant is not necessarily relieved of liability because the negligence of another person is also a contributing cause." Prosser 222. See discussion *supra* text at notes 923 ff.

[1213] Most of the cases in this area are collected in the Annot., 41 A.L.R.2d 329, 355 (1955). A discussion of selected cases appears in Hutton, "Res Ipsa Loquitur and Actionable Radiation Injury," 25 Tenn. L. Rev. 327, 334 *et seq.* (1958).

doctrine exists today in at least six jurisdictions,[1214] and several other states have announced rules so similar in end result that they must be numbered in the "friendly" group.[1215] Application has been specifically denied, however, by the courts in nine jurisdictions.[1216] In three states—the best example being California—there appear to be irreconcilable conflicts among recent pronouncements, and no clear rule can be said to have evolved.[1217]

The over-all judicial disharmony cannot be justified solely on the basis of differing factual situations, although as will be indicated below, the facts of a particular case, particularly the amount of radiation received, may have considerable influence. Principally, differences rest on divergent judicial attitudes toward (1) the doctrine of *res ipsa loquitur* in general, (2) the nature of the physician-patient relationship, and (3) the peculiarities of X-ray accidents and the likelihood that negligence is responsible for radiation injury. In Michigan, for instance, the court has specifically repudiated the doctrine of *res ipsa loquitur* or its

[1214] *Illinois:* Holcomb v. Magee, 217 Ill. App. 272 (1920) and Johnson v. Marshall, 241 Ill. App. 80 (1926); *Kansas:* Emrie v. Tice, 174 Kan. 739, 258 P.2d 332 (1953); *Minnesota:* Jones v. Tri-State Telephone & Telegraph Co., 118 Minn. 217, 136 N.W. 741 (1912) and Holt v. Ten Broeck, 134 Minn. 458, 159 N.W. 1073 (1916); *Mississippi:* Waddle v. Sutherland, 156 Miss. 540, 126 So. 201 (1930); *Tennessee:* Lewis v. Casenburg, 157 Tenn. 187, 7 S.W.2d 808 (1928), later appealed 163 Tenn. 163, 40 S.W.2d 1038 (1931); *Texas:* Hess v. Millsap, 72 S.W.2d 923 (Tex. Civ. App. 1934) and Martin v. Eschelman, 33 S.W.2d 827 (Tex. Civ. App. 1930).

[1215] *E.g., Louisiana:* Thomas v. Lobrano, *supra* note 1200; *Virginia:* Hunter v. Burroughs, 123 Va. 113, 96 S.E. 360 (1918).

[1216] *District of Columbia:* Sweeney v. Erving, 35 App. D.C. 57 (1910), *aff'd* 228 U.S. 233, 33 S.Ct. 416 (1913); *Indiana:* McCoy v. Buck, 87 Ind. App. 433, 157 N.E. 456 (1927); *Maryland:* Streett v. Hodgson, 139 Md. 137, 115 Atl. 27 (1921); *Michigan:* Barnes v. Mitchell, 341 Mich. 7, 67 N.W.2d 208 (1954) and Facer v. Lewis, 326 Mich. 702, 40 N.W.2d 457 (1950); *New York:* Antowill v. Friedmann, 197 App. Div. 230, 188 N.Y. Supp. 777 (1921); *North Carolina:* Nance v. Hitch, 238 N.C. 1, 76 S.E.2d 461 (1953); *North Dakota:* Dolan v. O'Rourke, 56 N.D. 416, 217 N.W. 666 (1928); *Oklahoma:* Cooper v. McMurry, 194 Okla. 241, 149 P.2d 330 (1944); *Pennsylvania:* Stemons v. Turner, 274 Pa. 228, 117 Atl. 922 (1922).

[1217] *Arkansas:* Gray v. McLaughlin, 207 Ark. 191, 179 S.W.2d 686 (1944) (applying rule closely similar to *res ipsa loquitur*) and Routen v. McGehee, 208 Ark. 501, 186 S.W.2d 779 (1945) (denying applicability of *res ipsa loquitur* to this class of cases); *California:* Bennett v. Los Angeles Tumor Institute, 102 Cal. App.2d 293, 227 P.2d 473 (1951) (denying applicability for several reasons) and Costa v. Regents of University of California, *supra* note 1163 (assuming applicability of the doctrine); *Iowa:* Shockley v. Tucker, 127 Iowa 456, 103 N.W. 360 (1905) (applying doctrine akin to *res ipsa loquitur*) and Berg v. Willett, 212 Iowa 1109, 232 N.W. 821 (1930) (denying application); *Wisconsin:* Rost v. Roberts, 180 Wis. 207, 192 N.W. 38 (1923) (approving instruction on *res ipsa loquitur* or closely analogous doctrine) and Kuehnemann v. Boyd, 193 Wis. 588, 214 N.W. 326 (1927) (denying application in physician-patient context).

equivalent in malpractice cases and has seen no need for varying the precedent when it was faced with an action involving X-ray injuries.[1218] Several courts have similarly rejected *res ipsa loquitur* on the broad theory that the doctrine, which frequently in effect makes the physician an insurer against bad results, should have no application in malpractice actions.[1219] One of the more articulate courts of this group has stated its reasoning thus:

> To put upon the medical profession . . . such a burden as financial responsibility for damages, if injury or death results, without proof of specific negligence, would drive from the profession many of the very men who should remain in it. . . .[1220]

However one evaluates the validity of this argument (and many have disputed it),[1221] it is embraced by several courts and has not been limited to actions involving X-ray machines.[1222] It has potential, therefore, in any malpractice action.

The third and perhaps most significant justification for refusal to apply *res ipsa loquitur* in X-ray cases,—*i.e.*, that this is not the type of accident which would occur only if there were negligence—appears in several decisions.[1223] The basis of this objection is that a number of expert medical witnesses have stated that, because of the peculiar sensitivity of some persons to X-rays, radiation injury can take place during diagnostic or therapeutic treatment without neglect on the part of the administering doctor or technician.[1224] This is because sensitivity is not a characteristic which can be determined before administration of X-ray, but only becomes apparent from the patient's reaction to early

[1218] *E.g.*, Barnes v. Mitchell, *supra* note 1216.

[1219] *E.g.*, Streett v. Hodgson, *supra* note 1216, Cooper v. McMurry, *supra* note 1216.

[1220] Stemons v. Turner, *supra* note 1216 at 233.

[1221] It may be questioned whether professional medical men, who universally carry insurance against public liability, are deterred in great measure by legal doctrines (such as *res ipsa loquitur*) from attempting the more risky cures. For a protestation of contrary opinion, however, see *e.g.*, Morris, "'Res Ipsa Loquitur'—Liability Without Fault," 25 Ins. C.J. 97, 112-13 (1958).

[1222] See generally Morris, *supra* note 1221; Regan, Doctor and Patient and the Law §30 (2d ed. 1949).

[1223] Normally such a conclusion is limited to the facts of the particular case. Refusing application of the doctrine on these grounds, therefore, does not necessarily mean that the court would reject it if faced with more appropriate facts. *E.g.*, Nance v. Hitch, *supra* note 1216; Antowill v. Friedmann, *supra* note 1216.

[1224] See *e.g.*, testimony of experts in Nance v. Hitch, *supra* note 1216. See also Gray, 1 Attorneys' Textbook of Medicine, ¶71.37 (3d ed. 1958). But see Dunlap, *supra* note 1148.

exposures. Thus, while continuing applications of X-ray, after knowledge of super-sensitivity has been or should have been obtained, may constitute a specific act of negligence, it is possible to argue that a physician in many instances might be said to act with due care in administering treatment initially in small doses. In cases involving this latter type of fact situation, courts have been reluctant to apply the *res ipsa loquitur* assumption, *i.e.*, that the accident is one which ordinarily would not occur without negligence.[1225]

On the other hand, there are experts who discount the hypersensitivity argument and argue for application of *res ipsa loquitur* in the majority of cases involving diagnostic use of X-rays and even in some therapeutic use cases.

> It seems that diagnostic films properly made, considering the low voltage of the rays and the transient exposure required, should never result in burns; injury of the patient therefore raises an inference of negligence and the doctrine of *res ipsa loquitur* should be uniformly applied. . . . In case of therapeutic burns, on the other hand, one cannot say so confidently that production of a burn always proves negligence. . . .
>
> The factor of hypersensitivity of the patient is . . . much overstressed; furthermore, the exposure required in making diagnostic films ordinarily should not burn a sensitive individual and lastly, in cases requiring prolonged treatment, there is no reason why the physician should not determine for himself, by initial small dosage of irradiation, whether the patient is hypersensitive or not.[1226]

Even if a physician determines that a person is hypersensitive, the patient's disease may be so grave that the possibility of its cure or arrestment could warrant taking the chance of radiation burns. It would be difficult to argue that the physician, embarking upon this course of treatment, should be subjected to an inference that he was negligent, without more specific proof, should radiation injury result.

Courts approving application of *res ipsa loquitur* in X-ray injury cases have done so rather automatically. Decisions normally are limited to their facts, the court stating that under the circumstances, an inference or presumption of negligence is warranted.[1227] Almost invariably these "circumstances" have included expert testimony to the effect that

[1225] Nance v. Hitch, *supra* note 1216, is perhaps the best example of this approach, although there is admittedly conflict in the expert testimony on many of the points in controversy.

[1226] Dunlap, *supra* note 1148 at 150-51, n. 25.

[1227] Holt v. Ten Broeck, *supra* note 1214; Holcomb v. Magee, *supra* note 1214.

this particular burn could not have been made without negligence on the part of someone. While no absolute factual pattern emerges, the majority of these decisions involve the treatment of milder maladies during which the patient has suffered third-degree burns.[1228] These courts demonstrate a readiness to discount hypersensitivity as a source of plaintiff's injury, particularly if there has been a continuing course of treatment permitting defendant to have ascertained the condition.[1229]

The most recent decision of this variety is one which, while not applying *res ipsa loquitur* by name, applies a procedural theory of the same general cast. In the Louisiana decision of *Thomas* v. *Lobrano*,[1230] the plaintiff over a three-year period received therapeutic X-ray treatment for boils. She eventually developed serious radiation burns in the general area of application. Commenting on the fact that one of plaintiff's counts was predicated on *res ipsa loquitur*, the court indicated that it was incumbent on the defendant physician to show in a malpractice action that he possessed an ordinary degree of professional skill *"and that in applying that skill to the given case he used reasonable care and diligence along with his best judgment."* This, the court stated, "related" to the *res ipsa loquitur* rule. The court then went on to say:

> . . . [T]he burden in the instant case is upon the defendant physician to affirmatively establish his use of reasonable care and diligence, together with his best judgment, in his treatment of the plaintiff. . . . It follows as a corollary that *the defendant is also under the burden of negativing the many specific charges of negligence* or want of proper care.[1231]

This doctrine, it may be suggested, if "related" to *res ipsa loquitur* also considerably exceeds it in effect if it should be applied to radiation treatment cases generally and is not limited solely to the rather peculiar facts of the *Lobrano* case. *Res ipsa loquitur* in theory is predicated on the assumption that, although the plaintiff cannot show specific acts of

[1228] *E.g.*, Emrie v. Tice, *supra* note 1214 (severe burns over large area resulting from removal of wart on ear); Thomas v. Lobrano, *supra* note 1200 (applying strong presumption of negligence where severe burns resulted from treatment of boils); Jones v. Tri-State Telephone & Telegraph Co., *supra* note 1214 (severe burns after diagnostic treatment); Waddle v. Sutherland, *supra* note 1214 (treatment for eczema caused burns so severe as to necessitate amputation of limb). But see Berg v. Willett, *supra* note 1217 (radiation burns from treatment for ringworm, doctrine not applied) and McCoy v. Buck, *supra* note 1216 (severe burns from treatment for eczema, doctrine not applied).

[1229] Waddle v. Sutherland, *supra* note 1214; Lewis v. Casenburg, *supra* note 1214.

[1230] *Supra* note 1200.

[1231] *Id.* at 605. (Emphasis added.)

negligence, the probabilities of the situation, because of known circumstances of the accident, point to the fact that defendant has been negligent. The burden of proving negligence except in a very few states,[1232] remains with the plaintiff. Under the broad language of the *Lobrano* case, however, the burden of showing due care in a malpractice action in Louisiana is automatically on the defendant. The apparent assumption, without contrary proof, is that the defendant has been negligent. This is not an instrument of logic, but solely one of policy, made all the more dramatic by the Louisiana rule permitting direct action against the insurer as a named defendant.[1233] If followed, the *Lobrano* reasoning will mean that in Louisiana the physician in many cases will be held strictly liable for damaging results of his treatment.

Thomas v. *Lobrano* is seemingly the furthest extension of pro-plaintiff sentiment in the X-ray field. It has been remarked that the case promises to be a leading one,[1234] but such a conclusion is very questionable. Practically all courts show some deference to the awkward position of the physician, who works constantly with dangerous instrumentalities and must continually make hair-line decisions as to the best course of treatment. The courts are not likely to disregard this difficulty in future cases.

In addition, those courts which are willing to apply *res ipsa loquitur* to the X-ray cases do so at best on an empiric basis, and one may doubt that this rather hesitant approach can form the foundation for the long jump to the Louisiana doctrine. As a precedent outside Louisiana, *Thomas* v. *Lobrano* would appear to have little weight except perhaps as one more decision applying a doctrine similar to *res ipsa loquitur* in the X-ray cases. One also should not ignore the fact that the way in which the doctor kept, or failed to keep, his treatment records rather clearly indicated to the court (and reasonably so if the facts stated in the opinion are taken at face value) that the defendant frequently was very careless and hence he probably was negligent in this instance as well.

More significant, perhaps, are some of the distinctions which have been drawn in the decisions to indicate those instances in which *res ipsa loquitur* would or would not be applicable. Some courts are willing to apply the doctrine when X-rays are used purely for diagnostic purposes,

[1232] See note 1201 *supra* and accompanying text.

[1233] La. Stat. Ann. (1952) §22:655 (Supp. 1956).

[1234] Hutton, "Res Ipsa Loquitur and Actionable Radiation Injury," 25 Tenn. L. Rev. 327, 338 (1958).

but not in the case of therapy.[1235] This is explained principally by the fact that there is a much greater likelihood that injuries resulting from diagnostic treatment are the product of negligence than is the case in therapeutic cases. Relatively low radiation exposure is required for X-ray diagnostic photography, and it is felt that even persons allegedly hypersensitive to radiation should not be affected by the rays if they are applied with ordinary care.

A further distinction is sometimes drawn between instances in which radiation burns are localized at the point of treatment and those in which injuries cover an area larger than necessary for treatment. Courts are more willing to apply *res ipsa loquitur* in the latter case,[1236] because the probabilities of negligence appear stronger than when radiation is localized. With known techniques, physicians are assumed generally to be able to localize the place of application.

Two restrictions on the use of *res ipsa loquitur*—generally repudiated elsewhere—occasionally are voiced in the X-ray decisions. One recent California decision stated that *res ipsa loquitur* could be applied only when, as a matter of common knowledge, the accident was one which would not happen *ordinarily* without negligence.[1237] The court construed this test to mean that expert testimony was not admissible on this issue of probability. Such a construction has seldom been followed, however, and indeed, the decisions as to the applicability or inapplicability of *res ipsa loquitur* to X-ray treatment accidents almost invariably are based in part on expert testimony.

There also have been a few cases in which the courts have declined to consider the plaintiff's *res ipsa loquitur* count on another ground, *i.e.*, that he pleaded and introduced evidence to prove specific acts of negligence.[1238] Thus some decisions, which at first glance appear to repudiate *res ipsa loquitur* in the X-ray context, are based only on this technical procedural point. The more liberal modern attitude toward permitting alternative pleading generally has spelled the decline of this argument, but it is still alive in some jurisdictions.[1239] Practitioners seeking to invoke *res ipsa loquitur* in radiation cases would do well, therefore, to

[1235] Holt v. Ten Broeck, *supra* note 1214; Bennett v. Los Angeles Tumor Institute, *supra* note 1217.

[1236] Emrie v. Tice, *supra* note 1214; Martin v. Eschelman, *supra* note 1214. *Cf.* Hamilton v. Harris, 223 S.W. 533 (Tex. Civ. App. 1920).

[1237] Bennett v. Los Angeles Tumor Institute, *supra* note 1217. But see Costa v. Regents of University of California, *supra* note 1163.

[1238] *E.g.*, King v. Dotto, 142 Ore. 207, 19 P.2d 1100 (1933); Hess v. Millsap, *supra* note 1214.

[1239] See generally Harper & James §19.10.

make a preliminary check of local precedent to avoid the possible embarrassment of seeing their strongest argument rejected on a pleading technicality.

Despite the divergent courses followed and theories advanced by the courts in X-ray cases, it is possible to draw certain conclusions which may form a basis for prediction as to future judicial action in radiation cases. Of course some jurisdictions will continue to refuse recognition to *res ipsa loquitur,* either in all cases or in malpractice actions. The discussion which follows is predicated on the assumption that the court is willing to apply *res ipsa loquitur* "under appropriate circumstances."

Even with this assumption, the first conclusion perhaps must be a negative one: there is or should be a general presumption against the applicability of *res ipsa loquitur* to radiation accidents resulting from radiation treatment, particularly when radioactive isotopes are used. There are three justifications for this statement. First, experts generally agree that untoward results may be produced, particularly in radiation therapy when used for serious diseases such as cancer, without any lack of care on the doctor's part. In part, this is because, as one expert has stated:

> This field of treatment is still in its infancy. A doctor must proceed as best he can, and with the meager knowledge of this field available. Unfortunate results are bound to occur in spite of his best efforts. He cannot properly be held at fault if he proceeded in accordance with the practice used by other men of like ability in his community.[1240]

Even those experts, who feel that the science of treatment by X-ray is sufficiently developed so that the doctor knows what the possible results will be, nevertheless agree that taking the chance of severe radiation injury in the hope of arresting serious disease may be action commensurate with due care and good practice.[1241] There is much that is unknown about medical use of isotopes, but their use holds great promise and must not be stultified.

Further, it has been pointed out that not even expert radiologists can control with absolute certainty the amount of emitted radiation, so that excessive radiation may not always be the product of human error.[1242] Finally, a number of experts point to hypersensitivity as a possible

[1240] Gray, *supra* note 1224..

[1241] See Dunlap, *supra* note 1148 at 153 *et seq.* See generally, Comment, 30 So. Cal. L. Rev. 80 (1956).

[1242] Gray, *supra* note 1224 at ¶71.31. See Berg. v. Willett, *supra* note 1217.

source of radiation injury, even though due care has been exercised.[1243] There is a difference of opinion, of course, as to the validity of this last justification,[1244] but the lack of unanimity among experts is all the more reason for rejecting the flat assumption that *res ipsa loquitur* should apply to radiation injuries caused by the use of radioactive isotopes for medical purposes.

Given the case of diagnostic treatment, however, where proved good practice dictates the use of radiation which should not harm even the hypersensitive person, or given the therapeutic case in which the condition is mild but burns are severe, *res ipsa loquitur* becomes easier to apply. Likewise, if the doctor subjects his patient to a long course of treatment, but fails to test for reaction following early treatment, or if he administers further radiation when first-degree burns are apparent, the doctrine is more inviting in all but the most advanced malignancy or similar cases.

In brief, the more serious the results of the exposure and the less grave the patient's condition, the less attractive theories of reasonable hope of cure, uncontrollable radiation error, or hypersensitivity become. Experts in radiology have shown marked willingness to evaluate these various sources of injury in a given case, and the courts have displayed equal receptiveness to such opinions.[1245] This expert testimony, together with the lay reaction to defendant's conduct and plaintiff's condition, spell the ultimate fate of *res ipsa loquitur* in those jurisdictions where the doctrine is considered acceptable under proper circumstances.

(3) Application of Principles in Other Radiation Cases

It would be impossible to chronicle here all the potential accidents in nuclear energy operations and processes and then predict the extent to which courts may be expected to apply *res ipsa loquitur* in each situation. Such a study would require technical acumen beyond the scope of this discussion, since the all-important probability of negligence can be determined only through knowledge of the specific technical features of a particular operation. More valuable, perhaps, would be a brief summarization of the general considerations which are likely to influence a court faced with a radiation injury case. The court normally will be interested in the questions of probability of negligence and defendant's

[1243] *Ibid.* See also testimony of expert witnesses in Nance v. Hitch, *supra* note 1216.

[1244] Dunlap, *supra* note 1148.

[1245] In practically all of the X-ray cases herein cited, expert testimony was received on the issue of probability of negligence.

responsibility. As indicated before, these will be affected not only by a strict evaluation of the probabilities involved, but also by broader considerations of policy which some courts allow to replace a strictly logical approach in a given case.

(a) Negligence Probability

With the modern dilution of the "exclusive control" condition precedent, the judicial evaluation of Wigmore's first *res ipsa loquitur* condition (*i.e.*, probability of negligence) becomes the most significant obstacle to the attorney seeking to invoke the doctrine.

(i) Expert Testimony

Probability of negligence is likely to be most strongly influenced by the testimony of experts. As previously noted,[1246] at first courts were disinclined to accept expert opinion on whether or not a particular accident could have happened without negligence and was therefore appropriate for *res ipsa loquitur*. This hesitancy may be laid to the fact that in the beginning judges were willing to accept *res ipsa loquitur* only in the simple accident situation, *e.g.*, the falling brick or scaffold. Situations began to arise, however, involving more complicated instrumentalities not understood by laymen, but occurring under circumstances, after explanation by the expert, strongly indicating negligence to the lay mind. It soon became evident that for accurate appraisal of the probable causation of an accident induced by such instrumentalities, testimony of someone familiar with their operation was indispensable. Thus a significant increase in judicial willingness to accept expert opinion became discernible.

The use of experts to determine whether or not *res ipsa loquitur* should be applied to radiation incidents often is imperative. In the nuclear field, however, there is no justification for a court's *assuming* that it knows enough to determine if the probabilities of negligence are great enough to justify using the doctrine without *first* hearing expert testimony. There may be situations which experts will agree probably could happen only if there has been negligence, but this should not be guessed at by the judge or the jury unaided by experts. As greater experience is gained in nuclear operations it may become generally recognized that in certain situations the probability of negligence is as great as in the "exploding bottle" cases, but this is surely not yet true for most cases.

[1246] See text following note 1162 *supra*.

Assuming that strict liability will not be applied at least to certain types of small research reactors, particularly to low power and subcritical assemblies, is this the type of case in which *res ipsa loquitur* should be applied? If a reactor "burns up" [1247] after operating safely for several months in compliance with all safety requirements established by the AEC and other expert consultants, should the law assume or allow the jury to conclude that someone has been negligent unless the defendant comes forth with proof of lack of negligence? [1248]

It is true that under AEC regulations extraordinary safety precautions must be used in operating a reactor with its potentiality for harm. In the light of the fact that there is much to be learned about the nature and properties of the atomic nucleus it clearly would be negligence to fail to use such precautions. The AEC makes a finding as to each reactor licensed to the effect that it can be operated without undue risk to public health and safety, and this determination is made only after careful study by competent scientists and engineers. Do these facts justify an assumption that if an incident occurs it probably resulted from negligence? Should *res ipsa loquitur* be available since present knowledge indicates that the safety precautions make it unlikely that an incident will occur? Or should we say that the requirement of so many safety precautions indicates that unless there is evidence that the safety devices were by-passed, mere human error in operation could not be a logical explanation, but instead the incident must have happened because of some scientific fact not heretofore known or at least not fully understood?

Unless *res ipsa loquitur* is to be used simply as camouflage for what actually is strict liability, there are some situations in which there is no possible justification for imposing liability on the basis of an *assumption* of negligence. If an airplane should crash into a reactor and cause a burn-up and subsequent release of radioactive material into the atmosphere under adverse weather conditions, it is not realistic to say that the release was the result of negligence. The same is true if it happened to be an unusually large meteorite or an enemy missile or bomb which pierced the reactor shell, or an earthquake of completely unpredictable magnitude which caused a burn-up. These possibilities have been recognized, but scientists for government and industry have decided that the chances of these events taking place are so small that they should be

[1247] See generally Chapter II, Section A. 1., *supra*.

[1248] See incidents described, *infra*. Chapter IV See also report of a recent reactor incident at Idaho Falls, Idaho N Y Times, Nov. 29, 1958, p. 2, col. 7.

ignored rather than to require the extreme precautions necessary to preclude them. This is not negligence but deliberate choice, approved by responsible persons including government officials. If liability is imposed for consequent injuries, this is application of strict liability, not negligence rules.

These, however, are not the difficult cases. If the burn-up occurs when no such obvious and non-negligent cause is known, should it then be assumed that negligence is responsible? This question cannot be answered generally; rather the answer should depend on the many variables for each installation, including the development of the art, particularly as to safety precautions, which will change from time to time as experience is gained. What is non-negligent procedure today may become negligent in the light of new knowledge. Likewise, the converse is possible. Surely, *res ipsa loquitur* should not be applied automatically but rather only when the facts of a particular installation as to a specific incident at a given time are considered. Types of reactors and incidents should not be catalogued either as calling for or not calling for an application of the doctrine. If any generalization has validity at all, it might be that, while a more complicated reactor increases the chance that some negligence in procedure is the cause, the chances are much greater that something unforeseeable or at least unpreventable caused an incident. Perhaps the same can be said for reactors using new and relatively untried designs. If liability is to be imposed, it should be an honest application of strict liability, not an assumption of negligence.

While in general similar conclusions may be drawn with respect to industrial and medical uses of radiation other than from reactors, there are differences. In the first place, the amount of damage including the number of persons that might possibly be hurt is very much less, even for high level radioactive material. Secondly, the variety of materials and their radiation characteristics is great and the possible uses cover a very wide range. Lastly, the possibilities for unforeseeable incidents are much less with radioisotopes—we know so much more about the injury potential and what might happen to cause trouble than we do about reactors and what happens when neutrons interact with material. Several conclusions concerning the use of *res ipsa loquitur* possibly can be drawn from these facts.

Laying aside medical therapy cases, the safety procedures are much more standardized and consequently there is a smaller number of possible explanations should something go wrong. Likewise, the proper

procedures may be learned readily, although it may be difficult to get personnel to follow them. Undoubtedly this will lead to greater willingness of courts to apply an assumption of negligence rule. On the other hand, it would be unrealistic to require the presence of a trained safety officer whenever a radioisotope is being used because this will impede greatly the more extensive use of such materials, a program the AEC is now promoting vigorously. In many cases at least the level of radiation and the difficulty of carrying out safety procedures would not call for such precautions, and the expense would be prohibitive. This conclusion probably is sound for many industrial uses, but it may not be a realistic one for the radiation laboratory where high level sources are present and where disposal problems may be so great that extreme care must be taken and only a properly trained specialist can provide it.

With sealed sources of radiation now being used in many industrial processes, there may be little to distinguish cases involving the handling of such sources, *e.g.*, a leaking thickness gage,[1249] from normal product liability situations in which it is thought proper to assume that there was negligence if an accident happens.

It may be completely reasonable to apply *res ipsa loquitur* if someone is injured by a high-level cobalt 60 source in a research laboratory which is properly safeguarded. If there are electrical interlocks, special light signals, limited access by special keys available only to trained personnel, and requirements of maze-type construction and precautionary use of detection devices, it would seem almost impossible for accidental exposure to occur unless some human negligence intervened. Undoubtedly, there are other similar examples of cases in which it would be fair to adopt the *res ipsa loquitur* principle.

The necessity of offering expert testimony before applying the doctrine in isotope cases may not be nearly as great as in reactor cases; nevertheless in many cases conclusions should not be drawn without such testimony. The same probably is true of accidents arising during the transportation of radioactive materials. If the question of negligence turns on whether sufficient precautions were taken, including adequate warning signs, to advise an unsuspecting layman or even a professional rescuer of the danger, the jury would seem in an even better position than an expert to determine adequacy of precautions. If the

[1249] This does not necessarily mean, of course, that *res ipsa loquitur* can be applied. The requirements that defendant is probably responsible for any negligence connected with the accident and that plaintiff eliminate himself as a contributing cause still pose formidable obstacles

question involves a determination of whether there was sufficient shielding or a strong enough container to withstand the impact of a crash or other accident, then it would be unrealistic to assume negligence without expert advice.

In connection with radioactive isotopes, as in the reactor cases, it is impossible to list those cases in which *res ipsa loquitur* should or should not be applied. Many judgments of social policy should be left to the layman; but when a technical question of probabilities is involved, expert evaluation should be sought. The court which errs on the side of caution and refuses to permit the unaided jury to decide such cases will do neither the parties nor justice a disservice.

(ii) Accident Experience in Operations

Taking account of developments in aircraft accident cases, there is yet another pertinent consideration in applying *res ipsa loquitur* in radiation cases. An improving safety record for an industry or operation may result in an increased willingness in the courts to apply the principle.[1250] The logic behind this tendency is that, with increased technical knowledge and prevention procedures, the probability of an accident occurring without someone's having been negligent decreases considerably. It has been argued already that the fine safety record in reactor operations may serve as a "boomerang," opening the way for *res ipsa loquitur* with its concomitant decreased burden of proof for plaintiffs.[1251] This argument is tenuous at best. Its basic thesis—that a rare accident means negligence—is valid only if it is assumed that design and operating procedures have been perfected, *i.e.*, that from a safety standpoint at least, there are no substantial vacuums of knowledge and that compliance with established procedures by operating personnel almost certainly will prevent any accident. This assumption simply is not applicable to many phases of nuclear energy operations, particularly reactors. Scientists, engineers, and medical researchers admittedly are only on the threshold of understanding nuclear energy and its many ramifications. In addition, the safety record thus far spans considerably less than two decades and is based on the operation of relatively few reactors. This would not seem sufficient, either as to comprehensiveness of knowledge or extensiveness of experience, to justify judging the probabilities as to cause with sufficient accuracy to

[1250] See text accompanying, and authorities cited in, note 1167 *supra*.

[1251] Becker & Huard, *supra* note 1149 at 67. But see Hutton, "Res Ipsa Loquitur and Actionable Radiation Injury," 25 Tenn. L. Rev. 327, 340 (1958).

permit general application of *res ipsa loquitur*. It is not even accurate to draw the conclusion that, because there have been so few injuries in past operations, this means that accidents are not likely to happen. As Dr. C. Rogers McCullough, chairman of the AEC Advisory Committee on Reactor Safety, stated at the Geneva conference, there is "serious doubt that our skill and care is sufficient to prevent all [reactor] accidents. . . . [W]e are convinced that the record is better than we have a right to expect. . . . [C]olleagues in other countries have been somewhat less fortunate than we and this emphasizes our own conviction that we cannot expect perfection in this regard."[1252] In evaluating the likelihood of accidents, we must consider that the large reactors with which we hope to produce economical electrical energy will be much more complex and of less tested design than existing reactors.

(iii) Relationship of Parties

A third, and possibly more important, general consideration in dealing with *res ipsa loquitur* is the relationship of the parties. It has already been pointed out that a number of courts are reluctant to impose *res ipsa loquitur* in the physician-patient context.[1253] This reluctance stems from judicial recognition that sound medical practice often may suggest more than one course of conduct.[1254] Some treatments may carry with them great risk of untoward result yet perhaps also offer the only hope for complete cure or arrestment of the disease. Judicial doctrines which potentially second-guess a physician's reasoned choice among the courses open to him, without requiring specific showing of negligence, are certain to have a deterrent effect upon the progress of medical treatment techniques and knowledge. Thus, whenever courts are presented with cases involving the use of radioactive materials for the cure of human ills, this type of reasoning is likely to be utilized.

In a sense, the logic which emerges from the X-ray cases is likely to cut across the entire atomic energy industry when the question of *res ipsa loquitur* arises. There is reluctance to second-guess the physician who is faced with alternative courses of action, but more willingness to do so when it appears that the malady that he sought to cure was of a less dangerous nature. In other words, choosing the more dangerous, but also potentially more effective, course may more easily be termed negligence when a serious untoward result occurs from treatment for a

[1252] Reported in 4 BNA, Atomic Industry Rep. 324 (1958).
[1253] See text following note 1218 *supra*.
[1254] Dunlap, *supra* note 1148 at 153.

mild condition rather than a serious one. In essence, the process is one of weighing the possible end result against the personal health risk involved. Similarly when isotopes are being used commercially for an industrial purpose, *e.g.,* to determine the thickness or purity of some material, an accident in which a non-employee is injured by radiation is likely to be classified as appropriate for *res ipsa loquitur.*[1255] Commercial perfection of materials, the desired result, generally would be considered a less important end, certainly minor in significance when compared with the cure of disease in a human body, and thus would be less justifiable as a ground for risking radiation injury. Conversely, it might be less appropriate to apply *res ipsa loquitur* to an accident occurring during experimental nuclear energy studies undertaken to advance the art which is so important to national welfare—particularly if some exposure was unavoidable.[1256]

This particular policy decision is probably an unconscious one, however, and can be exaggerated in importance. Often it may be much more difficult to weigh the end against the risk than in the cases suggested here. But it is a consideration which should not be ignored, for it often is basic to a court's conclusion that an accident speaks for itself, although such considerations have no logical relationship to the statistical chance that certain accidents were caused by negligence rather than an unforeseen circumstance.

(iv) Dangerous Instrumentality

One final factor deserves mention. The statement has been made that courts tend to apply *res ipsa loquitur* more freely if the instrumentality is dangerous in nature.[1257] While this conclusion has received some support in judicial dictum and has obvious significance for reactor operators, it should be viewed with skepticism. A review of cases involving explosions of dangerous materials, in which the plaintiff has attempted to apply *res ipsa loquitur,* indicates a strong tendency among

[1255] If, of course, the local workmen's compensation schedule applies to radiation injury, the question of *res ipsa loquitur* is obviated. At the present time, however, there is serious question whether many of these schedules are set up to cover radiation injury adequately. See Part II, *infra.*

[1256] This would seem to be basis for refusing recovery under the Federal Tort Claims Act for damages arising out of the Texas City disaster; Dalehite v. United States, 346 U.S. 15, 73 S.Ct. 956 (1953). See discussion of disposal operation and vicarious liability, *supra* notes 297 ff.

[1257] *E.g.,* Hutton, "Res Ipsa Loquitur and Actionable Radiation Injury," 25 Tenn. L. Rev. 327, 340-41 (1958).

courts to reject the doctrine.[1258] Indeed, one finds no greater willingness to ignore other hypotheses of cause in these "dangerous instrumentality" cases than appears in cases involving less dramatic occurrences. Harper and James argue,[1259] however, that the more complicated and dangerous a machine or process becomes, the more likely it is that the defendant's negligence caused the accident. Apparently the logic of this argument is not nearly as irresistible as they believe.[1260] The mere fact that more parts, people, complications, or dangers are involved is significant in determining what precautions should be required; but it does not mean that the probability of negligence in a specific case is greater. If anything it could be argued that if the defendant is at all conscientious and sensible, probably he will be more careful than when the situation is more familiar, simpler, and less dangerous. Familiarity and low danger potential breed carelessness. While negligence may occur in more places or ways, there is an equally great if not greater increase in the chances that something not reasonably to be foreseen or prevented is the cause of an accident. The probabilities that an accident will occur have increased because of the number of people or parts. It does not follow that there is a greater chance that someone was negligent, except in the sense that the more people there are, the greater the possibility of negligence. This would be like concluding that, because there is a greater likelihood that a negligent collision will occur when there are 1,000 people driving cars than when there are only 100 doing so, this means that when a collision occurs while 1,000 are driving it follows that it was the result of negligence. The number of negligent collisions will increase, given enough chances for the rules of probability to work, but the probability that any one of the drivers will be negligent does not increase. If the precautions required by the standard of care in a particular setting are so high that normal persons cannot be expected to live up to them, then the standard, by hypothesis, is too high or the law is imposing absolute liability or a variation of it by making defendant show his lack of negligence. The situation does not speak for itself and *res ipsa loquitur* should not be applied. If the rule of liability is to be

[1258] See *e.g.*, East End Oil Co. v. Pennsylvania Torpedo Co., 190 Pa. 350, 42 Atl. 707 (1899); Carter Oil Co. v. Independent Torpedo Co., 107 Okla. 209, 232 Pac. 419 (1924); Stanolind Oil & Gas Co. v. Lambert, 222 S.W.2d 125 (Tex. Civ. App. 1949); Brooks v. United States, 98 F. Supp. 679 (E.D. N.C. 1951). See comparable conclusions as to vicarious liability in transporting explosives discussed in text following note 291 *supra*.

[1259] Harper & James §19.6, especially at 1084.

[1260] See *Id.* at n. 21 for their cute but completely uninformative and therefore unpersuasive answer to Prosser's difficulty in seeing the logic of the argument.

changed it should be done honestly and not camouflaged with a Latin phrase.

(b) Defendant's Control

The second condition precedent to application of *res ipsa loquitur*—that the defendant probably was responsible for the negligence connected with the accident—posed no difficulty in the X-ray cases. Treatment invariably was administered by the single named defendant or by a person for whom the named defendant was legally responsible. Seldom was there any difficulty in tracing the probable cause of the accident to the operation of the X-ray machine. As previously noted, usually the real question in these cases concerned the probabilities involved in Wigmore's first condition: Would the accident probably not have happened except for negligence? No case has been found in which the court's decision to accept *res ispa loquitur* turned on a concept similar to the reasoning in *Ybarra* or *Litzmann*. Nor has any case been found in which *res ipsa loquitur* was applied against the manufacturer of the X-ray machine or a component part thereof.

The existing plethora of these latter complicating factors in the X-ray cases does not mean, however, that the atomic energy industry can ignore their obvious implications. As has been pointed out elsewhere,[1261] *res ipsa loquitur* has been invoked successfully against suppliers of chattels and their component parts, where there is some reasonable thesis upon which the court can discount possible causes-in-fact controlled by third persons. The willingness of the *Ybarra* and *Litzmann* courts to apply the doctrine against multiple defendants where there was no legal responsibility relationship *inter se*,[1262] is of significance to the industry. Indeed, in *Nichols* v. *Nold*,[1263] the Kansas Supreme Court permitted *res ipsa loquitur* to be applied against the manufacturer, distributor, and dealer of a bottled beverage. For the designer or manufacturer of a reactor or its component parts, for the medical researcher who develops new therapeutic uses of radioisotopes, for the packager or shipper of radioactive materials, these judicial tendencies are extremely important. If the second condition precedent to the application of *res ipsa loquitur, i.e.*, control by the defendant, can be satisfied by fact situ-

[1261] *Infra* Chapter V, discussion of product liability.

[1262] This is at least one possible thesis for the result in Ybarra. See quotation accompanying note 1181 *supra*.

[1263] 174 Kan. 613, 258 P.2d 317 (1953). For a similar holding, see Loch v. Confair, 372 Pa. 212, 93 A.2d 451 (1953) noted in 27 Temp. L. Q. 238 (1953).

ations such as these, then the potential vistas of liability are broadened greatly.

One concrete example should serve adequately to illustrate the problem. Suppose that a reactor burn-up takes place, and the cause is traced to the fuel core of the reactor. The plaintiff may not be able to obtain evidence as to the preparation of the fuel by the processor, design of the core by the reactor designer, or operation by the reactor licensee. He is reasonably certain that one of these three persons, whom he names as defendants, is negligent, but he has no evidence to indicate *which* of the three. He can argue for application of *res ipsa loquitur* on two principal theories. First, he can claim joint enterprise or joint responsibility, thereby obviating the issue of specific causation-in-fact. Since, at least in some cases, each defendant will be held responsible for the errors of the others, the determination of which defendant is at fault becomes unnecessary.

Second, if this is not possible, he can fall back on the theory tacit in *Ybarra* and *Litzmann*. All the inducements for application of this doctrine are present: a totally innocent plaintiff, the probability of insurance, the knowledge that this insurance may stem from a single source,[1264] and the strong possibility that the defendants have superior knowledge. Faced with these facts, the California court almost certainly would be willing to throw the logic of traditional *res ipsa loquitur* to the winds and shift the burden of "explanation" to the defendants. The pull in this direction for other courts may be equally strong.

C. Insurance and Indemnity

1. Introduction

In the 1957 Anderson amendment[1265] to the Atomic Energy Act, Congress offered at least a partial solution to the gigantic third-party liability problem facing AEC licensees. In the worst imaginable case, property losses might run as high as $7 billion, with personal injury

[1264] The government insurance and indemnity program is constructed on a framework that provides for the reactor operator to obtain insurance for other persons connected with operation of the reactor. See text accompanying notes 1306 ff. *infra*. The fact that one policy insures all the persons potentially liable can be a strong argument, of course, for eliminating the specific cause-in-fact question from the case. Whether it is a legitimate argument, in view of our traditional reluctance judicially to recognize the fact of insurance at all, is another question.

[1265] Pub. Law. 85-256, 85th Cong., 1st Sess. (1957), 71 Stat. 576, 42 U.S.C.A. §2210 (Supp. 1958), amending the Atomic Energy Act of 1954, 68 Stat. 919, 42 U.S.C.A. §§2011-2281 (Supp 1958). Section references that follow are to the 1954 Act, as amended.

and wrongful death claims aggregating additional untold amounts.[1266] Neither licensees nor domestic insurers were inclined or equipped to meet such a risk, and it soon became apparent that some form of government action was necessary.

a. What the Amendment Does

Several possible solutions were offered to Congress. One was to limit liability of a licensee or contractor to an amount equal to twice the original cost of the reactor or to an amount equaling the total private insurance available. Each of these limitations would have left the potential public claims largely unsatisfied, and the plans were rejected for that reason.[1267] A second solution involved unlimited government indemnification for all liability, but this also was rejected for the reason that Congress was reluctant to undertake such an obligation with so little knowledge concerning the extent of its commitment.[1268] The AEC suggested a third program, by which the government would sell (for a premium) indemnity coverage in excess of the amount of private insurance available on the open market. The purchase of indemnity under this plan was purely voluntary, however, and the fear that licensees might not purchase sufficient additional financial coverage to protect the public, led ultimately to the abandonment of this scheme as well.[1269]

The insurance and indemnity plan finally enacted contains features drawn from all the suggested programs and closely parallels the idea embodied in the AEC program—government financial backing to supplement funds available from private sources. Private insurance, or "financial protection," is made mandatory in amounts prescribed by the AEC for all Section 103 and 104 licensees and may be required of all other licensees and AEC contractors up to the maximum amount of insurance offered by insurance companies.[1270] For those licensees or contractors of whom financial protection is required, the amendment grants: (1) limitation of liability to the amount of financial protection required plus $500 million, and (2) governmental indemnity, for a nominal charge, of $500 million beyond the level of required financial

[1266] Statement of Lewis L. Strauss at *Hearings before the Joint Committee on Atomic Energy*, Governmental Indemnity and Reactor Safety, 85th Cong., 1st Sess., p. 11 (1957) [Hereinafter cited as "Indemnity Hearings"].

[1267] H.R. 9802, 84th Cong., 2d Sess. (1956). See Note, 71 Harv. L. Rev. 750, 751 (1958).

[1268] H.R. 9701, 84th Cong., 2d Sess. (1956).

[1269] H.R. 11242, 84th Cong., 2d Sess. (1956). See Note, 71 Harv. L. Rev. 750, 751 (1958).

[1270] Subsection 170a.

protection.[1271] If damages aggregate more than the total of these two, third-party losses theoretically will lie[1272] where they fall and neither the indemnitee nor the federal government will be held to further liability.

b. What the Amendment Does Not Do

The general congressional intent is thus clear: to satisfy the interests of the nuclear entrepreneur and the general public, at a non-prohibitive price, through a combination of private insurance and indemnification by the federal government. Equally clear is the fact that, beside the limitation on liability and certain other less significant provisions to be discussed below, Congress in no way has attempted to affect substantive doctrines of liability as they have been and are to be developed by state courts for the atomic industry. The report of the Joint Committee on Atomic Energy accompanying the Anderson amendment states unequivocally:

> 1. Since the rights of third parties who are injured are established by State law, there is no interference with the State law until there is a likelihood that the damages exceed the amount of financial responsibility required together with the amount of indemnity. At that point *the Federal interference is limited to the prohibition of making payments through the State courts and to prorating the proceeds available.*[1273]

State courts, therefore, are left free, at least as to the usual tort damages, to impose upon licensees their own legal liability doctrines when adjudicating claims under the amendment, and federal district courts

[1271] Subsections 170c, 170e. "A system of indemnification is established rather than an insurance system, since there is no way to establish any actuarial basis for the full protection required. The chance that a reactor will run away is too small and the foreseeable possible damages of the reactor are too great to allow the accumulation of a fund which would be adequate. If this unlikely event were to occur, the contributions of the companies protected are likely to be too small by far to protect the public, so Federal action is going to be required anyway. If the payments are made large enough to insure that there is an adequate fund available, the operation of reactors will be made even more uneconomic. On the other hand, if, as the Joint Committee anticipates, there never will be any call on the fund for payments, the funds will have been accumulated to no purpose. Hence, in this instance it seemed wisest to the Joint Committee not to treat this as an insurance problem but to treat it as an indemnification problem." S. Rep. 296, 85th Cong., 1st Sess., p. 9 (1957). This is the report of the Joint Committee on Atomic Energy written to accompany the Anderson legislation, and it will hereinafter be cited as "Joint Committee Report."

[1272] Congress can probably be expected to augment the funds authorized by the amendment if a more serious nuclear incident develops. See Joint Committee Report 21, 22.

[1273] Joint Committee Report 9. (Emphasis added.)

sitting in diversity cases will apply the law of the state in which they sit. The controversies, therefore, concerning the application and extension of doctrines of strict liability, *res ipsa loquitur,* and the duty of manufacturers and suppliers, continue to be extremely important and have received detailed treatment elsewhere in this volume.[1274] It is only after the state laws establish legal responsibility under these and other relevant principles that the Anderson legislation comes into play as a framework for satisfying the defendant's liability.

It would be naive in the extreme, however, to fail to recognize that the *existence* of the Anderson amendment, as a practical matter, may have a profound effect on state liability doctrines. The simple knowledge that defendant-licensee is protected by a fund of perhaps $560 million is certain to affect the thinking of legislators, judges, and juries, whether or not we like this kind of reasoning.[1275] But this tendency is not to be confused with a notion that the amendment imposes strict liability, authorizes the use of *res ipsa loquitur,* or establishes a manufacturer's duty to the ultimate person injured. Congress clearly did not intend this; and the states are at liberty to apply their own substantive, procedural, and conflicts rules without regard to the amendment, at least for most cases.[1276]

There is no provision in the 1954 act or any of its amendments authorizing the AEC or any other federal agency to award damages for radiation injuries except for those arising from testing atomic weapons.[1277] Therefore, under the reasoning of such cases as *United Automobile Workers* v. *Russell* (allowing state awards of damages arising from union unfair labor practices) it is clear that the states are not precluded in general from determining their own damage rules.[1278]

[1274] See B6 of this chapter and Chapters 4 and 5. See also, Becker & Huard, "Tort Liability and the Atomic Energy Industry," 44 Geo. L. J. 58 (1955).

[1275] The problems of claim adjudication created by the Anderson amendment are discussed in Section C3 of this chapter.

[1276] Congress' specification as to types of injuries which do not come within the protection of the amendment, together with the limitation of liability given thereby, is certain in some instances to have an effect on state liability doctrines. Thus, as we shall see, one who demonstrates mere depreciation in land values from the presence of the reactor, or one who is injured outside this country, may not be able to assert a claim under the amendment even though perhaps state law would accord him a valid cause of action. See the suggestion that psychological nuisance damages are precluded, *supra* text following note 716.

[1277] See Section 167. See also discussion *infra* at notes 1290-92.

[1278] See discussion of this problem *infra* Part III, Chapter V at note 311. (United Automobile Workers v. Russell, 356 U.S. 634, 78 S.Ct. 932 (1958). The related question of the impact on state tort rules of compliance with federal health and safety standards is discussed *supra* Section B2b(2).

On the other hand, Congress in a sense was restrictive as to the state-established liabilities for which financial protection and indemnity would be available. In general,[1279] the Anderson amendment extends only to domestic public liability arising from the hazardous properties of radioactive materials. This eliminates numerous potential causes of action. Injuries abroad, damage to property caused in a normal non-nuclear accident during construction of a reactor, or damage to the licensee's reactor itself, for example, are not covered by the amendment. These are broad areas which clearly have been excluded, and there are many other refined and complicated questions of exclusion. One who seeks to act or advise under this amendment must familiarize himself with these questions, or run a dangerous risk not necessarily apparent at first glance.

This discussion is devoted, therefore, to a scrutiny of the amendment. Several analyses of the general type of risks covered have already appeared in print,[1280] and references will be made to them and to the legislative history in the course of the discussion. Some of the most troublesome questions have not been commented on at all, or have only been mentioned casually. To understand these matters it is necessary first to define and explain the risks for which protection is provided. Then will follow discussions of the nature of the indemnity, the extent and nature of financial protection required and offered, and, briefly, the limitation of liability. Finally, discussion will be directed toward a consideration of the administrative problems inherent in the process of claim satisfaction under the amendment, a vital problem *concerning which there must be some legislative changes.*

2. The Program in Detail

a. Nuclear Incident and Public Liability

The risks against which insurance and indemnity are provided are circumscribed by several definitions which become terms of art, the most important of which for our immediate purposes are "nuclear incident" and "public liability." Unless "public liability" arises from a

[1279] Generalizations expressed here will be discussed in detail below.

[1280] See especially Comment, 56 Mich. L. Rev. 752 (1958); Note, 71 Harv. L. Rev. 750 (1958). The best source of background material for dealing with the legislation is undoubtedly Atomic Industrial Forum, Financial Protection Against Atomic Hazards (1957). See also recent discussions of indemnity provisions in Atomic Industrial Forum, Nuclear Liability Insurance and Indemnity (1959); AEC Report on Indemnity Act and Advisory Committee on Reactor Safeguards, Joint Committee on Atomic Energy, 86th Cong., 1st Sess. (1959).

"nuclear incident" there is no governmental indemnity and no federal limitation of liability.

(1) Nuclear Incident

As defined in the amendment, a "nuclear incident" is

> . . . [A]ny occurrence within the United States causing bodily injury, sickness, disease, or death, or loss of or damage to property, or for loss of use of property, arising out of or resulting from the radioactive, toxic, explosive, or other hazardous properties of source, special nuclear, or byproduct material.[1281]

The report of the Joint Committee indicates that this definition "is designed to protect the public against any form of damage arising from the special dangerous properties of the materials used in the atomic energy program." [1282] The rather broad terms of this statement and the definition itself make it clear that Congress intended that the scope of the statute should be delineated liberally; nevertheless there are a number of apparent limitations.

The first major exclusion is express in the definition. A nuclear incident can occur "within the United States" only. Where both a radioactive discharge and the resulting injury take place outside this country, as where materials have been exported to Europe, the answer is definite: no protection.[1283] The problem is more difficult, however, when one or the other of these conditions is changed. If, for example, a reactor "burns-up" near Detroit and a person living in Canada is injured, that person logically should be protected since the nuclear incident took place "within" the United States, albeit causing damage in Canada.[1284] The joint Committee hedged on this question, however, saying that the problem would require further investigation when and if it should arise.[1285]

[1281] Subsection 110.

[1282] Joint Committee Report 16.

[1283] *Ibid.*

[1284] Contrary to the normal conflict of laws rule which posits a tort at the place of injury, the amendment fixes the site of a nuclear incident as the place where the incident occurs, and not where damage may be caused. Subsection 170e. See Joint Committee Report 22.

[1285] Joint Committee Report 16. The Atomic Industrial Forum report, on the other hand, concludes that the Anderson legislation covers both this and the situation in which an incident occurs abroad and causes injury in this country. See Atomic Industrial Forum, Financial Protection Against Atomic Hazards 61, n. 355 (1957). This theory is based on the statement, found elsewhere in the amendment, that the statute

In the same category, according to the Joint Committee, is the situation in which "there is any activity abroad which causes further injury in the United States."[1286] Presumably, if American special nuclear material exported to Canada caused a reactor "burn-up" there, and persons in this country were injured, Congress would want to consider the possibility of extending coverage to such persons at that time. The report does not state whether "activity abroad" refers only to American activity, or also includes a reactor operated by foreigners with foreign materials. It can be argued that Congress did not intend to extend protection to any persons other than American licensees. On the other hand, part of the reason for the act was to protect the American public as a whole, which suffers no lesser injury because the radiation emanates from a foreign source than from a domestic one. Congress' reluctance to deal with this problem in the amendment again seems to indicate a desire to consider any such incident at the time it happens, rather than making advance provision for protection.

Obviously, the restrictive geographic definition placed upon "nuclear incident" constitutes a deterrent to our nuclear materials export program, and would pose an even more substantial threat to eventual widespread overseas activity by American licensees.[1287] Without protection similar to that offered in the Anderson legislation, entrepreneurs are not eager to expose themselves to the unprotected risks that foreign nuclear development would involve. Congressional leaders are aware of this problem, but display understandable hesitancy to enact an indemnification program that would cover non-nationals all over the world, when the benefits of such a program to the American people to a great extent would be quite indirect. Alternative means of establishing international protection are now under careful study.[1288] Perhaps the most

covers "any legal liability" and therefore should encompass both cases. The Joint Committee Report indicates, however, that this phrase was included to remove time restrictions on claims, rather than for some other purpose. Joint Committee Report 16.

[1286] Joint Committee Report 16.

[1287] An excellent statement of the foreign problem was made by Stoddard M. Stevens of Sullivan & Cromwell at the Indemnity Hearings 191-202.

[1288] See Atomic Industrial Forum, Financial Protection Against Atomic Hazards, The International Aspects, Preliminary Report (1958). This study, conducted under the auspices of the Harvard Law School, examines the various means available for affording financial protection to American nuclear entrepreneurs abroad. Among those methods which have been suggested are: (1) extension of the indemnity scheme of the Anderson amendment to foreign operations; (2) permitting only limited access to American courts by foreign claimants; (3) insulation of assets through formation of independent subsidiaries abroad; (4) contractual arrangements

promising, and yet an arrangement most difficult to achieve would appear to be an international convention limiting the liability of nuclear entrepreneurs.[1289] There is precedent in the maritime and aviation areas for this type of international agreement, but obviously the problems of geographic scope and latent injuries offered by the dangers of a substantial reactor "burn-up" complicate the picture for a convention in the atomic energy field.

Accepting the fact that the Anderson amendment generally is limited to application in the United States, one must further consider some less well-defined limits on the statute's scope. These relate particularly to the types of injuries which are compensable. In its broadest terms, a "nuclear incident" involves a sickness or loss arising from the hazardous properties of nuclear materials. It may be asked whether this definition would cover damages for mental suffering caused by the apprehension of having a major power reactor operate nearby.[1290] In a similar vein, what of the case of the well-established private school whose entrance applications fall off sharply the year after a minor nuclear incident occurs at a facility in the general neighborhood? Are claimants entitled to compensation for such "losses" arising from "hazardous properties"? Does the phrase "loss of use of property" include the profits lost by a manufacturer who is deprived of the commercial power supplied by a reactor when the reactor suddenly "burns-up"?[1291]

These questions are not answered in the amendment, and one can only try to deduce congressional intention from the language of the "nuclear incident" definition and the general history of the legislation. The Joint Committee apparently contemplated one limitation: a mere

for indemnification by foreign purchasers; and (5) an international convention for limitation of liability. See also *Hearings before the Joint Committee on Atomic Energy*, Operation of AEC Indemnity Act, 85th Cong., 2d Sess., pp. 32 *et seq.* (1958).

[1289] Atomic Industrial Forum, Financial Protection Against Atomic Hazards, The International Aspects, Preliminary Report, pp. 47 *et seq.* (1958). The study points out that an international convention limiting liability will be of little value to the general public unless there is also some government assumption of responsibility for damages exceeding the liability to which operators and suppliers are limited. Any such international commitment of government funds will certainly mean that the convention will require considerable time for ratification. It would probably be necessary, therefore, to negotiate bilateral agreements as interim devices.

[1290] This question would become pertinent, of course, only if applicable state law also permitted recovery for such damage. This may often be a greater hurdle for claimants alleging mental suffering than is the "nuclear incident" definition itself. See discussion *supra* in text following note 716.

[1291] It is probable that this would not be compensable under insurance policies presently available to the industry. See text accompanying note 1356 *infra*.

drop in land values caused by the presence of a reactor is not intended to be compensable.[1292] From this clue and from a reading of the amendment as a whole, it perhaps is safe to say that coverage was intended for personal injury and property damage caused by actual radioactive contamination, rather than loss resulting indirectly from the presence or operation of a facility.[1293] Indeed, compensation in a hypothetical case of a manufacturer probably would not turn upon a reading of the definition at all but would be provided for in the contract between his company and the power utility. Undoubtedly many interpretive questions can be obviated by contrast, and it is only in the cases where contractual protection is not feasible that courts must turn to close scrutiny of the amendment.

(2) Public Liability

The second crucial term of art is closely related to the first. The amendment's requirement of financial protection and provisions for indemnification are against "public liability," which is defined as:

> . . . [A]ny legal liability arising out of or resulting from a nuclear incident, except claims under State and Federal Workmen's Compensation Acts of employees of persons indemnified who are employed at the site of and in connection with the activity where the nuclear incident occurs, and except for claims arising out of an act of war. "Public liability" also includes damage to property of persons indemnified: *Provided,* That such property is covered under the terms of the financial protection required, except property which is located at the site of and used in connection with the activity where the nuclear incident occurs.[1294]

Within this definition are limitations and exceptions which must be added to those suggested with respect to the "nuclear incident" definition. It is clear that the on-site property of an indemnitee used in connection with the activity is not protected by the amendment, but as pointed out later, independent insurance against such a hazard is avail-

[1292] Joint Committee Report 16, 17. The Report also indicates that the Committee did not intend to include in the definition of "nuclear incident" any "similar causes of action which may occur, namely, from the location of an atomic energy facility at a particular site." *Id.* at 17.

[1293] Such a limitation would appear to be a proper interpretation of the Joint Committee Report. *Id.* at 17. It also generally coincides with the limitation written into the available nuclear energy insurance policies. See note 1356 *infra* and accompanying text.

[1294] Subsection 11u.

able from private sources. It also should be suggested parenthetically that the word "indemnitee" includes more than just the licensee who signs an indemnification agreement. While this feature will be discussed later,[1295] it is mentioned here to emphasize the fact that *everyone* for whom indemnification exists under an agreement is denied a claim for damages for loss of his on-site property.

Off-site property belonging to indemnitees, however, is fully covered within the "public liability" definition, so long as the underlying insurance policy or other form of financial protection is equally extensive. The insurance policy currently approved for the nuclear industry provides such coverage.[1296] Thus it is possible that one who is at fault in causing a nuclear incident nevertheless may proceed, with respect to his off-site property loss, against the insurance and indemnity fund on as favorable a basis as injured third parties. The Joint Committee has indicated that this provision was inserted to protect universities operating reactors on their campuses,[1297] but the language of the definition does not limit protection to this type of situation. Whether a court would be willing to construe the statute more narrowly when faced with the case of a tortious indemnitee-licensee asserting a large (but credible) claim against the fund for lost profits from loss of use of off-site property on a par with innocent claimants is an open question. The question becomes a hard one when there are insufficient funds by way of insurance and indemnity to pay all valid claims. It is probable that the expression of congressional motive for insertion of the provision, together with the obvious equities, could open the door for a construction favoring claims of innocent third parties. In any event this would seem to control as against any contrary result under state law, if state law should call for no distinction between types of claims.

Two exclusions are explicitly stated in the definition. First, claims usually falling under workmen's compensation acts of employees of persons indemnified, who are employed at the site and in connection with the activity where a nuclear incident occurs, are not part of the public liability against which indemnity is offered. Congress felt that these claims could be satisfied adequately through existing legislation.[1298] That this may not always be the case is indicated in the discussion else-

[1295] See text following note 1306 *infra*.

[1296] Approved Form of Nuclear Energy Liability Insurance, 23 Fed. Reg. 6684 *et seq.* (1958). Such persons are covered by the policy, and off-site property is not listed as an exclusion.

[1297] Joint Committee Report 18.

[1298] *Id.* at 18, 19.

where in this volume of problems under the present workmen's compensation statutes.

The second express exclusion involves war damage. The Joint Committee explained that in the event of war, "damages would be so great and the task of proving causation so difficult that further congressional study would be needed. . . . [However any] single act of sabotage would be covered by the indemnification provisions of the bill if it could not be proven to be an act of war." [1299]

In both the "nuclear incident" and "public liability" definitions, there are such general phrases as "arising out of," "in connection with," and "at the site of," to delimit certain claims or losses which are intended to be either included or excluded from the protection of the act. These phrases, necessarily ambiguous in the final analysis, invite speculation as to their actual meaning, and one may be sure that they will pose difficulties on the outer fringes of intended coverage.[1300] It is doubtful, however, that the statute could have been drawn with greater specificity and still permit some liberality in construction to take care of the "hard case." Nevertheless, these broad phrases make the interpretive process extremely important to numerous claimants, and the potential problems inherent in a system which entrusts this process to myriad state and federal courts, permitting centralized control only at the enforcement of judgment level, are dramatically apparent.[1301]

b. Indemnification

With this brief picture of the risks to which the Anderson amendment protection is applicable, what is the protection offered to licensees and contractors? As indicated in the introduction, coverage normally will consist of private financial protection (syndicate insurance in the usual case) and government indemnification. The coverage of the latter

[1299] *Id.* at 18.

[1300] "This language obviously includes any incident which occurs on the site of the licensed activity, and the Committee Report specifically includes any mishap that may arise while radioactive materials are being transported to or from that site. Does the phrase 'in connection with the licensed activity' embrace an incident which occurs at the plant of the fuel elements fabricator or re-processor? While such an inclusion appears reasonable, can the language be further extended to cover an accident occurring in one of these independent plants arising out of work done for another customer (which has no indemnity agreement) but which is aggravated by fissionable materials on hand for use in the indemnified reactor? To state such questions is to emphasize that they are a matter of degree and must be determined on their facts as they arise." Comment, 56 Mich. L. Rev. 752, 759-60 (1958).

[1301] The problems created by this system are discussed in detail in Section 3a *infra*.

will coincide to a considerable extent with the terms of the proposed insurance policy approved by the AEC. In some instances, however, indemnity protection may be somewhat broader, and this state of affairs will pose problems as to the nature of actual coverage. To simplify consideration of these problems, it will be best to analyze first the more comprehensive protective device—government indemnification.

(1) Generally

The principal feature of the Anderson amendment without question is the government's offer of $500 million third-party liability protection as a stimulus to further activities in the nuclear energy industry.[1302] This protection, which takes the form of individual indemnification agreements, is available to all licensees and contractors who are required under the operation of the amendment to obtain private financial protection against a nuclear risk. It may even be available to those who are not so required.[1303] By the terms of these agreements, the government agrees to indemnify and hold harmless "the licensee and other persons indemnified, as their interest may appear, from public liability arising from nuclear incidents which is in excess of the level of financial protection required of the licensee."[1304] If, therefore, a particular licensee is required to obtain $60 million of private financial protection, the government will sign an agreement to protect him for another $500 million —or a backstop fund totalling $560 million public liability protection for third parties who may assert claims in the event of a nuclear incident.

As pointed out in the previous section, indemnification is provided against public liability only as that term is defined in the statute.[1305] Thus there is no coverage for on-site property losses to indemnitees, off-site property losses of indemnitees where private insurance does not also cover such losses, claims of employees properly covered under workmen's compensation plans, and war losses. Indemnity is provided only for "nuclear incident" injuries and damage, not for claims arising from some other type of activity at the atomic facility. Protection generally is limited to domestic incidents.

[1302] Subsection 170c. The AEC has promulgated a proposed regulation containing a general form of indemnity agreement. This form rather closely parallels the specifications of the Anderson amendment. 23 Fed. Reg. 6681 *et seq.* (1958).

[1303] The language of the amendment is not clear on the question of indemnity for contractors and materials licensees who are not required to obtain financial protection. See discussion in text following note 1311 *infra*.

[1304] Subsection 170c requires this language.

[1305] See Subsection 11u.

(2) Protective Scheme

Indemnification covers "the licensee and other persons indemnified." [1306] As previously indicated, only the prime licensee signs an indemnity agreement for a facility,[1307] but its protection extends to any other person who might be subject to public liability, including subcontractors, designers, independent contractors dealing with the prime licensee, and tortfeasors such as trespassers. This relatively unusual scheme of coverage was motivated primarily by the requests of insurers, who feared that any other system would lead to pyramiding of insurance at each facility.[1308] Rather than requiring insurance of each person potentially responsible for a nuclear incident, Congress permitted all but the prime facility licensee to gain protection from the agreement executed by the latter. Cost to the facility licensee of the additional coverage probably will be passed along to the consumer of the facility's product, if any, just as it would if each sub-contractor were required to obtain protection for his own operations.

Foreign to this analysis, however, is the trespasser who causes a nuclear incident. Although he has no contractual dealings with the prime licensee, he is as fully protected by the licensee's indemnity agreement as is the licensee himself. Thus the operator of an aircraft who negligently crashes into a reactor,[1309] causing a nuclear incident, is afforded $500 million indemnity. The reason for this particular feature of the statute is obvious. Congress had as one of its two primary objectives in enacting indemnity legislation the protection of the general public, and an innocent third person is no less irradiated because the incident is caused by a tortious stranger than by the licensee himself.

(3) Indemnity for Contractors and Materials Licensees

Analysis thus far has been predicated on the assumption that some financial protection would be required of the licensee and that the government indemnity would be given in addition thereto. For some licen-

[1306] Subsection 170c.

[1307] The AEC plans the same scheme for contractors. *Hearings before the Joint Committee on Atomic Energy,* Operation of AEC Indemnity Act, 85th Cong., 2d Sess., pp. 19-20 (1958).

[1308] "Having the agreement run to the benefit of any other person who may be liable will parallel the policies which the insurance companies are planning to issue. They, too, will be entered into with the licensee or prime contractor and will run for the benefit of any other person who may be liable." Joint Committee Report 17.

[1309] This hypothetical case is specifically mentioned in the Joint Committee Report, *ibid.*

sees and for government contractors, however, private financial protection is not mandatory but rests on the discretion of the AEC. Only facility operators under Sections 103 and 104 of the Atomic Energy Act are required to obtain financial protection. Materials licensees under Sections 53, 63, and 81 and Commission contractors are not so required unless the AEC requires financial protection.[1310] Thus far, these latter individuals have not been asked to show private financial responsibility.[1311]

If this is so, then the question immediately arises as to whether a licensee or contractor having no private financial protection can demand and obtain government indemnity coverage of $500 million? As to AEC contractors, by Subsection 170d the Commission is "authorized" to enter into indemnity agreements in which the Commission "may" require financial protection and "shall indemnify the persons indemnified . . . above the amount of the financial protection required," in the amount of $500 million. It would appear perfectly defensible to read this language *either* as authorizing the Commission to sign indemnity agreements only with contractors who have obtained financial protection or as authorizing indemnification of contractors, whether or not private financial protection is required. The Joint Committee Report is of no assistance in choosing the proper interpretation, and our only clue, for what it is worth, is the fact that the AEC signed indemnity agreements (without insurance) before the Anderson legislation was passed and has indicated its intention to do so under the new statute.[1312]

The statute is no more helpful with respect to materials licensees. Subsection 170a provides that financial protection "may" be required of such licensees in the discretion of the Commission, and that "whenever such financial protection is required, it shall be a further condition of the license that the licensee execute and maintain an indemnification agreement." Subsection 170c then states that the Commission, with respect to licenses for which it requires financial protection, shall agree to indemnify. Nothing in the amendment specifically authorizes the Commission to sign indemnity agreements when financial protection is not required, but neither is there provision to the contrary.

[1310] Subsection 170a.

[1311] Report by the Atomic Energy Commission to the Joint Committee on Atomic Energy on Operations under Section 170 of the Atomic Energy Act of 1954, March 28, 1958, reported at CCH, Atomic Energy Law Rep. ¶9571 (1958).

[1312] *Hearings before the Joint Committee on Atomic Energy,* Governmental Indemnity, 84th Cong., 2d Sess., pp. 76-85 (1956); BNA, Atomic Industry Rep. 4:29 (1958). See also *Hearings before the Joint Committee on Atomic Energy,* Operation of the AEC Indemnity Act, 85th Cong., 2d Sess., pp. 19 *et seq.* (1958).

Since the cost of indemnification under the amendment is nominal,[1313] an indemnity agreement without the cost of private insurance would be a real boon to contractors and materials licensees. During the hearings on the legislation, strong arguments were made in favor of mandatory financial protection for all contractors and licensees, and not just Sections 103 and 104 licensees.[1314] Thus far it appears that the Commission has not exercised its discretion to require financial protection of its contractors and materials licensees and, if it continues on this course, the question of whether it is nevertheless empowered to give indemnity becomes quite important. If the risks involved in the operations of AEC contractors and materials licensees are great enough to warrant the advocacy of their inclusion within the mandatory provisions of the amendment, they also would appear great enough to require that some form of protection be given the public immediately. In the case of contractors particularly, the Commission may be reluctant to impose the financial protection requirement since the cost of insurance undoubtedly would be passed along to the government,[1315] but this is no reason why the indemnity agreement should not be signed anyway, for the sake of the public and for the protection of the contractor or materials licensee. Since the statute can be fairly interpreted to permit such a practice, it is submitted that the more liberal construction should be applied and the AEC should follow the course it has already set with respect to contractors,[1316] thus providing indemnification for both materials licensees and contractors, even when no insurance is required.

c. Financial Protection

The $500 million government indemnity generally is designed to supplement third-party liability protection obtained from private resources in the form of "financial protection." We thus far have used this term as if it were self-explanatory in the nuclear industry context. This is far from the case, as an examination of the requirements of the act will demonstrate.

[1313] "The Commission is authorized to collect a fee from all persons with whom an indemnification agreement is executed under this section. This fee shall be $30 per year per thousand kilowatts of thermal energy capacity for facilities licensed under section 103. For facilities licensed under section 104, and for construction permits under section 185, the Commission is authorized to reduce the fee set forth above. . . . No fee under this subsection shall be less than $100 yer year." Subsection 170f.

[1314] *E.g.*, Indemnity Hearings 162-63, 185.

[1315] See BNA, Atomic Industry Rep. 4: 158 (1958).

[1316] *Id.* at 4 29.

(1) General Requirements

By Subsection 170a, each license for a production or utilization facility under Sections 103 or 104, and permits for the construction thereof under Section 185, must contain a condition that the licensee will obtain "financial protection" against public liability of such type and in such amount as the AEC may require. As indicated in the previous section, licenses for the handling and use of special nuclear, source, and byproduct materials also may contain such a condition, if the Commission deems it necessary.[1317] Financial protection may take the form of private insurance, contractual indemnity, self-insurance, or other proof of financial responsibility, or a combination of such measures.[1318] The Commission may not, however, require protection in excess of the amount available from private sources, currently some $60 million, and its discretion is further limited by a statutory provision that any facility capable of producing 100,000 electrical kilowatts or more must carry insurance in the maximum amount privately available.[1319]

(2) Educational Institutions

Soon after passage of the Anderson amendment, the AEC promulgated temporary regulations implementing the legislative provisions.[1320] Pursuant to its statutory authority, the Commission, *inter alia*,[1321] initially set the minimum level of financial protection at $250,000.[1322] Because it soon became apparent that this relatively low minimum figure would potentially force the AEC into the "small claims" business, the Commission thereupon proposed a draft amendment to the proposed

[1317] Subsection 170a.

[1318] Subsection 170b. The Commission recently reported that of 22 licensees required to file proof of financial protection, 12 have submitted insurance binders and one has elected to make a showing that he possesses adequate resources to provide the required amount of protection. Nine licensees claim immunity from tort liability and one is considering such a claim. Report by the Atomic Energy Commission to the Joint Committee on Atomic Energy on Operations under Section 170 of the Atomic Energy Act of 1954, March 28, 1958, reported at CCH, Atomic Energy Law Rep. ¶9571 (1958).

[1319] Subsection 170b.

[1320] Financial Protection Requirements and Indemnity Agreements, 10 C.F.R. Pt. 140 (Supp. 1958).

[1321] Other sections of the regulations deal with such questions as the permissible types of financial protection, proof of financial protection, Commission review of such proof, reports by licensees asserting immunity from liability, indemnity agreements, and exemptions. *Id.* at §§140.12-140.18.

[1322] *Id.* at §140.11. Financial protection was to be required at a rate of $150,000 per thousand kilowatts of thermal energy capacity authorized.

regulation by which the minimum level of protection required would be increased to $3 million.[1323] Criticism of this new figure immediately arose from reactor-operating educational institutions, who pointed out that a policy providing coverage for the required $3 million might cost as much as $24,000 annually, a sum too great for the operating budgets of most university reactors.[1324]

Many universities were at the same time faced with another related problem. Serious doubt was being expressed as to the authority of state universities to waive their immunity from suit as might be required under the terms of Subsection 170a of the Anderson amendment.[1325] Five out of six state universities claiming immunity for their reactor operations advised the AEC that they had neither the power to waive or modify such immunity nor authority to purchase public liability insurance.[1326] In some of these states, the prohibition against waiver was constitutional,[1327] so that mere legislation could not eliminate it were the Commission to so require.

To meet this awkward situation, and at the same time to relieve educational and research institutions from the prohibitive burdens of a $3 million financial protection requirement, the House in mid-1958 proposed the addition of a new Subsection 170k to the Atomic Energy Act. This provision stated that:

> k. With respect to any license issued pursuant to section 53, 63, 81, 104a., or 104c. for the conduct of educational ac-

[1323] See proposed amendment to 10 C.F.R. §140.11 (Supp. 1958), reported at BNA, Atomic Industry Rep. 54:31, 54:33 (1958). A further amendment has been more recently proposed, not affecting this particular provision but containing a draft indemnification agreement. See 23 Fed. Reg. 6681 (1958). Other provisions of the draft amendment revising §140.11 change the formula by which the required amount of financial protection would be determined. The level of protection between $3 million and $60 million would be determined by an empirical formula based primarily on the authorized power level of the reactor, the length of the fuel cycle, and the population density in the general area. For reactors having a rated capacity of 100,000 electrical kilowatts or more, of course, the maximum $60 million would be required, as specified in the Anderson amendment. Subsection 170b.

[1324] Communication from Director, Michigan Memorial Phoenix Project, Ann Arbor, Michigan. This figure does not include the cost of property insurance on the facility itself, which would probably amount to another $8,000 annually. *Ibid.*

[1325] It is probable that this type of activity would be held to fall under the aegis of sovereign immunity, absent legislative waiver, in the vast majority of our states. For a recent review of this question, see Comment, 42 Corn. L. Q. 540 (1957). See also Livingston v. Regents of New Mexico College of A. & M.A., 328 P.2d 78 (N. Mex. 1958).

[1326] Report by the Atomic Energy Commission to the Joint Committee on Atomic Energy on Operations under Section 170 of the Atomic Energy Act of 1954, March 28, 1958, reported at CCH, Atomic Energy Law Rep. ¶9571 (1958).

[1327] *Ibid.*

tivities to a person found by the Commission to be a nonprofit educational institution, the Commission shall exempt such licensee from the financial protection requirement of Subsection 170a. With respect to licenses issued between August 30, 1954, and August 1, 1967,[1328] for which the Commission grants such exemption:

(1) The Commission shall agree to indemnify and hold harmless the licensee and other persons indemnified as their interests may appear, from public liability arising from nuclear incidents. The aggregate indemnity for all persons indemnified in connection with each nuclear incident shall not exceed $500,000,000, including the reasonable costs of investigating and settling claims and defending suits for damage. . . .

* * *

(3) such contracts of indemnification, when entered into with a licensee having immunity from public liability because it is a State agency, shall provide also that the Commission shall make payments under the contract on account of activities of the licensee in the same manner and to the same extent as the Commission would be required to do if the licensee were not such a State agency.[1329]

This enactment, ostensibly providing indemnification by the federal government from the ground up for approved educational institutions, eliminated both the problem of large financial protection premiums and that of the inability of some institutions to waive their immunity and purchase insurance. No financial protection would be required for such facilities, and liability would fall only on the federal government under its $500 million indemnity provisions.

Objection was raised in the Senate, however, to federal assumption of indemnitor's liability from the first dollar up, the thesis being that this was too much like the federal government entering the business of private insurance.[1330] A compromise measure therefore was reached, whereby the House version remained untouched except for the insertion, in paragraph (1) of the subsection following the phrase "public

[1328] This language, taken together with the preceding sentence, appears to indicate that such institutions will be exempted from the financial requirement indefinitely, whereas indemnity will be provided only under licenses issued until August 1, 1967. It is probable, however, that Congress intends to re-evaluate the exemption as well as the indemnification provisions by the 1967 date.

[1329] H.R. 13455, 85th Cong., 2d Sess. (1958). Paragraph (2), omitted here, is merely repetitive of concepts discussed elsewhere in this discussion. The bill is accompanied by H. Rep. 2250, 85th Cong., 2d Sess. (1958).

[1330] 104 Cong. Rec. 14834 (1958).

liability," of the words "in excess of $250,000." Exception from financial protection requirements is given while government indemnity still would be provided, but rather than beginning with the first dollar, indemnity would begin only at the $250,000 level. Up to that point the institution itself would be responsible. For private universities and state educational agencies not claiming immunity, the initial liability span would be covered by "private insurance, suppliers' liability insurance, or special State procedures."[1331] The compromise bill was passed in August 1958.[1332]

Congress' decision refusing to indemnify non-profit educational institutions from the ground up, while it preserves the indemnity program as a purely supplemental protective device, still leaves unsolved the waiver of immunity problem so neatly obviated by the House measure. As enacted, the legislation makes no provision for public liability claims up to the amount of $250,000 damages when the facility at which a nuclear incident occurs successfully invokes sovereign immunity. To satisfy damage claims beyond that level, the $500 million indemnity will operate "in the same manner and to the same extent as . . . if the licensee were not such a State agency." For the "first" $250,000 of claims, however, some or all third-party claimants are certain to find their judgments not fully satisfied. Congress does not indicate whether the loss will be borne only by the first claimants to obtain their judgments, or will be divided *pro rata* among all the claimants who ultimately win judgment. While the latter course obviously is more equitable, it also means that no final settlement of the amount to which each claimant is entitled can be determined until all judgments are rendered.[1333]

As indicated, liability beyond $250,000 of state agencies successfully invoking sovereign immunity will be covered by government indemnity just as if the agency were a private institution. One technical criticism of such a statutory scheme is in order. The new provision contemplates that payments under this indemnity provision will be made pursuant to a contract of indemnity signed by the Commission and the indemnitee. One may legitimately ask under what authority does an immune agency sign an agreement of indemnity? Indemnity protection for one who is immune is an anomaly, to say the least; there is no need to be indemni-

[1331] H. Rep. 2585, 85th Cong., 2d Sess. (1958) (Statement of managers on part of the House of Representatives).

[1332] 104 Cong. Rec. 16076 (House of Representatives), 16207 (Senate) (1958).

[1333] See the discussion of similar problems arising under Subsection 170e, Section 3b(3) of text *infra*.

fied from non-existent liability. And if the agency is immune, whom does the claimant sue in order to obtain judgment? Certainly he cannot name an immune person as defendant. While the over-all congressional intent as to these questions is clear, courts undoubtedly will be forced to read the statutory language liberally to overlook the technical defects of the congressional scheme. Probably courts will merely find an unwritten authorization that the government itself be named as defendant and be liable under its indemnity agreement for $500,000,000 worth of claims, although this will require some verbal, if not mental, gymnastics.

A final aspect of the new provision, dealing with the type of institution to which its coverage extends, should also be mentioned. While the terms of the amendment restrict its operation to "nonprofit educational institutions," Congress has indicated that this term includes "privately owned and sponsored nonprofit educational institutions" as well as those operated under state funds.[1334] The language of the provision thus encompasses reactors at private universities, and this is said to be true even though the facility is used for "incidental nonprofit research . . . for outside organization and industries." [1335] Apparently excluded by implication are licensees using radioactive materials purely for medical or other philanthropic purposes (but not educational), although the equities in favor of exemption for this type of operation would seem to be just as compelling as for those installations already covered by the amendment.

(3) Federal Facilities

With respect to the immunity of federal agencies operating reactors, the AEC has acknowledged that these bodies are without authority to make a more extensive waiver of sovereign immunity than that provided for in the Federal Tort Claims Act,[1336] and that they are without

[1334] H. Rep. 2250, 85th Cong., 2d Sess., p. 3 (1958).

[1335] *Ibid.*

[1336] Report by the Atomic Energy Commission to the Joint Committee on Atomic Energy on Operations under Section 170 of the Atomic Energy Act of 1954, March 28, 1958, reported at CCH, Atomic Energy Law Rep. ¶9571 (1958). The Federal Tort Claims Act permits suit in tort cases where a private person under the same circumstances would be liable, except that "an act or omission of an employee of the Government . . . in the execution of a statute or regulation . . . based upon the exercise or performance or the failure to exercise or perform a discretionary function or duty . . . whether or not the discretion involved be abused" will not subject the federal government to liability. 62 Stat. 984 (1948), 28 U.S.C.A. §2680 (1950). This exception has been broadly construed, but the Supreme Court has distinguished the

authority to purchase policies for nuclear energy liability insurance.[1337] No mention of federal facilities is made in H.R. 13455 or its accompanying report, but it is possible that certain government facilities could be classified as a "non-profit educational institution" by the Commission. Instead of legislation exempting federal agencies from the insurance requirements altogether, however, the Commission at one time was considering a bill which would waive government immunity from tort with respect to claims rising from a nuclear incident caused by federally-operated facilities.[1338] The AEC recently has indicated, on the other hand, that it will enter into indemnity agreements with federal agencies without requiring them to obtain financial protection. These agreements, subject to the $500 million limitation on liability, will indemnify federal licensees and other persons who may be liable. The Commission concluded that requiring federal agencies to obtain financial protection "would not accomplish any useful purpose under section 170."[1339]

(4) AEC Contractors

As previously indicated, financial protection for AEC contractors is authorized but not required by Section 170. No limitations are placed upon the discretion of the Commission as to the criteria for, or amount of, such financial protection to be obtained by its contractors, perhaps because Congress was aware that the cost of any insurance ultimately would be borne by the federal government and therefore there was no need of establishing an equitably-rated standard. For this same reason,

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use of governmental discretion to *undertake* a given activity and the mechanical aspects of carrying out that activity. See Indian Towing Co. v. United States, 350 U.S. 61, 76 S.Ct. 122 (1955). "Two recent district court decisions have evidenced a conflicting approach as to how far the exercise of discretion extends in the process of testing atomic weapons. These cases indicate generally that if, *e.g.*, the alleged negligence of a federal employee is in the determination of safety standards, rather than their proper administration, the government will escape liability." Comment, 56 Mich. L. Rev. 752, 759 (1958), citing Bulloch v. United States, (D.C. Utah 1956 145 F. Supp. 824), and Bartholomae Corp. v. United States, 135 F. Supp. 651 (D.C. S.D. Cal. 1955).

[1337] Report by the Atomic Energy Commission to the Joint Committee on Atomic Energy on Operations under Section 170 of the Atomic Energy Act of 1954, March 28, 1958, reported at CCH, Atomic Energy Law Rep. ¶9571 (1958); *Hearings before the Joint Committee on Atomic Energy*, Operation of AEC Indemnity Act, 85th Cong., 2d Sess., p. 4 (1958).

[1338] Report by the Atomic Energy Commission to the Joint Committee on Atomic Energy on Operations under Section 170 of the Atomic Energy Act of 1954, March 28, 1958, reported at CCH, Atomic Energy Law Rep. ¶9571 (1958).

[1339] *Hearings before the Joint Committee on Atomic Energy*, Operation of AEC Indemnity Act, 85th Cong., 2d Sess., p. 4 (1958).

the Commission decided late in 1957 to omit the requirement of financial protection for contractors.[1340] This decision presently is being reconsidered in light of the fact that services of insurance groups for the handling and investigation of claims arising from nuclear incidents probably would not be available in case of injuries caused by contractors due to the disinclination or lack of authority of insurers to engage in settlements when they had no pecuniary interest therein.[1341] Subsection 170g imposes upon the AEC the duty to use private insurers' services to the maximum extent possible, ostensibly to avoid building a claims-investigation branch within the Commission itself and also, of course, to take advantage of insurance company know-how in this area. Costs of such services normally would be charged to the indemnitee, but in the case of an AEC contractor, the federal government would bear the ultimate burden. The Commission has expressed hope, however, that nuclear insurance may be made available on a retrospective rating plan " 'that will permit AEC to require its contractors to obtain nuclear insurance for damages caused by AEC contractors' " without bearing the burden of a high annual premium.[1342]

d. Financial Protection Available

Under the terms of Subsection 170b, the required financial protection may be furnished through private insurance, private contractual indemnities, self-insurance, or other proof of financial responsibility, or a combination of these means. While there are thus several alternative programs available to licensees, the vast majority of corporate and state licensees in fact have turned to private insurance for protection. In 1958 the AEC reported that only one licensee had elected to show that he himself possessed adequate resources to provide the required amount of protection.[1343] For the remainder, the only practically available sources of insurance were the syndicates formed in 1956 to provide third-party liability coverage for the industry.

These syndicates or insurance pools came into existence in response to the need for a policy adequate to meet the unusual risks involved in

[1340] BNA, Atomic Industry Rep. 4: 158 (1958).

[1341] *Ibid.; Hearings before the Joint Committee on Atomic Energy,* Operation of AEC Indemnity Act, 85th Cong., 2d Sess., pp. 21 *et seq.* (1958).

[1342] *Ibid.*

[1343] Report by the Atomic Energy Commission to the Joint Committee on Atomic Energy on Operations under Section 170 of the Atomic Energy Act of 1954, March 28, 1958, reported at CCH, Atomic Energy Law Rep. ¶9571 (1958). See note 1318 *supra.*

reactor operation. While licensees could boast a nearly unmarred safety record,[1344] the mere possibility was a gigantic risk for which to provide protection. Insurers have little or no experience upon which to base rate tables, but it was rather clear that any rate which was reasonable from the standpoint of the insurer would be grossly too large if no incident took place and grossly too small if a real disaster should occur.[1345] No single private company was equipped financially or was inclined to provide coverage in the face of such problems at any level approximating the desired amount. The obvious solution, if the government was to adhere to its normal policy of offering indemnity only when no insurance was available from private sources, was to turn to the pooling of insurers' resources.[1346] The insurance companies responded with three associations, two providing protection against the public liability hazard and the third against property damage to the licensee's facility.

(1) NELIA-MAERP Policy

One of the liability syndicates is the Nuclear Energy Liability Insurance Association (NELIA), composed of more than 130 insurance stock companies, which eventually will offer third-party protection to the extent of $50 million per nuclear incident.[1347] Supplementing the policy offered by NELIA is the further protection available from the Mutual Atomic Energy Reinsurance Pool (MAERP), which is expected to develop a capacity for an additional $15 million insurance, including reinsurance.[1348]

A tentative draft of a combined NELIA-MAERP policy was first promulgated in 1957.[1349] Certain provisions of this draft came under criticism, and the insurance syndicates undertook to draw a more satisfactory policy.[1350] In August 1958, the AEC published an amendment

[1344] See Chapter IV at summary following note 126 for a discussion of this record.

[1345] Snow, "Atomic Energy and Financial Protection," 24 Ins. Counsel J. 353, 358 (1957).

[1346] Discussion of these pooling arrangements is found *ibid.*, and in Thomas, "Can We Insure Against Liability from Nuclear Incidents?" 46 Calif. L. Rev. 14, 15 (1958). See also CCH, Atomic Energy Law Rep. ¶¶4043, 4044 (1958).

[1347] Press Release, Nuclear Energy Liability Insurance Association (Feb. 1, 1957), reported at CCH, Atomic Energy Law Rep. ¶4044 (1958).

[1348] Snow, *supra* note 1345.

[1349] Indemnity Hearings 100-107. The best discussion of this contract is found in Butler, "Liability Insurance for the Nuclear Energy Hazard," 60 Public Utilities Fort. 913, 917 *et seq.* (1957). See also Thomas, *supra* note 1346 at 16.

[1350] See, *e.g.*, letter from Nuclear Energy Liability Insurance Association officer, included in Joint Committee Report 10.

to its regulations issued under the Anderson amendment, approving the second NELIA-MAERP policy as one by which the financial protection requirement could be satisfied.[1351] Since undoubtedly this policy will be the most popular means by which licensees will insure against public liability, it warrants closer scrutiny.

It first should be noted that the approved policy extends only to the "nuclear energy hazard," *i.e.*, "the radioactive, toxic, explosive or other hazardous properties" of source, special nuclear, or byproduct materials.[1352] Injuries to which public liability coverage extends generally are the same as those specified in the "nuclear incident" definition of the amendment.[1353] The terms of the policy state, however, that continuing discharges in the course of transportation or periodically over a long period of time from a single facility amount to only one nuclear incident.[1354] This provision spells out the answer to a question which is left undecided by the Anderson amendment.[1355]

Protection for loss of use of property is restricted to instances in which the property is "injured, destroyed or contaminated" or withdrawn from use because of real or potential contamination.[1356] This limitation by its terms is narrower than the broad indemnity coverage for "loss of use of property," but as was indicated previously,[1357] judicial construction of the indemnity provision probably would circumscribe the latter in just about the same terms as those included in the policy.

Persons insured under a policy include the named insured (the prime licensee) and other persons with whom the prime licensee has entered into contractual relations concerning the facility.[1358] This clause is substantially the same as the "persons indemnified" concept written into

[1351] See 23 Fed. Reg. 6684 *et seq.* (1958). At the time of this writing, the AEC has issued a notice of proposed rule-making only. The proposed amendment includes the following statement: "The Commission will accept any other form of nuclear energy liability insurance as proof of financial protection, if it determines that the provisions of such insurance provide adequate financial protection. . . ." *Ibid.*

[1352] Approved Form of Nuclear Energy Liability Policy, §II C, 23 Fed. Reg. 6684 (1958).

[1353] Subsections 11 o, 11 u.

[1354] Approved Form of Nuclear Energy Liability Policy, Condition 4, 23 Fed. Reg. 6684, 6685 (1958).

[1355] Subsection 11 o.

[1356] Approved Form of Nuclear Energy Liability Policy, §IA (2), 23 Fed. Reg. 6684 (1958).

[1357] See text accompanying note 1293 *supra*.

[1358] Approved Form of Nuclear Energy Liability Policy, §III, 23 Fed. Reg. 6684, 6685 (1958).

the Anderson legislation, and it is to be doubted that coverage under the latter would be any broader than the insurance scope, as far as constructors, suppliers, and other contractors are concerned.

In the original tentative policy, there was no provision to include a trespasser or other non-contracting tortfeasor as a person indemnified. Thus presumably the owner of an aircraft crashing into a reactor would not have been able to claim insurance coverage under the NELIA-MAERP policy, although statutory indemnity protection would have extended to him.[1359] Such a situation would have seriously endangered the public, since government indemnification is merely supplemental to insurance, beginning where the insurance coverage ends. This problem was raised with the insurance syndicates, and in the approved policy, the definition of persons insured includes, besides the named insured, "any other person or organization with respect to his legal responsibility for a nuclear incident." [1360]

Exclusions under the approved policy, except for the limitation on the amount of insurance available, are not extensive.[1361] It must be noted, however, that on-site property generally is not protected, and coverage does not extend to nuclear materials being transported, handled, or stored.[1362] Off-site property of persons insured apparently is covered, and therefore off-site property will have insurance coverage and statutory indemnity coverage as well under the terms of the amendment.[1363]

Further exclusion is made in the proposed policy for all operations and facilities outside the United States and its territories and possessions, so that, in general, exporters and prospective operators of foreign reactors at present cannot expect to obtain insurance for their activities.[1364] On the other hand, it appears that persons in Canada or Mexico who might be injured by United States domestic incidents would be

[1359] Note 1309 *supra*.

[1360] Approved Form of Nuclear Energy Liability Policy, §III, 23 Fed. Reg. 6684, 6685 (1958). By this provision, an agency of the United States cannot be an insured party.

[1361] The principal exclusions to the standard policy are (1) for workmen's compensation; (2) for liability assumed under contract; (3) for the handling or use of any nuclear weapon; (4) war damage; (5) the reactor property itself; (6) damage to nuclear materials in the course of transport; and (7) damage arising from use of such materials outside the United States and its possessions. Approved Form of Nuclear Energy Liability Policy, Exclusions (a)-(h), 23 Fed. Reg. 6684, 6685 (1958).

[1362] *Id.*, Exclusions (f), (g).

[1363] See text accompanying note 1296 *supra*.

[1364] Approved Form of Nuclear Energy Liability Policy, Exclusions (h)(1), 23 Fed. Reg. 6684, 6685 (1958).

able to claim under the policy.[1365] This is broader coverage, of course, than Congress has been willing to acknowledge with respect to indemnity.[1366] The insurers have further suggested that insurance may be available for foreign operations sometime in the future,[1367] perhaps as soon as the domestic program begins to function smoothly.

Because of the risks involved, the absence of loss-experience tables, and the lack of a broad base of exposure to spread the risk,[1368] the syndicates are demanding premiums which at first glance appear excessively high. For the maximum insurance of $60 million, the licensee may be forced to pay as much as $260,000 annually.[1369] This rather staggering figure may be somewhat deceptive, however, because the syndicates have announced a plan of retrospective premium adjustment. By this program, if it develops after ten years that accumulations in the premium funds, as diminished by actual payments under the policy and other normal expenses and charges, indicate that the premium level is too high, *pro rata* adjustments may be made whereby considerable portions of the paid premium would be returned.[1370]

Application of the proposed policy is limited to bodily injury and property damage resulting from nuclear incidents which occur within the policy period and for which a written claim is filed not more than two years following expiration of the policy period.[1371] Either party

[1365] See Joint Committee Report 10; Testimony of Charles J. Haugh, Nuclear Energy Liability Insurance Association, Indemnity Hearings 97.

[1366] The Joint Committee has indicated that "further investigation" will be required on this question. See note 1284 *supra* and accompanying text.

[1367] See Butler, *supra* note 1349 at 920; Atomic Industrial Forum, Financial Protection Against Atomic Hazards: The International Aspects, Preliminary Report 37 (1958).

[1368] Thomas, *supra* note 1346 at 17.

[1369] Butler, *supra* note 1349 at 922.

[1370] "The premiums earned by the pools for the first ten years of operation will be accumulated. From these premiums will be deducted actual incurred losses and loss adjustment expense thereon. A specified provision for expenses and long-term reserves will also be deducted. The balance of the 10-year premiums will be accumulated in a special reserve. During the eleventh year of operation, a procedure of gradual refund of this reserve will begin. The portion of the reserve to be returned in the eleventh year will be that percentage of it which corresponds to the relationship of the first-year premium to the accumulated 10-year premiums. . . . This return will be made to the insureds who paid premium in the first year of operation and will be divided [pro rata]. . . . In the twelfth year, the process will be repeated. . . ." *Id.* at 924.

[1371] Approved Form of Nuclear Energy Liability Policy, §IV, 23 Fed. Reg. 6684, 6685 (1958). The inadequacy of the policy's coverage will be even more dramatic in some nuclear situations if a recent Arkansas modification of its statute of limitations should be adopted in other states. Act 140, Laws of 1959, reported at CCH, Advance Sess. Laws Rep. 139 (1959), provides that the statute is tolled "whenever the identity of

can terminate the policy by giving advance notice,[1372] and if such a step is taken, then any claimant who does not or cannot discover his injuries and report them within two years after termination cannot claim under the policy. Potentially, therefore, the requirements of NELIA-MAERP are even stricter than the already-inadequate periods of limitations which presumably would be applied by our state courts to radiation injury claims growing out of a nuclear incident.

There is no mention in the contract as to when coverage first can be obtained by a facility operator. The Anderson amendment itself undoubtedly anticipates that financial protection may be required of construction permittees before the facility is in operation,[1373] and any policy which would not be available as early in the process of construction as a radiation hazard is present, therefore, would appear inadequate.

The approved policy differs from the normal third-party liability insurance contracts available in that it is continuous, rather than for a fixed period such as a year. As indicated, however, it may be cancelled on notice.[1374] The policy further provides that the limit of liability stated in the policy itself is the total aggregate liability of the insurers, and that each payment by the companies shall reduce by the amount of such payment the limit of the companies' liability under the policy.[1375] When payments of claims have exhausted this total of liability, the policy terminates automatically and the insurer is discharged.[1376] Thus presumably if a nuclear incident occurs at an insured facility, and the third-party claims exhaust the insurance fund, the policy terminates

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the tortfeasor or tortfeasors be unknown," if an action against "John Doe" is filed. This might apply in the multiple defendant cases when it is not known which one of several possible defendants caused the injury, discussed *supra* in text beginning at note 875. It also might apply to situations in which a person suffering from radiation injury cannot determine the source until more than two years after his symptoms appear. If he can use the Arkansas statute to extend the period for bringing his cause of action this will be another claim not covered by the insurance policy. Under such a statute the plaintiff's attorney should file a "John Doe" as soon as he knows the injuries are caused by radiation, and then he can investigate possible defendants at his leisure. The Arkansas statute is too concise and leaves many important uncertainties.

[1372] Approved Form of Nuclear Energy Liability Policy, Condition 12, 23 Fed. Reg. 6684, 6686 (1958).

[1373] Subsection 170a specifically requires that construction permits under Section 185 shall contain a financial protection provision. The Joint Committee indicates that use of the term "license" throughout the Anderson bill is intended to include the construction permittee. Joint Committee Report 20.

[1374] Note 1372 *supra*.

[1375] Approved Form of Nuclear Energy Liability Policy, Condition 3, 23 Fed. Reg. 6684, 6685 (1958).

[1376] *Ibid.*

and the facility operator is without financial protection until he can obtain another insurance contract. Even if the insurance fund is not exhausted, it is reduced by the amounts paid out. One may speculate whether the requirement of financial protection under the Anderson amendment would prevent a reactor operator in such a position from conducting further activities. It could be argued that if NELIA-MAERP refused him another policy, then the maximum amount of financial protection would be zero, and he therefore should be granted indemnification from the ground up.[1377] On the other hand, the insurance group probably would offer further coverage for another premium.

It is anticipated that the larger facility operators will obtain policies from both NELIA and MAERP, each containing very similar provisions.[1378] In the event of a nuclear incident, the two syndicates will be proportionately liable on all claims. The ratio normally should be between four and five to one, with NELIA of course assuming the greater burden.

(2) Potential Gaps in Protection

Of the NELIA-MAERP policy, one legitimately may observe that in general its coverage is co-extensive with that of the government indemnity. There are, however, exceptions to the rule. Claims arising from a nuclear incident might be asserted more than two years after termination of the policy and thus fall beyond the policy's discovery period, yet still be within the period of limitations for government contractual liability. Some types of injury, such as lost profits, may be construed to be covered by the indemnity, but not by the private insurance. A clause of the insurance contract gives the insurer the right to suspend the contract for unsafe operations; if an incident should occur after such suspension but before the AEC closed down operations at the reactor, presumably the indemnity would apply but the insurance would not.[1379] Remote as these possibilities may be, they pose funda-

[1377] Article II, ¶2 of the AEC indemnity agreement says the licensee "will make all reasonable efforts to obtain such reinstatements" in case the insurance policies fall below the figure set for financial protection. 23 Fed. Reg. 6682 (1958).

[1378] The policies issued by NELIA and MAERP will be identical in terms and conditions. Thomas, *supra* note 1346 at 20. For this reason, available insurance is frequently referred to as "NELIA-MAERP" in this chapter.

[1379] Approved Form of Nuclear Energy Liability Policy, Condition 2, 23 Fed. Reg. 6684, 6685 (1958). This contingency was suggested in Note, 71 Harv. L. Rev. 750, 753 (1958). The new approved policy lessens the likelihood of this happening by requiring twelve hours advance notice to the AEC prior to suspension. Approved Form of Nuclear Energy Liability Policy, Condition 2. Presumably the same question could arise if the insured failed to pay the annual premium, although no express power of suspension is included in the policy for this breach.

mental questions concerning the government indemnity: Is it intended to operate as an extension of financial coverage *beyond* the level of required insurance, or is it also intended to reinsure the risk covered by the policy, *e.g.*, the first $60 million? If it is the latter, then an exclusion operating under the policy will merely mean that only a total of $500 million will be available for payment of claims within the excluded area, and that the government will pay from the ground up for such claims. This of course would be ideal for facility operators who could be assured always of full protection of their own assets from the attachment of creditors. It does not appear, however, that Congress has chosen this interpretation. The Joint Committee Report indicates that if, for some reason, the policy does not apply to the incident or to the claim, the burden must be borne by the insured himself, to the level of the required financial protection.[1380] From the latter point only will government indemnity operate. The remote but distinct possibility exists, therefore, that in spite of the insurance and indemnity program, a licensee may himself be ruined financially or seriously injured by a nuclear incident, and third parties may go substantially uncompensated.

(3) NEPIA Policy

Loss to the licensee, however, may be prevented at least in part under the third insurance policy offered to the atomic energy industry—protecting against property damage to the nuclear facility itself.[1381] This is not the "financial protection" against public liability required by the statute, and therefore it is not a condition precedent to obtaining government indemnity. Coverage is expressly limited to on-site property, thereby avoiding duplication with the NELIA-MAERP policy, and such property may be owned either by the insured or by other persons with whom the insured prior to loss has agreed to provide protection.[1382]

This policy is offered by the Nuclear Energy Property Insurance As-

[1380] "The protection of indemnification afforded by the Government under the agreement of indemnification is intended only to start when the damages exceed the face sum or the level of the financial protection required by the Commission. This means that if there are any exceptions in the scope of coverage of the underlying financial protection which may be applicable to a particular incident the indemnification does not pick up from the ground up but still picks up only after the amount of damage reaches the level of the financial protection required of the licensee." Joint Committee Report 21.

[1381] On-site property of indemnitees is, of course, not covered by the Anderson amendment. Section 11u.

[1382] NEPIA, Specimen of Policy, reported at CCH, Atomic Energy Law Rep. ¶4047 (1958).

sociation (NEPIA), another syndicate of stock companies, and is expected to provide facility operators protection up to $56 million.[1383] At the time the amendment was passed, such an amount was believed sufficient to cover the value of even the most expensive reactor, but this estimate may prove to be incorrect.[1384] In any event, it is to be doubted that Congress will be interested in providing supplementary protection by way of indemnity.

NEPIA insurance is not limited to damages arising from the nuclear energy hazard, but extends to all risks to the property of the insured by any peril.[1385] Of the numerous specified exceptions, however, the most important would appear to be gradual accumulation of radioactive contamination, neglect of the insured to use reasonable means to save and preserve the property when it is in danger of physical damage, theft losses, injuries to land, war damage, business interruption costs, and property removed from the premises for purposes other than preservation from danger.[1386] Considering the "all risk" nature of the policy, one can deduce that there is certain to be some overlapping with other already-existing types of property insurance offered by individual syndicate members, and no doubt endorsements similar to those anticipated in the liability area will be common provisions of normal property insurance contracts, excluding therefrom the nuclear risk.[1387]

e. Limitation of Liability

The last of the three essential protective features of the Anderson legislation is the limitation of liability of persons indemnified to an aggregate of $500 million plus the amount of financial protection required.[1388] As we shall see below,[1389] if claims arising from a nuclear

[1383] Thomas, *supra* note 1346 at 20.

[1384] The AEC has estimated that the cost of the entire reactor plant at Shippingport, Pennsylvania, including the fuel element fabricator, will be about $72.5 million. See AEC Twenty-Third Semi-annual Report, Progress in Peaceful Uses of Atomic Energy 436-37 (1957).

[1385] Thomas, *supra* note 1346 at 20.

[1386] NEPIA, Specimen of Policy, reported at CCH, Atomic Energy Law Rep. ¶4047 (1958).

[1387] Thomas, *supra* note 1346 at 21. Four states have passed legislation permitting damage from "nuclear reaction" to be excluded from coverage under standard policies. North Dakota Laws 1959, H. 652, CCH. Advance Sess. Laws Rep. 135 (1959); Nebraska Laws 1959, Leg. 111, CCH, Advance Sess. Laws Rep. 37 (1959); West Virginia Laws 1959, S. 192, CCH, Advance Sess. Laws Rep. 99 (1959); Idaho Laws H. 194, CCH, Advance Sess. Laws Rep. 207 (1959).

[1388] Subsection 170e.

[1389] Section 3c *infra* deals with problems of claim administration.

incident exceed these combined amounts, the indemnitee or the Commission may petition the appropriate district court for limitation. This action would prevent claimants from satisfying claims by execution on other property of the indemnitee, and would force them to accept only partial payment if total claims did in fact exceed the funds. If, of course, the insurance policy for some reason is found not to apply to the nuclear incident, the limitation is for the most part illusory, since claimants presumably would satisfy their judgments out of other assets belonging to the indemnitee, up to the level of financial protection required. From that point on, government indemnity and limitation would take over.

In adopting the closed-end indemnification concept, Congress did not altogether shut the door on claimants when aggregate judgments exceeded the level of limitation. On the contrary, it was quite clear that Congress would be willing to consider the appropriation of further funds when and if a major disaster occurred,[1390] if all claims were not substantially compensated. The closed-end indemnity simply reflects the legislators' reluctance to promise unknown amounts of federal funds for an event, the probability of occurrence and extent of which are speculative.

Potentially, however, the limitation prevents full satisfaction of a valid state judgment, and the constitutionality of such federal action may eventually be questioned.[1391] In the present state of Supreme Court authority, it is extremely doubtful that this provision could be said to violate the Due Process Clause of the Fifth Amendment. Over forty years ago, the court upheld a limitation imposed on recovery under workmen's compensation acts, on the theory that in return for the limitation, a valuable right (absolute employer liability) was given by the legislation.[1392] The same reasoning has been applied with respect to the limitation given under the Warsaw Convention.[1393] It would appear to be equally applicable here, since the government's $500 million indemnity will in all but the most unusual case be a completely adequate substitute for the right to levy against all of the indemnitee's property.

There have been several cases in which limitation was imposed by Congress with no apparent substitute offered to claimants in return. Limitations in these cases also are upheld if the congressional action is found to be a reasonable and appropriate exercise of a substantive

[1390] Joint Committee Report 21, 22.
[1391] See Comment, 56 Mich. L. Rev. 752, 765-66 (1958).
[1392] New York Central R.R. v. White, 243 U.S. 188, 37 S.Ct. 247 (1917).
[1393] Pierre v. Eastern Air Lines, 152 F. Supp. 486 (D.C. N.J. 1959).

power.[1394] The substantive bases for the atomic energy program are several, and it is to be doubted that the Supreme Court would find the Anderson legislation an unreasonable restriction on claimants' rights (even ignoring the indemnity) in view of the need for protecting the nuclear industry.

Subsection 170e provides that for a single nuclear incident, the aggregate liability of persons indemnified, including the reasonable costs of investigating and settling claims and defending suits for damage, shall not exceed $500 million plus the financial protection required. Several special matters should be noted with respect to this provision. First, the limitation is available not only to the prime licensee, but also to any person indemnified, including a malicious trespasser. Although, from the public's point of view, there would appear to be justification for granting an indemnity to this latter class of persons, there seems to be no reason why they should also enjoy the limitations on liability.[1395] Protection against levies on the property of malicious or intentional trespassers really in no way fosters the atomic energy program. The statute well might be amended to provide that the government indemnity would operate only when insurance *and leviable assets* of such trespassers were exhausted. This should not include merely negligent trespassers, such as an airline whose plane crashes into a reactor.

A further question arises as to whether persons of whom no financial protection is required can obtain the benefit of the limitation. Obviously, this question turns upon the answer to our previous inquiry, whether such a person can sign an indemnity agreement under the terms of the Anderson amendment.[1396] The same policy considerations which would seem to dictate that these persons should be permitted to enjoy indemnity would operate equally to justify a limitation. Contractors and materials licensees deserve the same type of protection as operators of production and utilization facilities.

A very closely related but nevertheless distinct problem is whether the limitation on liability applies to all liability of the licensee or only to that liability for which the government provides indemnity, *i.e.*, "public liability" arising out of a "nuclear incident." The whole act is keyed carefully to these two terms of art. If they are applied to the limitation of liability of the individual as well as that of the government, it means there will be no limitation in some circumstances, such as (1) damages

[1394] Comment, 56 Mich. L. Rev. 752, 765 (1958). See also discussion *supra* at note 1276.

[1395] *Id.* at 757.

[1396] See text following note 1311 *supra*.

caused in foreign countries possibly either from a domestic facility or certainly from one sold or operated in a foreign country, and (2) property of some indemnitee not at the site of the accident and not covered under the terms of the financial protection required.

An argument can be made that the limitation applies to all liability and not as limited by the terms of art. The language of Section 170e is that the "aggregate liability" shall not exceed financial protection plus $500 million. Because the word "public" is not found here it can be argued that the limitation is not so restricted, since in most of the rest of the indemnity amendment provisions the term used is "public liability." This certainly is true of Section 170a, c, d, and even of e. The difficulty with this argument is that "public" also is omitted when reference is made to liability in Section 53e(8), Section 170b, and in the last part of 170e itself. These would seem to indicate that the two phrases, "public liability" and "liability" were used synonymously. If this is the interpretation accepted by the courts, it will mean that some very substantial liability will not be limited by the Anderson amendment provision. It is true that this is not likely to exceed the amount of insurance available and Mexican and Canadian damages apparently are covered by the approved insurance policies, but in the event of a major reactor incident such liability might well exceed the amount of insurance coverage.

One final matter remains. If a nuclear incident takes place and it appears that two persons who have signed agreements of indemnity are found at fault and responsible, is government indemnity for the incident doubled? The language of Subsection 170c appears to give a negative answer. It says that the "aggregate indemnity for all persons indemnified in connection with each nuclear incident shall not exceed $500,000,000. . . ." This does not necessarily indicate, however, that where two licensees independently obtaining insurance under NELIA-MAERP are both responsible for an incident, the insurance fund available would not be the sum of the two policies. The terms of the NELIA-MAERP agreement do not state that the syndicates will only be liable to a certain extent for a single nuclear incident, but merely that they will be liable to that extent "under this policy."[1397] In the rare case, then, indemnity would be available in the amount of $500 million, plus the sums of two insurance policies.

Even as to government responsibility to indemnify it is arguable that each release of harmful radiation which causes damage is a separate in-

[1397] Approved Form of Nuclear Energy Liability Policy, Condition 3, 23 Fed. Reg. 6684, 6685 (1958).

cident, whether it comes at widely separated times from the same facility or at the same time from two widely separated installations. The language of Section 11 o, "any occurrence . . . causing" harm, might be read to mean each separate release of material which causes harm, no matter how many indemnified sources also contribute, rather than each occurrence of harm to a person or particular property. It would seem more consistent with the over-all policy of the indemnity scheme if the former interpretation were accepted. The general philosophy seems to be to limit the liability of the government for a single incident at a single installation to $500 million. There is no reason to limit the protection of the injured public to $500 million when the injury results from two separate installations merely because they happened to coincide in time of occurrence or effect. So long as each facility incident causes some of the injury and the government would have been liable up to $500 million for each incident if the other had not happened at the same time, the government should be liable as fully as if they had happened separately. Liability should not be limited because of a coincidence in time of occurrence or effect. To so interpret the act would be to subvert the theory of covering each installation up to $500 million for *each harmful incident at that installation.*

Where two installations contribute to a total injurious radiation dose, but the contribution of neither would have been enough alone to cause compensable harm, will the government be liable for an "incident"? Certainly it can be argued that unless discharge from a specific installation causes harm there is no "incident" within the terms of the act. If legal liability should be imposed on the owner, however, the whole theory of the indemnity legislation to protect both the operator and the public would be defeated. It could be argued that each installation caused some harm, though recovery is not allowed until the harm manifests itself in an observable manner when added to the radiation from another source. This type of situation is not likely to cause injury extensive enough to call for government indemnity, but it is not impossible.

3. Claim Satisfaction Under Subsection 170e.

One provision of the Anderson amendment which has drawn little comment or criticism is Subsection 170e, dealing with the procedural aspects of satisfying claims arising from a nuclear incident. In part, the subsection states:

> The Commission or any person indemnified may apply to the appropriate district court of the United States having venue

> in bankruptcy matters over the location of the nuclear incident, and upon a showing that the public liability from a single nuclear incident will probably exceed the limit of liability imposed by this section, shall be entitled to such orders as may be appropriate for enforcement of the provisions of this section, including an order limiting the liability of the persons indemnified, orders staying the payment of claims and the execution of court judgments, orders apportioning the payments to be made by claimants, orders permitting partial payments to be made before final determination of the total claims, and an order setting aside a part of the funds available for possible latent injuries not discovered until a later time.[1398]

The relative dearth of commentary on this provision is somewhat remarkable when one considers the number of difficult problems either created or totally ignored under its terms. One explanation for this situation perhaps lies in the general attitude that a substantial nuclear incident is so unlikely that there is little point in worrying about the procedural problems until they arise. The Anderson amendment, however, was enacted on the assumption that a nuclear incident *could* happen[1399] and that there should be federal legislation to cover such a possibility. Accepting this basic assumption, the procedural aspects of claim satisfaction become extremely important, and for that reason warrant careful analysis. Unless procedures are adequate, substantive benefits well may prove illusory.

In the report made by the Joint Committee to accompany the amendment, it was emphasized that Subsection 170e sets venue at the site of the nuclear incident giving rise to liability, not at the place where resulting damage might occur.[1400] This specification of venue, however, is applicable only to petitions by the Commission or indemnitee for the various orders enumerated in the subsection. No restriction is placed upon venue for suits by claimants. Indeed, the report states that "the right of the State courts to establish the liability of the persons involved in the normal way is maintained, but the payment of those lia-

[1398] Subsection 1703. The venue provision is somewhat similar to the admiralty rule setting venue for petitions to limit liability when no libel has as yet been filed. See 28 U.S.C.A., Admiralty Rule 54 (1950).

[1399] For an interesting study of the possible effects of a reactor burn-up under "ideal" meteorological conditions, see University of Michigan Engineering Research Institute, Report on the Possible Effects on the Surrounding Population of an Assumed Release of Fission Products Into the Atmosphere from a 300-Megawatt Nuclear Reactor Located at Lagoona Beach, Michigan (1957).

[1400] Joint Committee Report 22.

bilities can be stayed." [1401] Thus it is apparent that Congress intended a two-step process for satisfaction of claims: (1) determination by state courts, and federal courts sitting in diversity of citizenship cases, of the fact and extent of liability of the indemnitee, and (2) apportionment of the financial protection amount and indemnification fund to these judgments, presumably on a *pro rata* basis, by the federal district court having venue over the nuclear incident. The second step undoubtedly is included to prevent the discrimination which might otherwise result from the satisfaction of some judgments earlier than others, and from the "race of diligence" that could be expected if no such provisions were made.

It is important at this point to note one very substantial limitation upon the power of the local federal court to enter limitation and apportionment orders under Subsection 170e. Under its express terms, the provision restricts the court's authority to those instances in which claims "will probably exceed" the available fund. In other words, the amendment makes absolutely no provision for centralized control of judgments or payment of claims as long as there appears to be sufficient monies available for satisfaction of all judgments. Thus when a "small" incident takes place (perhaps involving only $300 million worth of valid claims), the federal district court having venue is not vested with the power to set aside a fund for latent injuries, or to permit payments before judgment to claimants demonstrating immediate financial crisis, or to stay execution of court judgments against the indemnitee's property. Any of these steps, if a district court takes them, could only be based upon a general equitable power to implement apparent congressional intent implied in the amendment.

In the situations most likely to happen, therefore, Subsection 170e is of no assistance whatsoever. On the other hand, it does purport to deal with incidents in which claims probably will exceed the fund—where the special problems of limitation and apportionment are presented. Our discussion deals primarily with this particular problem, but many of the considerations and suggestions which follow will relate equally to the case in which the fund is adequate to meet valid claims.

There is no express indication in the subsection that the district court, even in the instance where the fund is inadequate, is given the power to stay proceedings in state courts [1402] before their culmination in judg-

[1401] *Ibid.* See also the general statement of purpose for the amendment made by the Joint Committee, text accompanying note 1273 *supra*.

[1402] Reference to "state courts" will henceforward include federal courts sitting in diversity and therefore applying state substantive law.

ments or to consolidate all claims for trial before it. Any such power would have to be derived from an application of the doctrine of *ejusdem generis* to the phrase "such orders as may be appropriate for enforcement of the provisions of this section" and the enumerated authorized orders which follow.[1403] The other orders seem more limited and this probably makes the use of *ejusdem generis* of little value. One of the permissible orders under the subsection is for the stay of execution of court judgments. Enumeration of such an order is clearly inconsistent, without explanation, with an intention that the district court should have the power to consolidate before a judgment is rendered by the state court. In addition, a finding of a power to consolidate is made extremely difficult by the statement quoted above from the congressional report accompanying the amendment which appears to contemplate "normal" state proceedings on the question of liability.

a. Effect of Inability to Consolidate Claims

While certainly the limited statutory grant of power to issue stay and apportionment orders will alleviate considerably the confusion and vexation engendered by prosecution of multiple claims against the indemnitee, the apparent failure of Congress expressly to empower the district court to take jurisdiction over all claimants' suits is unfortunate. Potentially a nuclear incident may cause damage over a large area encompassing several states. It is more than probable that the indemnitee will be sued in each jurisdiction where injuries result, since a corporation in general today is amenable to process in any state where it does business or its property can be attached. Within each of these jurisdictions, actions sometimes may be brought in several different trial courts. Thus thousands of actions arising from a single incident may be brought and pursued in a vast number of courts. Each court of course will apply its own procedural rules; and, since the prevailing conflicts rule for substantive tort questions is "place of injury" rather than "place of defendant's act," [1404] it will apply different substantive prin-

[1403] This would actually be an inverse application of *ejusdem generis*, which normally comes into play when a list specifics is followed by a general descriptive phrase into which further specifics of like nature can logically be placed. Here the authorization for granting "such" orders as are "appropriate" invites a reading which would permit the court to make other orders to those subsequently listed in the subsection.

[1404] Stumberg, Conflict of Laws, 182 *et seq.* (2d ed. 1951). Note also that in wrongful death actions, the law of the place of injury, rather than the place of death, controls the substantive questions of liability. *Id.* at 191. See also Goodrich, Conflict of Laws, 263 *et seq.* (3d ed. 1949). The best illustration of conflict of laws problems involved in a tort having multi-state impact is the case of the so-called "national libel,"

ciples depending upon the jurisdiction in which the plaintiff's person or property was located at the time of injury. Thus one court may apply a one-year statute of limitations to a claim arising from the incident, whereas another will be bound by a two-year limitation period.[1405] Substantively, the defendant may be held only to a standard of due care or, on the other hand, to strict liability, depending upon the plaintiff's location. Because of these differences, it is entirely possible that one claimant, whose injuries are no less serious than another's, may be barred because of the vagaries of place of injury or place of suit. The equality of treatment for claimants apparently intended by Congress thus often may not be fully realized under the explicit terms of the subsection. Even if consolidation were possible, state substantive rules are applicable and this would cause the same unequal treatment.

Even if we ignore these vexing considerations, we are further struck by the profoundly difficult task facing any district court seeking to administer the fund under the terms of the subsection. Let us assume that the incident causes damages of over $500 million plus the amount of required insurance (although such a determination in itself may often be an enormous problem) and that an order has been granted limiting liability to that amount. Assuming the court has no power to consolidate claims, it apparently must wait until all judgments are entered before it can finally apportion the indemnity and insurance fund. In the interim, however, it is empowered to permit "partial payments to be made before final determination of the total claims."[1406] Does this mean that the court may authorize payments to persons who have not reduced their claims to judgments if defendant agrees to a

in which a defamatory statement is made to persons in numerous jurisdictions through the medium of a large-circulation magazine or newspaper. Even if the states are able to establish a "single-publication" rule by legislation or judicial decision, the courts are still confronted with the problem of what substantive law to apply to defendant's act. Prosser lists ten possible rules for the choice of law—including the law of each place of impact, the law of the place of predominant impact, the law of the place of defendant's act, the law of the place of plaintiff's domicile, and the law of the forum—and concludes that possibly the last has been employed more frequently than any of the others. Prosser, "Interstate Publication," 51 Mich. L. Rev. 959, 971-78 (1953). See also, "Developments in the Law—Defamation," 69 Harv. L. Rev. 875, 950 *et seq.* (1956). The defamation rules are complicated in the context of the nuclear incident, however, by the traditional "place of injury" rule for the physical torts involving negligence or intentional conduct. It is probable that the latter test would prevail in the event of a nuclear incident.

[1405] Periods of limitation, with some exceptions, are considered procedural matters, and the law of the forum therefore controlling. Stumberg, *supra* note 1404 at 147 *et seq.*

[1406] Subsection 170e.

settlement, or does it merely mean that some judgments may be satisfied before all judgments are rendered? Either interpretation of the statutory language leads to confusion. If the former construction is correct, what happens if the state court ultimately determines that the claimant is not entitled to judgment, because the defendant's conduct is non-tortious or because the statute of limitations had run on the claim? Or if the latter interpretation is adopted, the question becomes: How much should be paid—what if the amount paid turns out to be more than the claimant's ultimate proportionate share? Too liberal payments early in the administration of the fund possibly will leave nothing for those obtaining judgments later. It has been suggested that in the event of serious mishap Congress can be expected to appropriate more monies for compensation of claimants. While this may be a reasonable assumption, it is no basis for accepting the ambiguity of the subsection. A clarifying amendment should be enacted.

Crucial to many of these problems is the fact that the touchstone of the district court's power is the preliminary state court judgment. It is entirely possible that the last valid judgment will not be finally rendered until years after the nuclear incident. Claims may not have been filed until shortly before the statute of limitations was to run; courts frequently find themselves two or more years behind their docket calendars, and appeal and retrial processes are likely to consume even more time. The district court, therefore, can look forward to a five to ten year period before the fund can be apportioned to the initially adjudicated claims.

Even when all state judgments have been rendered, the subsection poses yet another obstacle to complete claim satisfaction. The district court is permitted, upon petition, to set aside a portion of the fund "for possible latent injuries not discovered until a later time." [1407] While such a provision is admirable in its recognition of the fact that the damage picture is immensely more complex when radiation injury is involved, its terms also provide further problems for the district judge in requiring his continuing supervision for an even longer period. It is almost impossible for him to determine what a fair reserve should be. The subsection gives him no guide on this point, and indeed, there is no indication whether the judge should determine the amount based on his conception of what would be equitable in view of probabilities of latent injuries, or based on his estimate of what legal liabilities for latent injuries will be adjudicated by state courts. If the latter, then the size of

[1407] *Ibid.*

the reserve fund will be exceedingly small, since there is little precedent in our state courts for delayed assessment of damages to compensate for later-appearing injuries.[1408] Even if the district judge should decide on a figure, he is faced with the dilemma of how long he should keep the reserve open. Theoretically, at least, genetic damage may appear more than 100 years after the incident, and there is excellent indication that latent injuries such as bone damage and leukemia may appear as much as thirty years after harmful radiation.[1409] Surely Congress did not intend that claimants demonstrating present injuries for which the insurance and indemnity fund (as reduced by the reserve fund) does not provide adequate compensation, should be forced to wait for such a period in order to obtain more adequate satisfaction of their judgments.

While these reserve fund matters are not problems peculiarly present when the district court finds itself unable to consolidate the numerous actions, they nevertheless are made more complicated if multitudinous state courts are permitted to take the initial action. In one state, a jury may include in its damage award an amount equated to the degree of possibility of future manifestation of radiation injury, whereas in another state a judge may direct the jury to disregard such a factor in assessing damages. How can the district court weigh such differences when petitioned for an order to permit payment from the reserve fund? And for that matter, who is to determine what later

[1408] "There is also the matter of statutes of limitations. There is no uniformity among the states as to the length of the period during which they run. Further, and more importantly, these statutes are not well adapted to take care of radiation injuries. As presently worded, most of them, except those with reference to fraud and to occupational diseases, begin to run from the time of the harmful impact. The diseases which result from radioactive substances may not be discovered for years after the impact. In fact, until the disease becomes manifest its victim may have no realization of the radiation. I suggest that the federal statute should include a provision which would enable suit within a reasonable time after the disease or disability is discovered or should have been discovered in the exercise of reasonable care. Further, since the immediate consequence of radiation is frequently only apparently minor harm for which an action might or might not be brought, the statute should provide for a subsequently appearing but unpredictable harm. The present rules of res judicata prevent a subsequent action if judgment has been obtained in an action based on the impact, although at that time, the harm appeared to be minor. Perhaps it would be better to provide for installment payments, to be increased or diminished as subsequent events determine the extent of the total harm." Seavey, "Torts and Atoms," 46 Calif. L. Rev. 3, 12 (1958).

[1409] Atomic Industrial Forum, Financial Protection Against Atomic Hazards 16-17 (1957); National Academy of Sciences, Biological Effects of Atomic Radiation (Report of Committee on Pathological Effects), reported at CCH, Atomic Energy Law Rep. ¶4028 (1958).

payments are to be made out of the reserve fund—the state court with the approval of the district court or the district court alone?

These are a few of the immensely difficult questions that will confront any district judge called upon to administer the insurance and indemnity fund and apportion it equitably to numerous state judgments. One can conjure up further problems almost at will. Should any distinction be made between claims based on personal injuries and those involving property damage? Should the traditional notion that the claim is merged in the state court judgment be followed? How can the district court prevent juries in a given jurisdiction from inflating damages for local claimants in order to assure them a greater share of the funds?

The secondary and supervisory role apparently accorded the federal district court by the subsection thus appears an exacting one indeed. It can readily be seen that many of the suggested legal and administrative problems would be alleviated if an effective means of consolidation could be found. A single set of procedural rules would thereby be applied to all actions. One tribunal only would decide the fact of liability and the monetary extent of injury.[1410] Administration of the indemnity fund, including the provision of reserves for latent injuries, would be in the hands of the district judge alone, subject of course to appellate supervision. Enormous administrative difficulties would no doubt remain, but the fact that a district court could deal with them *ab initio,* rather than after the picture has become confused by the actions of numerous state courts, would surely lead to saner, more equitable distribution of the indemnity fund.

b. Available Consolidation Devices

If the desirability of consolidation and the apparent omission of Congress to include such a device in Subsection 170e is accepted, there remains the question of whether the federal district court is not otherwise vested with the power to consolidate without regard to the subsection. Several equitable devices have been employed with great success in previous mass tort cases.[1411] Any attempt, however, to use one of these devices always meets several serious obstacles which cannot be

[1410] Without further federal legislation, however, the district court would still apply that substantive law dictated by traditional conflicts rules. Thus the possibilities of inequities among claimants would still exist, although perhaps to a lesser extent. See the discussion of this problem in Seavey, *supra* note 1408 at 11.

[1411] Instances of the use of such devices will be discussed in some detail below. See generally, Comment, 63 Yale L. J. 493 (1954).

dismissed lightly. Most formidable of these is the legislative limitation on range of process. With minor exceptions, a federal district court cannot render a valid and binding *in personam* judgment based on personal service of process beyond the territorial limits of the state in which the court sits.[1412] Facts litigated in one action before the district court could therefore have no binding application to a foreign claimant who chooses not to appear.

A further problem which becomes immediately apparent is the very limited power of federal courts to enjoin concurrent state proceedings. The general rule is that a court of the United States "may not grant an injunction to stay proceedings in a State court except as expressly authorized by Act of Congress, or where necessary in aid of its jurisdiction, or to protect or effectuate its judgments."[1413] Of course, no express authorization is found in Subsection 170e for such an order, and the tendency has been to construe the latter two exceptions strictly against the injunctive power.[1414] "Aid of its judisdiction" refers to cases in which the jurisdiction of federal courts is exclusive, not where, as here, it is concurrent with that of the states.[1415] Protection of judgments is valid as a basis for injunction only when the federal court has rendered a judgment; it is not construed as a ground for staying other proceedings while an action is pending or in progress in a federal court.[1416] Thus when it is possible for claimants also to bring action in state courts, consolidation is of limited value since the court is without power to consolidate all claims before it by use of the injunction.

Still another obstacle to an equitable proceeding into which all claimants might be forced is the right to trial by jury. While in strict constitutional terms, an equitable action probably would not violate federal or state guarantees,[1417] yet it is widely accepted in this country that tort

[1412] "All process other than subpoena may be served anywhere within the territorial limits of the state in which the district court is held and, when a statute of the United States so provides, beyond the territorial limits of that state." 28 U.S.C.A., Federal Rules of Civil Procedure 4(f) (1950). This is a legislative and not a constitutional restriction on the range of process. Howard v. United States, 126 F.2d 667, 668 (10th Cir. 1942), *cert. den.* 316 U.S. 699, 62 S.Ct. 1297 (1942). See 2 Moore, Federal Practice ¶4.42 (2d ed. 1948).

[1413] 62 Stat. 968 (1948), 28 U.S.C.A. §2283 (1950).

[1414] See Moore, Commentary on the U.S. Judicial Code 407-15 (1949).

[1415] *Id.* at 412.

[1416] *Id.* at 410-11.

[1417] The federal and state constitutions generally preserve the right to jury trial as it existed at common law. There is evidence that equity courts took jurisdiction in this type of case at the time the constitutions were adopted. See Comment, 63 Yale L. J. 493, 508 (1954).

actions, and particularly negligence actions, should be tried by jury.[1418] One writer has suggested that such a tradition will not be easily broken for the mere sake of convenience for the defendant and the court,[1419] especially in view of the fact that the claimant has an equally strong interest in having his grievance independently litigated before a jury.

Formidable though these objections may be, yet, as indicated, there is a growing body of precedent for the consolidation of mass tort claims before a single court, although none of the procedural devices thus far evolved can completely surmount the enumerated obstacles. Several of these devices have received extremely careful consideration in two recent law review comments,[1420] and the discussion which immediately follows draws liberally on the factual background provided by their authors. It must be noted, however, that these comments were not written in contemplation of the nuclear incident. While many of the questions arising with respect to previous non-nuclear disasters may be related by analogy to the nuclear incident, yet obviously the problems peculiar to the latter merit special attention in the context of Subsection 170e. Particularly important are the probabilities that, should a nuclear incident occur, (1) there will be latent injuries whereas in all previous mass tort cases the injuries have been immediately or soon apparent and (2) injury or damage may be spread over a much larger area than previously considered by courts. Finally, it bears repeating that Congress may well have intended, by its failure to provide for consolidation in Subsection 170e, to preclude such proceedings altogether, in which case consolidation under an independent device is impossible. Our assumption must be either that Congress intended to permit consolidation, or in view of the ease in administration which it affords, will amend the subsection to include its use.

(1) Bill of Peace

This traditional remedy has been employed occasionally at the instance of the defendant in a mass tort situation to enjoin multiple suits in other courts and to bind all claimants to the decision of a single equity court.[1421] There is little uniformity in the decisions to define the permissible limits for use of this device, but a safe general rule is that a bill of peace may be entertained in a federal district court only (1)

[1418] See Chafee, Some Problems of Equity 186 *et seq.* (1950).

[1419] Comment, 63 Yale L. J. 493, 496 (1954).

[1420] Note, 60 Yale L. J. 1417 (1951); Comment, 63 Yale L. J. 493 (1954). See also, Molnar, "Equity Jurisdiction in Tort Actions" 10 Ga. B. J. 309 (1948).

[1421] Comment, 63 Yale L. J. 493, 501 *et seq.* (1954).

where the defendant shows that he will be subjected to multiple suits and (2) where a common or "general" interest binds the multiple claimants together.[1422] A recent court of appeals decision interprets the latter requirement to mean, not that there must be "privity" among claimants in the narrow sense of common title, but that there need only be a common and substantial question of law or fact involved in the general controversy.[1423] Thus construed, the equitable bill of peace would appear generally appropriate to the consolidation of claims arising from a single nuclear incident.

Use of the bill of peace, however, is severely limited by the problems of process, power to enjoin, and right to jury trial discussed above. As indicated, process of the federal court generally extends only to the borders of the state in which it sits. The power to enjoin state court proceedings already begun in the mass tort situation has been specifically denied in a recent district court case based on Section 2283 of the Federal Judicial Code quoted above.[1424] And an equity suit pursuant to a bill of peace in which the court decides questions of fact may well run contrary to traditional notions of the right to jury trial in negligence cases.[1425]

(2) Spurious Class Actions

Under the federal rules of civil procedure, a class action is authorized when, *inter alia,* the character of the right sought to be enforced for or against the class is "several, and there is a common question of law or fact affecting the several rights and a common relief is sought."[1426] This class action is known as the spurious type, in which the only relation of the claimants *inter se* need be one of related law or fact rather than common title.

In an action by one of the alleged tortfeasors in the recent South Amboy ammunition explosion causing injury to several thousand claimants,

[1422] *Id.* The most recent federal case upon this point in relation to mass tort claims is Yuba Consolidated Gold Fields v. Kilkeary, 206 F.2d 884 (9th Cir. 1953) involving property damage caused by flooding.

[1423] *Id.* at 888, rejecting the narrower construction offered in Tribette v. Illinois Central R.R., 70 Miss. 182, 12 So. 32 (1892), and relying on 1 Pomeroy, Equity Jurisprudence §269 (5th ed. 1941).

[1424] Pennsylvania R.R. v. United States, 111 F. Supp. 80, 88-89, (D.C. N.J. 1953) refusing to enjoin state court proceedings arising out of the 1950 South Amboy ammunition explosion.

[1425] See note 1417 *supra.* The mere showing of a multiplicity of actions was not sufficient grounds for equitable intervention at the time of adoption of the Federal Constitution, so the objection may be constitutional as well as traditional. *Ibid.*

[1426] 28 U.S.C.A., Federal Rules of Civil Procedure 23 (a)(3) (1958).

the plaintiff sought to employ this device to bind all claimants to the findings made by the court in which the spurious class action was brought.[1427] In addition to refusing to enjoin prosecution of the numerous state actions already initiated, the court refused to permit its decision to be binding on any claimant who had not expressly signified an intention to enter the suit.[1428] Such a refusal appears to accord with previous interpretations of the meaning of a spurious class action judgment.[1429] It is thus evident that such a device is of extremely limited efficacy in the context of a nuclear incident, where the claimants' normal disposition will be to refrain from entering the class suit and where it is probable that numerous claimants can be neither served nor notified of the action.

(3) Receivership

The use of receivership proceedings by a lower Connecticut court to handle the problem of multiple claims arising from the Ringling Brothers, Barnum and Bailey circus fire in Hartford several years ago has received detailed consideration in a recent law review article.[1430] This procedural device was settled upon by agreement between defendant circus and the prospective plaintiffs as an effective means of assuring payment of the numerous claims asserted. The defendant waived all affirmative defenses, claims were submitted to arbitration, and the arbitrators' findings were made binding upon the parties. The receivership order placed all of the defendant's property under the court's control, abating previous attachments and barring subsequent attachments. Court permission was required for suits against the receiver. Within six years following the disaster, this procedure resulted in the arbitration or settlement of every claim.

Employment of a receiver in the mass tort context has little precedent in American law.[1431] Two reasons are indicated for judicial reluctance to turn to this device. In the first place, the traditional but now gen-

[1427] Pennsylvania R.R. v. United States, *supra* note 1424, discussed at length in Comment, 63 Yale L. J. 493, 511 *et seq.* (1954).

[1428] *Supra* note 1424 at 90.

[1429] See 3 Moore, Federal Practice ¶23.11[3] (2d ed. 1948). For the most recent case on this point, see Hurd v. Illinois Bell Telephone Co., 234 F.2d 942 (7th Cir. 1956).

[1430] Note, 60 Yale L. J. 1417 (1951). The facts surrounding settlement of the claims are drawn from this note, at 1418-20.

[1431] Receivership was permitted to handle tort claims arising from a hotel fire in Geele v. Willis, 203 Ga. 267, 46 S.E.2d 126 (1948). See Molner, *supra* note 1420. So far as the authors have determined, receivership has never been used in this context in a federal court.

erally discredited view that a non-judgment creditor has no standing to ask for a receiver normally would appear to prevent a mere tort claimant from doing so.[1432] Secondly, receiverships designed solely for moratorium purposes, abating the rights of creditors, are looked upon with disfavor.[1433] Receivership is normally considered a remedy ancillary to some other equitable proceeding, not an end in itself. The argument is made, however, that receivership may be peculiarly adapted to the solution of the mass tort problem, and that creditors would be aided rather than injured by the creation of a moratorium during which claims are adjusted by arbitration.[1434]

By application of *ejusdem generis* to the phrase in Subsection 170e granting power to issue orders "appropriate for enforcement of the provisions of this section,"[1435] one could further argue that the subsection permits the use of this procedural device. Such an interpretation no doubt would circumvent the traditional objection that a non-judgment creditor cannot demand receivership since by Subsection 170e the Commission or the indemnitee could so petition. Whether it would also circumvent the objection to the use of receivership except as an ancillary device is an open question. But even it be found that receivership was contemplated by Congress and that these problems are obviated, substantial judicial legislation would be necessary to impute sufficient powers to the district judge appointing the receiver to make the device effective. Receivership, by itself, does not accomplish consolidation. Without a power in the court to enjoin claimants from participating in actions against the receiver other than those brought in the federal district court having venue over the incident, the effectiveness of the device would be seriously curtailed. The Ringling Brothers receivership was created by common consent, and it was the accompanying arbitration provisions which gave real force to the centralized proceeding.[1436]

Moreover, it must be noted that the principal feature favoring receivership in the mass tort context is that it permits continued operation

[1432] 1 Clark, Receivers 210 *et seq.* (2d ed. 1929). For a more recent discussion of the question with respect specifically to the power of a federal court, see Note, 10 Stan. L. Rev. 361 (1958).

[1433] Michigan v. Michigan Trust Co., 286 U.S. 334, 345, 52 S.Ct. 512 (1932). See also 1 Clark, Receivers 60 (2d ed. 1929).

[1434] Note, 60 Yale L. J. 1417, 1422 (1951).

[1435] This appears to be the tacit assumption of a comment writer, who states that the subsection "suggests as a solution to these [claim administration problems arising under section 170] the use of a device akin to the equity receivership." Comment, 56 Mich. L. Rev. 752, 768 (1958).

[1436] See text following note 1466 *infra*.

of the defendant's business, which in turn permits greater likelihood that claims will be more promptly and fully paid. This feature probably would be of little significance in the event of a nuclear incident. In the latter case, a fund for the payment of claims theoretically is already available in the form of compulsory insurance and the indemnity fund. The existence of these funds and the limitation of liability above such amounts mean there is little justification for receivership as a guarantee for continued operation of the business. The only possible exception would be when, because of some exclusionary clause in the policy covering the incident, the insurer is not liable, and the company must then meet claims from its own assets up to the point where indemnification begins.[1437]

(4) Consolidation

The federal rules of civil procedure permit a federal court to order consolidation (in the technical sense) [1438] or joint hearing or trial of actions pending before it involving a common question of law or fact. This device, coupled with the pre-trial conference, has been used with considerable effectiveness in the district court on at least two occasions, the most recent of which involved claims arising from the sinking of the Italian liner, *Andrea Doria*.[1439] But in both cases, the district court had exclusive jurisdiction over all of the multiple claims; in the *Andrea Doria* case, because of federal admiralty jurisdiction;[1440] in the other, because defendant was the federal government and could be sued only in the federal district court under the terms of the Federal Tort Claims

[1437] See text following note 1379 *supra*.

[1438] The term "consolidation" up to this point has been used in the broad sense, encompassing all of the various devices by which a court can bring numerous claimants before it in one action or group of actions. In its narrow construction, "consolidation" means the procedural device authorized by Rule 42(a) of the Federal Rules. See 28 U.S.C.A., Federal Rules of Civil Procedure 42(a) (1958), which states: "When actions involving a common question of law or fact are pending before the court, it may order joint hearing or trial of any or all matters in issue in the actions; it may order all the actions consolidated; and it may make such orders concerning proceedings therein as may tend to avoid unnecessary costs or delay."

[1439] Clark v. United States, (D.C. Ore. 1952 13 F.R.D. 342) discussed at length in Comment, 63 Yale L. J. 493, 517 *et seq.* (1954), involved some 3,000 damage claims for property loss from flooding for which the federal government was liable. Litigation ensuing from the sinking of the *Andrea Doria* is progressively described in The New York Times, beginning on August 1, 1956. See particularly, N. Y. Times, Aug. 9, 1956, p. 49, col. 2.

[1440] See Gilmore & Black, Admiralty §§10-16 to 10-18 (1957), describing the court's power over other proceedings once the owner has petitioned for limitation.

Act.[1441] In neither, therefore, was the injunction against concurrent state court proceedings a problem. Thus it is relatively clear that the unwillingness or inability of federal district courts to enjoin state proceedings would render consolidation under the federal rules of little value in deciding claims arising from a nuclear incident, since potentially there is concurrent state court jurisdiction. Only those claims actually brought in federal courts would be subject to consolidation.

(5) Interpleader

Another device which appears to have pertinence in the mass tort context, but which clearly was not designed for such use, is the statutory bill in the nature of interpleader. Such a bill may be brought in any district court by a stakeholder having custody or possession of money or property of the value of $500 or more when there is diversity of citizenship between two or more adverse claimants and when these claimants threaten to subject the stakeholder to multiple liability. This is federal statutory interpleader.[1442] Each of the traditional obstacles to consolidation is in great measure overcome by this relatively new device. Process is expressly designed to run throughout the United States.[1443] The federal code provisions authorize the district court to enter an order restraining all claimants from initiating or prosecuting any proceedings in state or federal courts affecting the property.[1444] Interpleader is an equitable action, and while there may continue to exist the accepted notion that actions involving negligence or similar conduct should be tried before a jury, there is no constitutional prohibition to trial of the factual issues by a judge when interpleader is brought.[1445]

[1441] 60 Stat. 842 (1946); 28 U.S.C.A. §§1291, 1346, 1402, 1504, 2110, 2401, 2404, 2411, 2671-80 (1950).

[1442] 62 Stat. 931, 936, 970 (1948); 28 U.S.C.A. §§1335, 1397, 2361 (1950). This is the most recent of a series of federal interpleader statutes. Interpleader may also be accomplished in a suit based on the normal diversity of citizenship and amount in controversy rules. See 2 Barron & Holtzoff, Federal Practice and Procedure §551 (1950). Statutory interpleader liberalizes the diversity rule by requiring diversity between "two or more claimants" only, whereas complete diversity is required in the non-statutory interpleader suit. See Note, 55 Mich. L. Rev. 1183 (1957). See generally 2 Barron & Holtzoff, Federal Practice and Procedure §552 (1950). The statute further liberalizes the interpleader device with respect to range of process, jurisdictional amount, and power to enjoin other proceedings. See 3 Moore, Federal Practice ¶¶22.01-22.09 (2d ed. 1948). The statute is supplemented by 28 U.S.C.A., Federal Rules of Civil Procedure, 22 (1958).

[1443] 62 Stat. 970 (1948); 28 U.S.C.A. §2361 (1950).

[1444] *Ibid.*

[1445] 2 Barron and Holtzoff, Federal Practice and Procedure §555 (1950).

Interpleader in this statutory form would appear in general to provide an excellent foundation for settlement of claims arising from a nuclear incident. The minimum diversity requirement of the statute almost certainly would be met, and even less question should be anticipated with respect to the jurisdictional amount of $500. Interpleader claims need not be in privity nor of an identical nature.[1446] And a bill in the nature of interpleader under the statute does not carry with it a requirement, as in the traditional practice, that the stakeholder admit his liability and thus seek only a determination of the person or persons entitled to the fund.[1447] Thus the insurance group, who would be the most likely party to bring this type of bill, would be free to assert defenses to the indemnitee's liability, or to its own liability under the policy.

Two requisites for the maintenance of the statutory action appear troublesome if interpleader in its strict sense is to be used in this context. First, the adverse claims must expose the stakeholder to potential double or multiple liability, that is, the aggregate claims must appear to exceed that which will be available for their payment.[1448] If it appears that damage or injury is caused only in a sum less than that for which the indemnitee has financial protection, interpleader apparently is not available—a serious limitation on the effectiveness of the device. If on the other hand, claims exceed both the insurance and indemnity funds, the incident would clearly appear appropriate for a bill in the nature of interpleader,[1449] unless it should be argued that the limitation against any liability above financial protection requirements plus $500 million makes it impossible to be subjected to multiple claims.

In the case, however, where the claims total a sum more than the amount of financial protection carried, but less than the amount of total insurance plus indemnity, a second difficulty arises. It has been held (and probably quite properly) by a lower federal court that the United

[1446] 62 Stat. 931 (1948); 28 U.S.C.A. §1335(b) (1950).

[1447] 3 Moore, Federal Practice ¶22.07 (2d ed. 1948).

[1448] *Id.* at ¶22.08. The original use of statutory interpleader was to protect insurers who hold a fund being wholly claimed by two or more persons, as in Sanders v. Armour Fertilizer Works, 292 U.S. 190, 54 S.Ct. 677 (1934). It is recognized, however, that the requirement of multiple liability is also met if claims to only a part of the fund all total more than the fund itself. See 3 Moore, Federal Practice ¶22.08 (1948).

[1449] Note also, however, that as Subsection 170e now reads, the district court having venue apparently has no power at all in the event of a nuclear incident unless claims exceed both the insurance and the indemnity fund. See paragraph of text following note 1268 *supra*.

States under the statutory language may not act as interpleader plaintiff.[1450] If this is so, then it would be possible that in the normal case, the sole interpleader plaintiff would be the insurer, and that at best the United States would be an intervenor defendant. One might argue, therefore, that the sole amount of money for which interpleader is brought is the insurance fund alone, and that the claims need only aggregate an amount larger than this. On the other hand, the court might recognize that in substance, since the United States is a party to the action as intervenor, its judgment would have binding effect on the United States as well and therefore the presence of the indemnity fund also must be accepted. The court could thus conclude that the claims must aggregate more than both the insurance and the indemnity before interpleader could lie.

These complications surely arise in part because interpleader was never designed for this type of situation. Either interpretation of the requirements of the statute will still mean that the device is of limited value in dealing with nuclear incident claims. Indeed, the equitable bill of peace or even the declaratory judgment[1451] more closely resembles the desirable type of procedural device for the mass tort situation. But the liberalized aspects of interpleader—its broad range of process, the court's injunctive power, and the absence of a jury trial requirement —are all essential for a really effective consolidation proceeding and are common to none of the other devices discussed above.

(6) Federal Removal Power

One final device by which consolidation conceivably might be effected in the mass tort situation is the use of federal removal power and the federal statutory successor to the doctrine of *forum non conveniens*. The Federal Judicial Code provides that:

> (a) Except as otherwise provided by Act of Congress, any civil action brought in a State court of which the district courts of the United States have original jurisdiction, may be removed by the defendant or defendants, to the district court of the United States for the district and division embracing the place where such action is pending.

[1450] The interpleader statute is available by its terms only to "any person, firm, or corporation, association, or society." In United States v. Coumantaros, 146 F. Supp. 51 (D.C. N.Y. 1956), the court held that the United States did not fall within this definition.

[1451] See Federal Declaratory Judgment Act, 68 Stat. 890 (1954), 28 U.S.C.A. §§2201-2 (Supp. 1958).

> (b) Any civil action of which the district courts have original jurisdiction founded on a claim or right arising under the Constitution, treaties or laws of the United States shall be removable without regard to the citizenship or residence of the parties. Any other such action shall be removable only if none of the parties in interest properly joined and served as defendants is a citizen of the State in which such action is brought.[1452]

On the face of the statute, defendants in actions brought in state courts, if they can demonstrate a federal question or diversity of citizenship as a basis for original federal judisdiction, are in a position to have the actions removed to the federal district court. Thereupon, the more liberal provisions of statutory *forum non conveniens*[1453] in federal courts are potentially available, opening the way for drawing all actions into a single court.

Let us examine this possibility more closely, beginning with the provision for removal where original jurisdiction is not based on a federal question. The statute states that such actions shall be removable only if none of the defendants is a citizen of the state in which the action is brought. A recent change in the Judiciary Act expressly provides that for the purposes of this section, a corporation shall be deemed a citizen of any state by which it has been incorporated and of the state where it has its principal place of business.[1454] This being the case, even though there is original jurisdiction based upon complete diversity of citizenship among the parties to the action, if the defendant or any one of several defendants is a corporation which is either incorporated in or has its principal place of business in the state where the action is brought, removal to the federal district court is impossible. Often this will be the precise situation if there is a "burn-up." Many reactors will be operated under license issued to private domestic corporations. The chances would appear great that the plaintiff would be forced to sue in a state where the defendant was incorporated or had his principal place of business. If a nuclear incident took place in Michigan, for example, and the defendant was incorporated or had his principal place of business

[1452] 28 U.S.C.A. §1441 (1950).

[1453] §1404 (a) of the Federal Judicial Code provides: "For the convenience of parties and witnesses, in the interest of justice, a district court may transfer any civil action to any other district or division where it might have been brought." For thorough discussions of the pre-statutory federal *forum non conveniens* doctrine and its limitations, see Barrett, "The Doctrine of Forum Non Conveniens," 35 Calif. L. Rev. 380 (1947); Braucher, "The Inconvenient Federal Forum," 60 Harv. L. Rev. 908 (1947); Comment, 56 Yale L. J. 1234 (1947).

[1454] Pub. Law. 85-554, 72 Stat. 415 (1958).

in Michigan, undoubtedly many Michigan plaintiffs would sue in the courts of that state. Under such circumstances the defendant would be powerless to remove to the federal courts. As indicated previously, a device by which less than all of the actions can be brought into one court is defective in the mass tort context. It is to be doubted, therefore, that the non-federal question removal power is a practical basis for consolidation.

Still a possibility, of course, is the removal power where the basis of original jurisdiction is that the action is "founded on a claim or right arising under the Constitution, treaties, or laws of the United States. . . ." Here, citizenship is irrelevant, so the basic question becomes whether an action brought in a state court against a defendant who is licensed, insured, and indemnified under the aegis of the indemnity amendment to the Atomic Energy Act of 1954 is one "founded on a claim or right arising under the . . . laws of the United States." The interpretation of this phrase, as to whether a given suit is "founded" on a federal law, forms a vast body of law in itself,[1455] and a study thereof is beyond the scope of this presentation. Certain basic principles are clear, however. First, the Supreme Court has decided that to be removable a suit must involve a real and substantial dispute or controversy, the resolution of which turns on the construction of a law of the United States.[1456] A cause cannot be removed merely because it may become necessary to construe the laws of the United States. Rather the cause must be one the decision of which depends on such construction, *i.e.*, the plaintiff's right to recovery stands upon federal law.[1457] Finally, it is the federal *nature* of the right to be established that is important for removal purposes, not the source of the authority to establish it.[1458] The mere fact that a state establishes a right in an area which could be pre-empted by the federal government is no justification for saying the state-established right is "founded" on federal law.

The foregoing summarization of the federal-question removal jurisdiction is neither detailed nor specific; nevertheless it can serve as a general guide for our purposes here. It is safe to say that the basic right asserted by a plaintiff in the nuclear incident situation is a tort right created by state statutory or common law.[1459] A federal license in the

[1455] See 2 Cycl. of Fed. Procedure §§3.22 *et seq.* (3d ed. 1951).

[1456] Western Union Telegraph Co. v. Ann Arbor R.R., 178 U.S. 239, 20 S.Ct. 867 (1900); Williams v. 1st Natl. Bank of Pauls Valley, 216 U.S. 582, 30 S.Ct. 441 (1910).

[1457] Gold-Washing & Water Co. v. Keyes, 96 U.S. 199 (1877).

[1458] Puerto Rico v. Russell & Co., 288 U.S. 476, 53 S.Ct. 447 (1933).

[1459] See discussion in text, *supra* at notes 1401 ff.

hands of the reactor operator and insurance purchased under the federal financial protection requirements, while required by federal statute, have no direct bearing on establishing the state-created right. At most, the insurance enhances the insured's ability to respond in damages. It has no effect in most cases on the fact of liability, because the plaintiff's right is substantively affected only by the existence of the federal limitation of liability provision. If total claims aggregate more than $560 million (assuming maximum financial protection required), each plaintiff potentially can be prevented from full collection of his state judgment. One could argue, of course, that this federal provision begins to operate only after the state right has been vindicated and judgment awarded, and therefore no federal question is raised before this time. Probably, however, a court would be willing to look through the form to the substance, saying that potentially each plaintiff's right is diminished substantively by the federal provision. Then, of course, the question of construction previously raised with respect to the exact operation of Section 170e comes into play—and one can argue that the extent of the plaintiff's right turns on a federal statute. To succeed with this argument, however, the defendant would have to induce the Supreme Court to overrule those cases that clearly hold that a federal question *defense* does not make the case one involving federal question jurisdiction.[1460] The federal question must be the *basis* for the plaintiff's claim. Even if successful, which seems unlikely, the argument is valid only when the total claims aggregate more than the limitation level. Frequently, indeed normally, this will not be the case. It is likely that a given court will refuse to look beyond the fundamental limitation of the indemnity provision—that it only affects state remedies at the judgment level. Likewise, removal jurisdiction is available only if the claim exceeds $10,000,[1461] and if a major reactor incident occurs it is likely that there will be thousands of claims for less than this amount.

Even assuming that all suits brought by injured plaintiffs in state courts could be removed to a federal court on the ground of diversity of citizenship or federal question, two difficulties of almost insurmountable proportions block effective consolidation of all claims. If the plaintiff brings his action where he was at the time of impact (the place of

[1460] Louisville & Nashville R.R. v. Mottley, 211 U.S. 149, 29 S.Ct. 42 (1908) (Federal statute wiping out pass privileges previously contracted for used as a defense held not to be a federal question). And see similar concept applied in declaratory judgment case, Skelley Oil Co. v. Phillips Petroleum Co., 339 U.S. 667, 70 S.Ct. 876 (1950).

[1461] §§1331, 1332 of Federal Judicial Code, 28 U.S.C.A. §§1331-2 (Supp. 1958).

injury), there would seem to be considerable doubt that a federal court would transfer the trial on the ground of a more convenient forum.[1462] This might be true also if the plaintiff shows nothing more than that he lives where he brought the action.[1463] Perhaps more important is the fact that an action cannot be removed to a federal court and then the place of trial transferred on the basis of more convenient forum until the plaintiff chooses to start a suit. There is no way to force all potential plaintiffs to bring their actions within a given time so they all can be removed to the court of the federal district where the incident occurred. For all of these reasons we can only conclude that the removal power will not be of service in connection with the mass tort litigation resulting from a nuclear incident.

One author has suggested the propriety and need for congressional legislation to deal with the mass tort problem, and we support the suggestion with particular reference to nuclear incidents and Subsection 170e.[1464] A statute is required which combines the best features of the bill of peace and the bill in the nature of interpleader, by which one who is threatened with suit by potentially numerous claimants can bring

[1462] The general theory of the federal transfer provision is that it codifies the old *forum non conveniens* doctrine and was not intended to give plaintiffs a better hunting license in shopping for a desirable district for trial. Foster-Milburn Co. v. Knight, 181 F.2d 949 (2 Cir. 1950); noted 45 Ill. L. Rev. 676 (1950), 60 Yale L.J. 183 (1951). In accord, Shapiro v. Bonanza Hotel Co., 185 F.2d 777 (9th Cir. 1950). See also Kaufman, "Observations on Transfers under Sec. 1404(a) of the New Judicial Code," 10 F.R.D. 595 (1951); Comment, "Limitations on the Transfer of Actions under the Judicial Code," 64 Harv. L. Rev. 1347 (1951); Comment, "Change of Venue in Federal Courts under Section 1404-A of the New Judicial Code—Effect on Rights of the Parties," 2 Hastings L. J. 29 (1950).

In Norwood v. Kirkpatrick, 349 U.S. 29, 75 S.Ct. 544 (1955), the Supreme Court held that the district courts in transfer cases could order transfer upon a lesser showing of inconvenience by a defendant than would be required for dismissal under the doctrine of *forum non conveniens*. Noted 55 Col. L. Rev. 1067 (1955); 36 Bost. U. L. Rev. 127 (1956); 41 Va. L. Rev. 813 (1955); 2 N.Y.L. For. 127 (1956). In this case the case was transferred to the place where the three employees suing under the F.E.L.A. had been injured. This is a more appealing case for transfer than when the plaintiff brings suit where the injurious impact took effect as would likely be the case if there were a reactor "burn-up."

[1463] This was the rule under the *forum non conveniens* doctrine prior to enactment of §1404 (a); Braucher, *supra* note 1453 at 919-20; Barrett, *supra* note 1453 at 413. But see Nicol v. Koscinski, 188 F.2d 537 (6th Cir. 1951). One of the plaintiffs in Norwood v. Kirkpatrick, *supra* note 1462, resided in the district in which the suit was brought. This fact brought forth a sharp dissent. In any event, the appeal courts refuse to upset the trial judges' exercise of discretion unless a serious injustice results. Ford Motor Co. v. Ryan, 182 F.2d 329, 331-32 (2d Cir. 1950); Moore, Commentary on the U. S. Judicial Code 210 (1949).

[1464] Comment, 63 Yale L.J. 493, 521-22 (1954).

a single action into which all claimants can be forced and by which they are all bound. It would appear that the desirability of individualized determinations of the liability relation between each claimant and the defendant is far outweighed by the factors of timeliness, equality, and efficiency that a centralized proceeding would bring. In short, Congress should modify Subsection 170e to provide for an original bill in the federal district court having venue over the incident, under which process would run throughout the United States, the court having the power to enjoin proceedings elsewhere, and the right to jury trial being discretionary with the judge, although this raises the problem of the constitutional right to jury trial in civil proceedings in federal courts.[1465] It should not be necessary that claims exceed the fund available, but only that the defendant will be subjected to a multiplicity of suits and, in the opinion of the court, the ends of justice will be served by consolidation. Only when this or a similar provision is enacted into law will Subsection 170e provide an adequate basis for the satisfaction of nuclear incident claims.

c. Administrative Detail

Assume that the federal district court has discovered or been given a procedural device by which it can force substantially all of the injured parties to consolidate their claims. Although many administrative problems thus would be solved, others emerge. The court is confronted with the task of sorting out, evaluating, and satisfying the thousands of valid claims likely to arise from a nuclear disaster. The district judge, if possible, must seek further procedural tools at this stage to assist him in the administration of this enormous proceeding. Again there is some precedent in previous mass tort cases which may have application to an action resulting from a nuclear incident, and the judge may also find additional assistance in the federal rules of civil procedure.

(1) Arbitration

Arbitration was used with considerable success in the *Ringling Brothers* case, discussed above with respect to receivership.[1466] The appointment of a receiver in that action was accompanied by an arbitration agreement, signed by the circus and most of the claimants, by the terms of which (1) the circus waived defenses of contributory negligence, absence of negligence, or the statute of limitations; (2) the

[1465] Jacobs v. Ringling Bros., Barnum & Bailey Combined Shows, Inc., 141 Conn. 86, 103 A.2d 805 (1954). See Note, 60 Yale L. J. 1417 (1951).

[1466] *Supra* note 1430 and accompanying text.

assets of the circus were released to the receiver; and (3) with certain minor exceptions, the award of the arbitration panel was made final. Additional provision was made for direct settlement of claims, with the arbitration panel having the right to supervise settlement of any claim in excess of $200. It further was agreed that successful claimants were to be paid in periodic dividends from operational profits, income tax refunds, and proceeds of insurance policies.

While such a device would appear highly efficient as a means of processing claims, there are several serious limitations on its use in federal courts in the context of a nuclear incident. The first drawback is somewhat obvious; such arbitration agreements are by definition the product of consent. Local pressures, such as the obvious favor with which the Connecticut court and the local bar association looked upon arbitration in the *Ringling Brothers* case, strongly induced claimants to submit to arbitration.[1467] These pressures might be absent in the event of a nuclear incident, particularly since damages are certain to be of a less localized nature in many instances.

The probability, therefore, that a substantial majority of claimants would agree to arbitration is not great and is at best speculative. On the one hand, arbitration could be expected to insure more rapid settlement of claims; but on the other, the claimants would lose the advantage of jury trials. Wide geographical distribution of claimants and the fact that many potential claimants would not know at the time of recommended arbitration that they had sustained injuries or the extent of those injuries further lessen the effectiveness of the arbitration device. In the Hartford disaster and in all other mass tort cases herein discussed, injuries were of such a nature that all claims were asserted within a relatively short time. An arbitration agreement signed by less than all of the claimants has only limited value, and the fact that many claimants will not know of their injuries probably will mean that considerably fewer than all the claimants would be parties to the contract.

A final difficulty with arbitration of claims in federal courts is the fact that the United States Arbitration Act apparently is restricted in scope to "transactions involving commerce" and "maritime transactions."[1468] It is clear that a rather broad construction of the term

[1467] Note, 60 Yale L. J. 1417, 1419, n. 12 (1951).

[1468] 61 Stat. 669 *et seq.* (1947); 9 U.S.C.A. §§1-14 (1953). The statute specifically empowers federal courts with respect to these transactions only, and it has been concluded that although Congress could constitutionally extend the statute further, it did not do so. See Sturges & Murphy, "Some Confusing Matters Relating to Arbitration under the United States Arbitration Act," 17 Law & Contemp. Prob. 580, 585 *et seq.* (1952).

"commerce" would be required before one could conclude that the district courts had the power under the statute to implement the arbitration process judicially. The authors have found no tort cases in which issues have been submitted to arbitration pursuant to the federal act. Further, it is to be doubted that a federal court would enforce an agreement to arbitrate tort claims solely on the basis of its inherent equity powers, in view of the traditional doctrine that arbitration agreements are both revocable and non-enforceable unless a statute dictates otherwise.[1469]

(2) Pre-Trial Conference

Advantageous use of this simplification device in mass tort litigation was illustrated in *Clark* v. *United States*,[1470] a case in which consolidation of all claims was possible because all the actions were against the government under the Federal Tort Claims Act. The court insured complete claimant participation in the proceeding by waiting until the statute of limitations had run before beginning hearings. Under the close supervision of the district court, numerous pre-trial conferences were then held for the purpose of drafting a definitive pre-trial order as a basis for the simplification of the issues of liability. Twenty cases eventually were selected for trial at a final conference between the government and claimant's attorneys, and at the same time a final pre-trial order was submitted to the court. Counsel for claimants whose causes were not selected for trial were directed to submit proposed definitive pre-trial orders of their own, or to agree of record to abide by the order for the selected cases. After careful review of its terms through the submission of briefs by the parties, the district court ultimately gave final approval to a binding pre-trial order framing all the issues of fact and law in the case.

So employed, the pre-trial conference with its resulting order is a powerful weapon for simplification of mass tort litigation. The real questions of fact and law at issue are brought out forcefully in the candid atmosphere that can characterize such a proceeding. Stipulations among parties as to agreed facts are encouraged, and without a doubt, the frank airing of issues provides an excellent opportunity for initiation of settlement discussions.[1471] Particularly where the only real

[1469] *Id.* at 587.

[1470] *Supra* note 1439. For a discussion of the procedures followed, see Comment, 63 Yale L. J. 493, 517-18 (1954).

[1471] See Murrah, "Pre-Trial Procedure, A Statement of Its Essentials," 14 F.R.D. 417, 418 (1953). This paper was prepared for use by federal district judges seeking to work under Federal Rule 16. The rule states: "In any action, the court may in

controversy is over the extent of claimants' injuries, the pre-trial conference can easily become the most satisfactory forum for the satisfaction of claims. It was in this fashion that hundreds of claims arising from the sinking of the *Andrea Doria* were settled and paid in less than a year.[1472] A district court finding itself able to consolidate claims arising from a nuclear incident almost certainly would wish to make extensive use of this device for rapid, reasonable satisfaction of claims.

In this regard, however, Subsection 170h of the Anderson amendment introduces a complication. There it is provided that, as a term of each indemnity agreement, when the AEC determines that the government probably will have to make payments under the indemnity agreement, the Commission "shall collaborate with any person indemnified and may approve the payment of any claim under the agreement of indemnification, appear through the Attorney General on behalf of the person indemnified, take charge of such action, and settle or defend any such action."[1473] The Commission is further given the authority "on behalf of the United States to settle or approve the settlement of any such claim on a fair and reasonable basis with due regard for the purposes of this Act."[1474] The Joint Committee report indicates that

its discretion direct the attorneys for the parties to appear before it for a conference to consider (1) The simplification of the issues; (2) The necessity or desirability of amendments to the pleadings; (3) The possibility of obtaining admissions of fact and of documents which will avoid unnecessary proof; (4) The limitation of the number of expert witnesses; (5) The advisability of a preliminary reference of issues to a master for findings to be used as evidence when the trial is to be by jury; (6) Such other matters as may aid in the disposition of the action. The court shall make an order which recites the action taken at the conference, the amendments allowed to the pleadings, and the agreements made by the parties as to any of the matters considered, and which limits the issues for trial to those not disposed of by admissions or agreements of counsel; and such order when entered controls the subsequent course of the action, unless modified at the trial to prevent manifest injustice . . . ." 28 U.S.C.A., Federal Rules of Civil Procedure, 16 (1950).

[1472] See reference to *Andrea Doria* settlements, note 1439 *supra*.

[1473] The full text of Subsection 170h is as follows: "The agreement of indemnification may contain such terms as the Commission deems appropriate to carry out the purposes of this section. Such agreement shall provide that, when the Commission makes a determination that the United States will probably be required to make indemnity payments under this section, the Commission shall collaborate with any person indemnified and may approve the payment of any claim under the agreement of indemnification, appear through the Attorney General on behalf of the person indemnified, take charge of such action, and settle or defend any such action. The Commission shall have final authority on behalf of the United States to settle or approve the settlement of any such claim on a fair and reasonable basis with due regard for the purposes of this Act. Such settlement may include reasonable expenses in connection with the claim incurred by the person indemnified."

[1474] *Ibid.* The indemnity agreement proposed by the AEC provides in this respect that the "Commission shall have the right . . . to require the prior approval of the

this latter authority is given the Commission so that it will not be bound by legal technicalities "such as rules of legal proof in a situation in which the courts have not yet had a chance to establish new rules for new problems arising from radiation." [1475]

The problems that lurk in this rather remarkable provision are myriad. While the Commission's powers under the subsection are apparently restricted to settlement of claims against the indemnity fund, it would appear as a practical matter that separation of claims against the insurer and the indemnitor is impossible, particularly when Subsection 170e appears to contemplate apportionment of claims among the entire fund of insurance plus indemnity. Can it be that Congress intended *two* apportionments: first, payment by the insurer of those legal liabilities which are established against the insurance fund; and then second, payment through settlement or otherwise by the government of "fair and reasonable" claims out of the indemnity fund, whether or not the insurer's legal liability therefor has been established? This is certainly a curious, cumbersome process. But if this is not what Congress intended, then the insurers undoubtedly are laboring under the misapprehension that they will be liable for payment only when such liability is established in a court of record under legal rules, albeit "new," or in the alternative, when they themselves decide that settlement is the more intelligent course. If the Commission can tell the insurers when and for how much to settle, then really an insurance policy containing conditions and exclusions is little more than a pious gesture. Also illusory would be the hope that the insurer's liability would be based on legal doctrine, except to the extent that legal doctrine may accord with the Commission's notion of what is "fair and reasonable."

Commission for the settlement or payment of any claim . . . and . . . take charge of such action and settle or defend such action." Proposed 10 C.F.R. §140.76, 23 Fed. Reg. 6682, 6683 (1958).

[1475] Joint Committee Report 23. The report also states that this authority is given to the Commission so that its settlements need not "wait for an action to go to final judgment but can be settled when it seems fair and reasonable." *Ibid.* One can easily see the dilemma that this provision brings to the district court judge having venue. He is empowered to limit liability and make the other orders specified in Subsection 170e only when it appears that claims will exceed the combined funds. With the government settling state actions even before they come to trial, it is almost impossible for him to know whether claims are actually "sufficient" to empower him. Assuming that the government does settle many claims before state judgments are rendered (even so, sufficient claims go to judgment that they aggregate more than the insurance and indemnity fund), does an apportionment by the district court require those with whom the government settled to refund part of their payment? Or is the amount of indemnity reduced by the settlements made, and therefore apportionment is only necessary among those claims which go to judgment?

Perhaps this interpretation would also result in significant changes being made in state substantive tort rules.

One possible interpretation of this subsection is that it is merely designed to place final authority in the Commission, among government agencies, to establish the government's position on each claim. This would not necessarily mean that the Commission's authority was final with respect to the insurer or indemnitee. So restricted, the subsection would pose less of a problem, although certainly in any case in which the decision as to settlement is to be made by more than one agency, there will always be differences of opinion. But so to restrict the subsection is to ignore much of its language and much of the language of the Joint Committee report. Clarification of Congress' position in this respect is certainly in order, for undoubtedly the settlement process will be extremely important in the event of a nuclear disaster.

(3) Reference to a Master

One of the appropriate issues for discussion at a pre-trial conference under the federal rules is the advisability of preliminary reference to a master for findings to be used in evidence when trial is to be by jury.[1476] The purpose of such reference is the simplification of complex evidence for the jurors, and the master's report, while not conclusive, appears as strong and impartial evidence for them to weigh with whatever testimony is introduced by the parties at the trial. Good practice would seem to support the use of a master in a jury case where it is necessary to introduce technical, scientific, and medical data in order to show the fact and extent of indemnitee's liability to various claimants allegedly suffering radiation injury.[1477]

If, however, the proceeding in which claims are to be satisfied is of a non-jury variety, the possibility of reference to a master is considerably less. Rule 53 of the federal rules provides that in these cases a reference is to be made "only upon a showing that some exceptional condition requires it."[1478] It is clear that the mere fact of a crowded docket is not sufficient ground for reference.[1479] The court may be able

[1476] 28 U.S.C.A., Federal Rules of Civil Procedure, 16(5) (1950).

[1477] "A reference to a master shall be the exception and not the rule. In actions to be tried by a jury, reference shall be made only when the issues are complicated; in actions to be tried without a jury, save in matters of account, a reference shall be made only upon a showing that some exceptional condition requires it." 28 U.S.C.A., Federal Rules of Civil Procedure, 53(b) (1950). "Complicated" jury cases in which reference has been allowed are listed in 5 Moore, Federal Practice ¶53.05[2] (2d ed. 1948).

[1478] See Federal Rule 53(b), *supra* note 1477.

[1479] McCullough v. Cosgrave, 309 U.S. 634, 60 S.Ct. 703 (1940).

to show, on the other hand, that specialized training on the part of the master in the field of radiation injury makes him peculiarly suited for a preliminary hearing of claims arising from a nuclear incident.[1480] If such a justification is possible, then, of course, the court will be spared the task of holding full individual hearings on each claim. Perhaps the most desirable procedure that a court could follow would be to appoint a master to hear matters of damage or injury after pre-trial conferences have been held on the issue of liability. The chance of rapid settlement for just amounts would appear excellent should such a course be followed.

As with the question of possible consolidation, there is little guidance in Subsection 170e for a federal district court called upon to deal with these basic problems of administration. While undoubtedly considerably more latitude should be left to the judge in these matters than in the issue of deciding upon a consolidation device, yet the Atomic Energy Act or regulations promulgated thereunder at least should provide a framework for a claims proceeding. As Subsection 170e now reads, there is no indication of the nature of the action in which the enumerated orders are to be granted, or the manner in which adjudicated claims actually are to be paid. Such procedural details are easily specified and should not be left to judicial invention.

4. Conclusion

The government indemnity provisions found in the 1957 enactment badly need some clarifying amendments. This should be done immediately, before more reactors are put into operation, since a reactor incident, should it occur, could cause enough damage to bring the indemnity provisions into play.

The form of insurance policy as approved by the AEC should be changed in at least one respect; liability from all operations during the time the policy is in effect should be covered so as to give protection commensurate with the applicable statute of limitations, and not be arbitrarily limited to two years after the policy is cancelled. This means that most radiation injuries will not be covered because they often are delayed more than two years after irradiation. The only alternative is to allow the possibility of immediate recovery for future injuries. As pointed out in the previous discussion of such damages, this is far from

[1480] See 5 Moore, Federal Practice ¶53.05[2] (2d ed. 1948) for cases in which reference has been made when trial was to be before the court without a jury. See also Kaufman, "Masters in the Federal Courts," 58 Col. L. Rev. 452, 455 (1958).

satisfactory so long as present compensation methods are used.[1481] If the approved policy is not changed, the question then is posed as to whether legal liability will be indemnified by the government for the whole amount beginning with the first dollar not covered by the approved policy or whether the indemnitee will have to stand the losses. It can be argued that the indemnitee will have satisfied the financial protection requirement by taking out insurance under an approved policy and that the government must step in where the insurance policy ceases to protect. This will mean that much of the private insurance coverage is illusory even though very high premiums have been paid for it. Congress should answer this question specifically.

[1481] *Supra* discussion at Section B 5 c (4)(a).

Chapter IV

STRICT LIABILITY FOR RADIATION INJURIES*

A. Introduction and Historical Background

Strict liability for all damages inflicted by one person upon another was anciently the rule of the common law. Every man was held responsible for the consequences of his acts, however reasonable he may have been and however carefully he may have performed his tasks.

In the beginning this doctrine was apparently applied by the courts principally if not exclusively to trespasses commited by the defendant's domesticated animals upon the adjoining land of a neighbor. Strict liability was imposed in such instances on the ground that owners of adjoining land owed the mutual obligation to save each other's property from harm caused by such incursions upon it. Even today, apart from statutory provisions to the contrary, such strict liability is the rule in most of the courts of the United States as regards animals that are likely to stray and do damage to others. Some of the western states have rejected the idea because of their range grazing needs, and statutes now very generally cover the field.

Likewise something approaching strict liability was imposed by the early common law for injuries caused by fire escaping from the premises of a landholder to those of his neighbors. This harsh result was, however, mitigated in England by a statutory provision enacted in 1707,[1] to the effect that no action should be maintained against one whose building or estate caught fire accidentally, although liability was imposed for negligence and for intentional acts. This early English statute was carried to this country as part of the common law and was taken over by the courts on this side of the Atlantic. Our courts have consistently held in the absence of legislation that there is no liability for the escape of fire if the defendant was not negligent or guilty of an intentional wrong.[2]

These early doctrines of strict liability and those related to them ap-

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[1] 6 Anne c. 31, ¶6, as amended by 10 Anne c. 14, ¶1, and 14 Geo. 3, c. 78, ¶86.

[2] See Prosser, Torts 327 (2d ed. 1955).

plied in other areas of the law did not derive from deep moral principle; instead the law was occupied principally with the very practical problem of keeping peace between individuals. To that end it provided a judicial remedy that would be accepted by the people in place of self help or private vengeance. Moral bases of the law were a later development.

With the lapse of time and by the process of evolution, as growing moral consciousness in the community made itself felt, the courts moved away from the cruder methods of early complete liability toward the more discriminating rule of equating legal liability in tort with conduct which would not be expected of a worthy member of the community. Accordingly, two types of conduct were in general found to involve such a degree of moral or social fault as to make the actions unworthy in the eyes of the law; first, conduct *intended* to invade the legally protected interests of others and, second, conduct which created an *unreasonable risk* to such interest, *i.e.*, negligence.

As Lord McMillan stated it in the recent and important English case, *Read* v. *The Lyons Company, Ltd.:*

> The process of evolution has been from the principle that every man acts at his peril and is liable for all the consequences of his acts to the principle that a man's freedom of action is subject only to the obligation not to infringe any duty of care which he owes to others. The emphasis formerly was on the injury sustained and the question was whether the case fell within one of the accepted classes of common law actions; the emphasis now is on the conduct of the person whose act has occasioned the injury and the question is whether it can be characterised as negligent. I do not overlook the fact that there is at least one instance in the present law in which the primitive rule survives, namely, in the case of animals *ferae naturae* or animals *mansuetae naturae* which have shown dangerous proclivities. The owner or keeper of such an animal has an absolute duty to confine or control it so that it shall not do injury to others and no proof of care on his part will absolve him from responsibility.[8]

Accordingly the law became so shaped that unless a man were guilty of "a fault" in the sense indicated he would not be compelled to respond in damages for injuries resulting from his acts.

There has, however, developed in the latter part of the nineteenth and twentieth centuries still a new direction in the law of civil liability; that is, a limited though more sophisticated return to "liability without

[8] [1946] 2 All. E. R. 471 at 476.

fault," at least without fault in the ordinary sense, unless the term be broadly defined to include ultrahazardous activities.

Following the lead of an 1868 English decision in the case of *Rylands* v. *Fletcher*[4] a modern doctrine of strict liability has been enunciated and applied to certain types of activities which may, in general, be loosely characterized by the phrase "ultrahazardous in nature." The application of this doctrine to particular fact situations is quite unclear for it depends not only upon potentialities for harm, but also upon such vague and intangible considerations as social utility, the nature of the location, common usage within the area, and other related factors.

The twentieth century development of the *Rylands* v. *Fletcher* doctrine is of substantial concern to the atomic energy industry, for it would seem that certain segments of that industry will in all probability become subject to its financial burdens although certain other segments may be dealt with under conventional negligence doctrines. Or, on the other hand, some parts of the new industry may follow the course developed in connection with damages occasioned by fire, for in many respects fire is a predecessor of atomic energy. If this parallelism should prove to be appealing, atomic energy may in the initial stages of its use be held subject to absolute liability, in some of its applications at least, although social utility and community needs may, in the more distant future, bring about through statutory means a change in the theory of liability to one less drastic in nature.

At all events we shall find ourselves, in discussing the question of tort liability of atomic enterprise, facing the full circle of historical development starting from ancient strict liability, continuing through the Victorian doctrines of negligence, and now back again to strict liability.[5]

B. Current Common Law Principles in General

As the peaceful uses of atomic energy become more and more commonplace, we shall find it necessary to deal increasingly with the problems of civil liability for the very simple reason that, notwithstanding all of the care that will be exercised, injuries due to overexposure to radiation will occur in ever increasing numbers. For practical purposes there are three principal theories of liability demanding consideration in this connection: negligence, nuisance, and strict liability, the latter sometimes called liability without fault.

[4] 3 Hurl. and C. 774 (1865); L. R. 1 Exch. 265 (1866); L. R. 3 H. L. 330 (1868).

[5] For further development of the historical background of strict liability, see Prosser, Torts 315 (2d ed. 1955), and 2 Harper & James, Torts 785 (1956).

Negligence has been defined as conduct which involves an unreasonably great risk of causing harm to others, or, in different words, conduct which falls below the standard established by law for the protection of others against unreasonably great risk of harm. Conduct falls short of this standard when the individual against whom the charge is advanced has failed to act as the reasonable man of ordinary prudence would act under similar circumstances. The standard is an objective one rather than one based upon the individual judgment of any particular person. Negligence, as a legal basis for imposing liability, emerged as a judicial doctrine after the Industrial Revolution. It constituted a departure from the more primitive concepts of the earlier common law. Over the last century or more it has developed into a widespread and omnipresent theory of liability applicable to most forms of human activity and enterprise.

Nuisance, or at least "private nuisance," according to Dean Prosser is "a term applied to unreasonable interference with the interest of an individual in the use or enjoyment of land." He further states that the interference "may be intentional, or negligent, or may result from an abnormally dangerous activity for which strict liability is imposed. It must result from conduct of the defendant which is found to be unreasonable in the light of its utility and the harm or risk which results." [6]

Not all authorities in the law of torts agree with Dean Prosser in his definition of nuisance. For example, Professor Warren Seavey argues that the term "nuisance" should not be deemed to refer to the fact of interference with the land of another but to the nature of the defendant's conduct which causes the interference. He places emphasis not only upon the conduct of the defendant but also he would require unlawfulness; that is, to be a nuisance there must be a tortious or criminal act interfering with the use of the land of another.[7]

However, regardless of definitions given by commentators, the term "nuisance" is in fact widely used by the courts in rendering judgments for damages in situations not too far removed from those which may and probably will in due course arise out of peaceful utilization of atomic energy. Nuisance, therefore, must be taken into account as a possible theory of liability applicable to this new field.

The third theory demanding consideration is so-called *strict liability,*

[6] Prosser, Torts 389 (2d ed., West Pub. Co., 1955).

[7] See Seavey, "Nuisance, Contributory Negligence, and Other Mysteries," 65 Harv. L. Rev. 984 (1952). The Restatement of Torts follows Prosser rather than Seavey; see 4 Restatement, Torts, Scope Note to Ch. 40 (1939). We shall deal more fully with this matter later in this chapter.

sometimes referred to as liability without fault. As previously noted there is a new direction in the evolution of the law, a change from the course of development which limited liability in tort to acts involving fault of the defendant, and a movement, in certain areas in any event, toward developing a policy of imposing liability without regard to such fault. This is particularly the case when injuries arise out of activities involving unusual danger to persons and property in the community. It is possible to argue, in support of strict liability as a mere extension of negligence, that the actor who carries on a dangerous activity in a community under such circumstances that harm is likely to be inflicted upon other persons is by virtue of that fact alone guilty of committing a fault. Or, on the other hand, one can say, as courts have frequently said, that the person who carries on such activities should be obliged to pay (as a matter of proper social distribution of the loss) the damages resulting therefrom, that is, to "pay his way." The social expediency of this development in the law has been favorably commented upon by certain authorities writing recently on the law of torts. Professors Fowler Harper and Fleming James, Jr., have written:

> There is a growing belief, however, that in this mechanical age the victims of accidents can, as a class, ill afford to bear the loss; that the social consequences of uncompensated loss are of far greater importance than the amount of the loss itself; and that better results will come from distributing such losses among all the beneficiaries of the mechanical process than by letting compensation turn upon an inquiry into fault.[8]

In specific reference to atomic energy injuries, Dean Prosser, writing in 1955, offered this observation:

> The first case involving damage from the escape of radiation from the use of atomic energy has yet to reach the courts. When it does, it is not difficult to predict that there is no court which will refuse to apply to it the principle of strict liability found in the cases which follow Rylands v. Fletcher.[9]

In this chapter we shall explore with considerable detail the doctrines to which Professors Harper, James, and Prosser refer, namely, the doctrines stemming from *Rylands* v. *Fletcher* and involving this modern trend toward liability without fault. It is this trend and these doctrines with which atomic energy users and their insurance carriers will be chiefly concerned. We shall also concern ourselves with the possible ap-

[8] 2 Harper & James, Torts 794-795 (1956).
[9] Prosser, Torts 336 (2d ed. 1955).

plications of nuisance doctrines to activities involving peaceful utilization of atomic science. In other words, in this chapter all phases of liability imposed upon operators of equipment containing radiation sources except liability founded upon negligence, will be discussed.

C. Strict Liability Under the Doctrine of *Rylands* v. *Fletcher*—The English Decisions

We will now proceed to examine the current theory of strict liability employed in common law jurisdictions as derived from the English case of *Rylands* v. *Fletcher*. The case was decided by the House of Lords in 1868, and, although it is now ninety years of age, its value as a precedent seems to grow with time. It is a part of a modern trend toward strict liability. In the United States especially, it has become a very broadly ranging and even severe doctrine in some of its applications.

In *Rylands* v. *Fletcher* a mill owner built a water reservoir on his own land over an abandoned mine shaft that, unknown to him, connected with a mine located on the plaintiff's adjoining premises. The water accumulated in the reservoir and thereafter escaped into and through the abandoned shaft and thence into the plaintiff's workings. Damage resulted and the plaintiff brought suit. Neither negligence, nuisance, nor trespass was claimed or found to exist.

In the lower court (Exchequer Chamber) Justice Blackburn found the defendant liable though without fault. He stated the rule of the case in these often quoted words:

> We think that the true rule of law is, that the person who for his own purposes brings on his lands and collects and keeps there anything likely to do mischief if it escapes, must keep it in at his peril, and, if he does not do so, he is prima facie answerable for all the damage which is the natural consequence of its escape. He can excuse himself by showing that the escape was owing to the plaintiff's fault; or perhaps that the escape was the consequence of a vis major, or the act of God.[10]

This decision was affirmed on appeal to the House of Lords, but some important limiting qualifications were added to the doctrine of the case as stated by Justice Blackburn. Specifically a requirement of "non-natural user" of the defendant's land was added. The court, Lord Cairns speaking, said:

> [I]f, in what I may term the natural user of that land, there had been any accumulation of water, . . . and if, by the

[10] Rylands v. Fletcher, L. R., 1 Exch. 265, 279-280 (1866).

> operation of the laws of nature, that accumulation of water had passed off into the close occupied by the Plaintiff, the Plaintiff could not have complained. . . .
>
> * * * * *
>
> On the other hand if the Defendants, not stopping at the natural use of their close, had desired to use it for any purpose which I may term a non-natural use . . . and if in consequence . . . the water came to escape and to pass off into the close of the Plaintiff, then it appears to me that that which the Defendants were doing they were doing at their own peril.[11]

The court did not specifically limit the rule of the case to damage inflicted on adjoining land but, on the contrary, as it was stated, it could readily be made applicable to personal injuries as well. That aspect of the decision has subsequently been given judicial consideration in England with results that we shall presently note.

In accordance with these pronouncements, therefore, three important limitations appear in respect to the application of the *Rylands* doctrine; namely, (1) liability is imposed only in case of bringing and maintaining on to the land a dangerous substance likely to cause mischief if it escapes, (2) this activity must constitute a "non-natural use" of the land, and (3) there must be an "escape" that causes damage. These limitations create great uncertainty in the application of the doctrine to other situations.

In regard to the first point, *i.e.*, the dangerous quality of the substance or instrumentality, Dr. Stallybrass reached the conclusion, after an extensive examination of all of the English decisions down to the time of writing in 1929, that the application of the doctrine rests upon a principle of relativity. He wrote that "just as there is nothing which is at all times and in all circumstances dangerous so it seems that there is scarcely anything which is in all circumstances safe." [12] He elaborates the principle in the following language:

> The principle of law behind all these cases is, it is submitted, that if a man takes a risk, which he ought not to take without also taking upon his shoulders the consequences of that risk, he shall pay for any damage that ensues.
>
> In every case the question really is: Was the risk one which the defendant was entitled to take only on condition of paying compensation to those injured thereby irrespective of any negligence on his part? And the answer to that question will

[11] Rylands v. Fletcher, L. R., 3 H. L. 330, 338-339 (1868).

[12] Stallybrass, "Dangerous Things and the Non-Natural User of Land," 3 Camb. L.J. 376, 387 (1929).

> not depend upon whether the thing in question was dangerous *per se,* but upon whether it was dangerous in the circumstances of the particular case.[13]

In short, if the defendant brings a substance on his land which involves an unreasonable risk of harm to persons or property in the vicinity, he falls within the doctrine of the *Rylands* case. It is obvious that application to specific situations will present difficulties.

Moreover, there is serious uncertainty in connection with the application of the term "non-natural user." The court's opinion in the *Rylands* case offered no assistance, and the problem of determining when a given user is non-natural persists to this day. The words have now become "terms of art," and the courts have indicated that they are susceptible to change as the world becomes more crowded, and as industry becomes more complex. The doctrine has been said to be confined to activities which are "extraordinary" or "abnormal." It does not apply to "usual," "ordinary," and "normal" types of activity. It has also been said that "the reasonable use of property in the way most beneficial to the community" is not deemed to be a "non-natural use" so as to render the actor subject to strict liability.[14]

Forty-five years after *Rylands* v. *Fletcher* was decided the case of *Rickards* v. *Lothian* came before the English courts. That case, somewhat like *Rylands,* involved an overflow of water on an upper floor damaging plaintiff's stock in trade stored below. Recovery, sought on the basis of the *Rylands* case, was denied, however. The court said:

> The provision of a proper supply of water to the various parts of a house is not only reasonable, but has become, in accordance with modern sanitary views, an almost necessary feature of town life. . . . in some form or another it is usually made obligatory in civilized countries. Such a supply cannot be installed without causing some concurrent danger of leakage or overflow. It would be unreasonable for the law to regard those who instal or maintain such a system of supply as doing so at their own peril.
>
> * * * * *
>
> It is not every use to which land is put that brings into play that principle [namely the principle of Rylands v. Fletcher]. It must be some special use bringing with it increased danger to others, and must not merely be the ordinary use of the land or such a use as is proper for the general benefit of the community.[15]

[13] *Id.* at 387, 388.

[14] Bramwell, J., in Nichols v. Marsland, L. R. 10 Exch. 255, 259 (1875).

[15] [1913] A. C. 263, 280-282.

It is clear, then, that not only the character of the activity but also the place and manner in which it is carried on are pertinent to the classification of the function as a non-natural user or otherwise.

In accordance with the foregoing principles, the English courts have applied the strict liability doctrine in a considerable variety of cases involved in some seventy English decisions. They have applied it against defendants who collected water in large quantity in hydraulic power mains; who operated a plant for washing film in close proximity to the plaintiff's land; who stored illuminating gas in quantity; who conducted high voltage electricity in the public streets; who operated a traction engine with the fire under its boiler shooting out sparks along the highway; who operated a ten-ton traction engine too heavy for the highway; who stored large quantities of explosives, or inflammable liquids; who engaged in blasting or accumulating sewage; who maintained a facility involving the emission of creosote fumes; or who operated a pile driver which caused excessive vibration. All of these have been deemed "non-natural users" for which strict liability ensued. On the other hand, maintaining water in a cistern, or in household pipes, or household gas or electricity supply, or fire in a fireplace, or driving automobiles on the highways are customary uses for which strict liability does not apply.[16]

In respect to the requirement of "escape" of a dangerous substance from the defendant's premises, the recent English case of *Read* v. *The Lyons Company, Ltd.*[17] may well exert considerable influence upon American courts in further evolution of the American doctrines of strict liability. The cause of action arose during World War II as a result of an accident in defendant's ordnance factory. The plaintiff, an employee of the Ministry of Supply, was on the premises as a shell inspector, and she was injured by the explosion of a shell. The issue was briefly summarized by Lord Porter who asked:

> Are the occupiers of a munitions factory liable to one of those working in that factory who is injured in the factory itself by an explosion occurring there without any negligence on the part of the occupiers or their servants?[18]

A claim of strict liability was advanced by the plaintiff but without success. Said Viscount Simon, one of the judges:

> The fact that the work that was being carried on was of a kind which requires special care is a reason why the standard of

[16] For a citation of the many English cases, see Prosser, Torts 329, 330 (2d ed. 1955).

[17] *Supra* note 3.

[18] *Id.* at 478.

> care should be high, but it is no reason for saying that the occupier is liable for resulting damage to an invitee without any proof of negligence at all.[19]

On the question of "escape" Viscount Simon commented:

> The first essential condition of "escape" does not seem to me to be present at all. "Escape," for the purpose of applying the proposition in *Rylands v. Fletcher* means escape from a place which the defendant has occupation of, or control over, to a place which is outside his occupation or control.[20]

Lord McMillan also participated in the court's opinion. He commented both on "escape" and also on "non-natural user" as follows:

> The doctrine of *Rylands* v. *Fletcher,* as I understand it, derives from a conception of the mutual duties of adjoining or neighboring landowners. . . . The two prerequisites of the doctrine are that there must be the escape of something from one man's close to another man's close and that that which escapes must have been brought on the land from which it escapes in consequence of some non-natural use of that land whatever precisely that may mean. Neither of these features exists in the present case. I have already pointed out that nothing escaped from the defendant's premises, and, were it necessary to decide the point, I should hesitate to hold that in these days and in an industrial community it was a non-natural use of land to build a factory on it and conduct there the manufacture of explosives. I could conceive it being said that to carry on the manufacture of explosives in a crowded urban area was evidence of negligence, but there is no such case here.[21]

Lord Simonds who also wrote an opinion mentioned the rule set forth in the American Law Institute Restatement of Torts, reference to which will be made later in this chapter, to the effect that "ultra-hazardous activities" should carry with them the doctrine of strict liability. He rejected both the Restatement rule and other American strict liability doctrines in the following language:

> Somewhere the line must be drawn unless full rein be given to the doctrine that a man acts always at his peril. . . . I speak with all deference of modern American textbooks and judicial decisions, but I think little guidance can be obtained from the way in which this part of the common law has developed on the other side of the ocean.[22]

[19] *Id.* at 473.
[20] *Id.* at 474.
[21] *Id.* at 477.
[22] *Id.* at 481.

In regard to liability of persons on the defendant's premises, Lord Simonds concluded:

> I would reject the idea [of the Restatement] that, if a man carries on a so-called ultra-hazardous activity on his premises, the line must be drawn so as to bring him within the limit of strict liability for its consequences to all men everywhere. On the contrary, I would say that his obligation to those lawfully on his premises is to be ultra-cautious in carrying on his ultra-hazardous activity, but that it will still be the task of the injured person to show that the defendant owed him a duty of care and did not fulfil it. It may well be that in the discharge of that task he will sometimes be able to call in aid the maxim *res ipsa loquitur*.[23]

It should not be assumed, however, from the above quotations that the English courts apply the doctrine of *Rylands* v. *Fletcher* only to injuries to land. It is true that most of the seventy decisions involve such injuries, and, in English law, landed interests are for historical reasons highly regarded—perhaps considerably more so than are personal interests. However, there are cases imposing strict liability for purely personal injuries such as the *Jennings Brothers* case concerning an amusement park with its centrifugal whirling chair device which went awry and injured the plaintiff.[24]

Moreover, there are certain exceptions to the doctrine of strict liability that may be gleaned from the British decisions. Strict liability is not applicable:

1. When the defendant is able to ". . . excuse himself by showing that the escape was owing to the plaintiff's default";[25]

2. When the damage is caused by the intervention of an Act of God;[26]

3. When the harm results from the deliberate act of a third party stranger;[27] or

4. When the defendant is acting under and in accordance with statutory authority, a subject to be more fully developed later in this chapter.[28]

In short, the views of the British courts as reflected in the cases, including the significant *Read* v. *Lyons Company, Ltd.*, may be summarized as follows: (1) strict liability under the *Rylands* rule is founded

[23] *Id.* at 481-482.

[24] Hale v. Jennings Bros. [1938] 1 All. E. R. 579.

[25] L. R. 1 Exch. 265, 279 (Ex. 1866).

[26] Nichols v. Marsland, L. R. 10 Exch. 255 (1875).

[27] Box v. Jubb 4 Ex. Div. 76 (1879).

[28] Green v. Chelsea Water Works Company, 70 L. T. R. 547 (1894); Longhurst v. Metropolitan Water Board [1948] 2 All. E. R. 834.

historically upon a mutual obligation of adjoining or neighboring landowners, a fact which to no small degree affects its interpretation; and (2) in order to apply the *Rylands* doctrine the court must find: first, a dangerous substance or instrumentality; second, non-natural user of the land under defendant's control; third, an escape of the dangerous substance or instrumentality from the defendant's premises; fourth, harm caused to the owner of adjacent or neighboring premises, or to persons in the vicinity; and, fifth, that none of the named exceptions is applicable.

In considering the future application of the British cases to injuries occasioned by escaping radioactive substances it would seem that the principal difficulty will arise from the necessity of applying the concept of "non-natural user." Because radioactive particles migrate with distressing ease, there will be little question but that in the years to come untoward incidents will result in the escape of radioactivity into the surrounding countryside, and the question will be raised whether or not the source from which the escape takes place does or does not amount to a "non-natural user" of the land. The determination of this issue will depend upon a considerable number of factors, including location of the source with respect to outside persons and property, the character of the utilization device with respect to its dangerous propensities, and the social utility expected to be derived from the location of the particular activity in the community where the incident occurred.

D. The Doctrine of *Rylands* v. *Fletcher* Under American Decisions

We will now consider the American cases which are obviously of greater significance than are the English cases in connection with an appraisal of the possibility of strict liability for radiation injuries being imposed upon nuclear industry in the United States. In this country *Rylands* v. *Fletcher* has been accepted by some courts and rejected by others.

At a very early date the Supreme Courts of Massachusetts and Minnesota approved the doctrine.[29] Soon afterward, however, the doctrine was repudiated in New York,[30] New Hampshire,[31] and New Jersey.[32]

[29] Ball v. Nye, 99 Mass. 582 (1868), involving the escape of filthy water from the defendant's premises; Cahill v. Eastman, 18 Minn. 324 (1871), involving damage to property caused by escape of water onto plaintiff's premises through a tunnel constructed by the defendant.

[30] Losee v. Buchanan, 51 N.Y. 476 (1873), a steam boiler case.

[31] Brown v. Collins, 53 N.H. 442 (1873), a traffic situation.

[32] Marshall v. Welwood, 38 N.J.L. 339 (1876), a steam boiler case.

In subsequent litigation the doctrine has been repudiated by name, at least, in seven additional states—Kentucky, Maine, Oklahoma, Pennsylvania, Rhode Island, Texas, and Washington. On the other hand, an even greater number of American courts have accepted the doctrine and applied it in one way or another. In addition to Massachusetts and Minnesota, decisions to this effect have been rendered in Arkansas, California, Colorado, District of Columbia, Indiana, Iowa, Kansas, Maryland, Missouri, Ohio, Oregon, South Carolina, and West Virginia.[33]

Accordingly it would appear that the doctrine has met with substantial favor in the United States and the extent of the approbation is increasing. The doctrine has been applied to many and varied cases involving such situations as the impounding of water, the storage of explosives and inflammable liquids, blasting, fumigation, crop dusting, oil well operations, and the emission of smoke, dust, or noxious gases. Like the courts in Great Britain, the United States courts have declined to apply the doctrine to so-called "natural uses" of land, and for this reason they have declined to apply it to such activities as carrying water in pipes for household use, conducting gas in ordinary household supply devices, installing electric wiring, storing gasoline in filling stations, coal mining operations, and other affairs that are deemed normal and natural in relation to the community where they are carried on.

In view of the importance of the American cases in connection with possible strict liability of the atomic industry, it will be desirable to survey a number of the leading cases. For this purpose, we shall divide the cases into three categories: first, cases in which the doctrine has been repudiated altogether and the plaintiffs have been referred for redress to the doctrines of negligence; second, cases in which the doctrine has been recognized and applied; and third, cases in which the doctrine has been recognized but the courts have declined to hold the defendant in the particular situation to a rule of strict liability.

1. *Rylands* v. *Fletcher* Repudiated

As has already been stated, in the United States the doctrine of *Rylands* v. *Fletcher* was early repudiated by several of the leading state courts, and there is today a substantial body of judicial authority to the effect that it will not be applied, at least under the conditions and circumstances involved in the cases in which the question has been raised. Although the trend of modern decisions may be in the direction of accept-

[33] Dean Prosser in his volume Selected Topics on the Law of Torts (1953) has assembled a most complete listing of citations. See pp. 152-157.

ance rather than rejection of the doctrine, these cases nevertheless possess considerable current authority.

In *Losee* v. *Buchanan,*[34] decided by the New York Court of Appeals shortly after the English courts handed down their decision in *Rylands* v. *Fletcher,* action was brought to recover damages occasioned by the explosion of a steam boiler as a result of which parts were projected onto the plaintiff's premises and through several of his buildings, damaging the same and destroying personal property therein. The plaintiff urged the court to apply the principle of liability without fault apart from considerations of negligence. The court declined to do so, not because the operation of a steam boiler was a "natural use" of the premises, but because the doctrine of strict liability was generally distasteful. A quotation from the opinion reveals the theory.

> By becoming a member of civilized society, I am compelled to give up many of my natural rights, but I receive more than a compensation from the surrender by every other man of the same rights, and the security, advantage and protection which the laws give me. So, too, the general rules that I may have the exclusive and undisturbed use and possession of my real estate, and that I must so use my real estate as not to injure my neighbor, are much modified by the exigencies of the social state. We must have factories, machinery, dams, canals and railroads. They are demanded by the manifold wants of mankind and lay at the basis of all our civilization. If I have any of these upon my lands, and they are not a nuisance and are not so managed as to become such, I am not responsible for any damage they accidentally and unavoidably do my neighbor. He receives his compensation for such damage by the general good, in which he shares, and the right which he has to place the same things upon his lands. I may not place or keep a nuisance upon my land to the damage of my neighbor, and I have my compensation for the surrender of this right to use my own as I will by the similar restriction imposed upon my neighbor for my benefit. I hold my property subject to the risk that it may be unavoidably or accidentally injured by those who live near me; and as I move about upon the public highways and in all places where other persons may lawfully be, I take the risk of being accidentally injured in my person by them without fault on their part. Most of the rights of property, as well as of person, in the social state, are not absolute but relative, and they must be so arranged and modified, not unnecessarily infringing upon natural rights, as upon the whole to promote the general welfare.[35]

[34] *Supra* note 30.
[35] *Id.* at 484, 485.

In a more recent Oklahoma case, *Gulf Pipe Line Company et al* v. *Sims*,[36] the plaintiff claimed that absolute liability should rest upon the defendant for injuries occasioned to the plaintiff while he was riding as a passenger in an automobile driven along a public highway. As he approached a bridge over a small ravine, gas which had collected near and around the bridge was ignited causing an explosion and fire as a result of which the plaintiff was severely burned. The gas came from crude oil leaking from the defendant's pipelines. The plaintiff contended that the defendant should be held liable regardless of negligence, relying upon the doctrine of *Rylands* v. *Fletcher*. Yet the court refused to apply the doctrine to the circumstances as they existed in Oklahoma. Said the court:

> We think that case, (*i.e., Rylands* v. *Fletcher*) is not in point here upon the facts. And we conclude that the rule there announced, and here contended for the plaintiff, Sims, cannot be sustained in this jurisdiction in this character of action, and that our conclusion that it should not be followed is justified both by the trend of modern decisions, and by modern economic and industrial developments.
>
> The business engaged in by the defendants, that of transportation and storage of crude oil, is one of the basic industries of the state; that business is not only legal, necessary, and proper, but has an outstanding part in the development of the natural resources of the state. When that business is conducted in the recognized manner, with all diligence, and with the use of standard equipment, materials and appliances, and without negligence, then the persons engaged in such business should not, under the rule in Rylands v. Fletcher, be held to be insurers that in no event would it be possible that damage or injury could result from such operation.[37]

In later cases the Oklahoma Supreme Court has pointed out that the *Sims* case has no application in cases of injuries to real property which is protected by Section 23, Article 2 of the state constitution providing that no private property shall be "taken or damaged" for private use without compensation.[38]

[36] 168 Okla. 209, 32 P.2d 902 (1934).

[37] *Id.* at 213.

[38] See Phillips Petroleum Company v. Vandergriff, 190 Okla. 280, 122 P. 2d 1020 (1942), and British-American Oil Producing Co. v. McClain, 191 Okla. 40, 126 P.2d 530 (1942). See Comment on the Oklahoma cases in Foster and Keeton, "Liability Without Fault in Oklahoma," 3 Okla. L. Rev. 38-41 (1950), where the authors criticize the Sims case, referring to the fact that, in the later British-American case, the court had stated that the views expressed in the Sims case were largely dictum. They add "It would appear that there is substantial doubt as to the present vitality and future application of the *Sims* case." However, it still stands as the law of Oklahoma.

A similar question has arisen in the neighboring state of Texas in *Turner* v. *Big Lake Oil Company.*[39] This case also involved oil producing operations. In a state in which such operations form a very large part of the economy, Turner brought suit against the oil company for damages for alleged pollution of the plaintiff's land and his water holes resulting from the defendants' permitting the escape of salt water from oil producing operations on its property. The jury found that the defendants were not guilty of negligence. The plaintiffs on appeal contended for a doctrine of strict liability, referring for authority to the rule of *Rylands* v. *Fletcher* and American cases in accord with it. The Texas court declined to apply the rule stating that "in Texas we have conditions very different from those which obtain in England" and that it had "long since repudiated the general rule announced in Rylands v. Fletcher." The court referred with approval to another Texas Supreme Court opinion, in *Gulf, C. & S.F. Ry. Co.* v. *Oakes,* in which case the court criticized the rule of the *Rylands* case stating:

> The rule laid down was largely deduced from prior rulings establishing absolute liability for damages caused by fires kindled on one's premises and spreading to those of another; by injuries inflicted by one, in his lawful self-defense against another, upon an innocent bystander; and by animals straying from the lands of their owners upon those of others. The law has become settled, in this country at least, that there is no liability in the first two instances without negligence on the part of the person permitting the fire to spread or inflicting the injury; and in the case of animals, the law is entirely different in this and other states.[40]

Accordingly, the court in the *Turner* case concluded:

> Since we have repudiated the bases of the rule announced in Rylands v. Fletcher, it follows as a necessary corollary that we should not apply the rule in cases such as the one before us.[41]

Although the Texas court declined to apply the rule of *Rylands* v. *Fletcher* in the *Turner* case, it did at several points in its opinion refer to the possibility of imposing an equivalent of liability without fault by reference to nuisance doctrines, if a nuisance were in fact created by the defendant.[42]

[39] 128 Tex. 155, 96 S.W.2d 221 (1936).

[40] Gulf, C. & S. F. Ry. Co. v. Oakes, 94 Tex. 155 at 158, 159, 58 S.W. 999 (1900).

[41] *Supra* note 39 at 162.

[42] See Prosser, "Nuisance Without Fault," 20 Tex. L. Rev. 399 (1942), criticizing the Turner case and indicating that the effect of strict liability might perhaps be achieved in Texas by pleading and urging a nuisance doctrine.

These cases make it clear that there is at least some authority in the United States to the effect that the doctrines of strict liability should not be applied indiscriminately. The vitality and extent of this opposition are open to question in view of current trends in thinking about tort liability, and, in any event, there is still left open the question as to whether or not the doctrine should be applied to damages occasioned by radioactive substances.

2. *Rylands* v. *Fletcher* Accepted and Applied

We have already mentioned the fact that more state supreme courts have accepted and approved the doctrine of *Rylands* v. *Fletcher* than have refused to give it recognition. It is now desirable to review a number of the better reasoned opinions rendered in cases approving and applying the doctrine, or its American equivalent, and thus to attempt to derive a theory which will permit us to predict the likelihood of strict liability being invoked against those who inflict radiation injuries on others. We shall not be able to derive the same clearcut pattern of theory as that which can be derived from the opinions of the English courts. However, by examining a selection of six leading cases, we can obtain a fairly adequate understanding of the extent of the doctrine as it is applied in those states that have accepted it, and thus place ourselves in a position to make a projection into the atomic age.

The Kansas case of *Berry* v. *Shell Petroleum Company* [48] involved a claim for damages caused to real property by the seepage of salt water, thereby ruining the water supply on the plaintiff's premises. The defendant owned and operated an oil producing field. The oil, as it came from the ground, was mixed with salt water. Separation was achieved by storage in tanks, drawing the oil off the top and the water off the bottom. The salt water was discharged through pipes which connected with a drainage ditch in the city of Wichita, Kansas. This was done pursuant to and in accordance with a city ordinance. It was understood that the salt water would be carried through the sanitary sewer system except in case of emergency or when it was found necessary to divert it into a drainage canal for the purpose of flushing the drainage canal system. During the course of a flushing operation salt water apparently seeped through the sand bottom of the canal and into the wells used by the plaintiff. The water was rendered unfit for use. The plaintiff made no allegation of negligence; reliance was placed squarely upon the doctrine of absolute liability. The defendant not only denied the applicabil-

[48] 140 Kan. 94, 33 P.2d 953 (1934).

ity of strict liability rules but also contended that when it delivered its water, impregnated with salt, to the city, all duties resting upon it came to an end. The court nevertheless held the defendant strictly liable.

The court first spoke in terms of nuisance, saying:

> The rule is well settled that an individual who sustains an injury peculiar to himself may have relief against a public nuisance and is entitled to maintain an action at law for damages on account of the special injury which he has sustained.[44]

The court did not, however, rest its decision exclusively on the ground of nuisance. It also turned to the doctrine of *Rylands* v. *Fletcher,* referring to it with approval and stating:

> It is well settled in this state that when a water supply is damaged by salt water percolating through the soil and impregnating it with salt so that the water is rendered unfit for use, the owner of the land may maintain an action for damages against the owner of the land from whose land the salt water escaped.[45]
>
> It must be remembered that negligence is not a necessary element of the right of recovery in a case like this. The right to recover results from the company having the harmful substance on its land and permitting it to escape to the damage of plaintiff.[46]

It should be noted that the facts in the *Berry* case are in interesting contrast to those in the *Turner* case, referred to in the preceding section, decided by the Texas Supreme Court only two years later. The fact that the economy of the state of Texas is so largely dependent upon the production of oil, whereas that of Kansas depends more on agricultural and industrial pursuits, can no doubt be regarded as at least a partial explanation of the difference in the attitude of the two courts concerning the applicability of the doctrines of strict liability to the business of oil production. It should be noted that in the *Berry* case the Kansas Supreme Court made no mention whatsoever of the *Rylands* requirement of "non-natural use of the land." The court simply stated that "the liability . . . springs from the fact that the companies had salt water on their property and permitted it to escape." [47] Furthermore, the court said: "We are aware of the fact that such a ruling places a great burden on the oil industry. It is, however, no new principle which we are an-

[44] *Id.* at 99.
[45] *Id.* at 100.
[46] *Id.* at 101.
[47] *Id* at 102.

nouncing. It is as old as the industry of man. We consider that the water supply of the people is of greater importance than the operation of a business at a reduced cost." [48] Thus the court enunciated a doctrine of relative social utility which is more nearly akin to nuisance doctrines originating in equity.

In *Berger* v. *Minneapolis Gaslight Company* [49] the defendant, a gas manufacturer and distributor, maintained a reservoir containing crude petroleum. The petroleum escaped and percolated through the ground to the plaintiff's premises where it caused damage. The defendant contended that the case should be dismissed since there was a failure to show negligence. Nevertheless the trial court instructed the jury that the defendant was liable without proof of negligence. The Supreme Court, citing *Rylands* v. *Fletcher* with approval, agreed with the instruction and sustained the verdict and judgment for the plaintiff, saying that the proofs showed that the defendant fell within the limits of strict liability, and that

> The essential condition of liability, without proof of negligence on the part of the owner, for injury to others by the escape of things kept by him on his own premises, is that the natural tendency of the things kept is to become a nuisance or to do mischief, if they escape.[50]

Thus the Minnesota court, like the Kansas court in the *Berry* case, apparently ignores the question of "non-natural use" of the land, but concentrates simply and solely upon the question as to whether or not something of dangerous potentialities has been permitted to escape. Thus the decision is rested upon only one of the principal requirements imposed by the English courts in connection with *Rylands* v. *Fletcher*. The fact is that the doctrine of strict liability is developing in this country on an even broader base than in the country of its origin. If, for example, the defendant's crude petroleum tank had been located far away from centers of population and in a location in which such storage in tanks was a common practice, the defendant would still have been held liable according to the language used by the court.

Another case worthy of attention in this connection is *Frost* v. *Berkeley Phosphate Co.*[51] This was an action for damages inflicted upon the plaintiff and his property by the defendant who operated a mill in which he manufactured sulphuric acid and commercial fertilizers. In

[48] *Ibid.*
[49] 60 Minn. 296, 62 N.W. 336 (1895).
[50] *Id.* at 301.
[51] 42 S.C. 402, 20 S.E. 280 (1894).

the process of producing sulphuric acid certain gases and fumes were produced which had injurious effects upon vegetable and animal life. The plaintiff charged that gases escaping from the defendant's mill injured and destroyed his crops and other vegetation growing upon his land, and proved so detrimental to health as to render his premises unfit for habitation. Under the instructions of the trial court a verdict was returned by the jury for the defendant, and the plaintiff appealed. The Supreme Court of South Carolina found the instructions of the trial court objectionable for the reason that they propounded a doctrine of non-negligent liability based solely upon nuisance (*i.e.*, unlawful action) and leaving no room for strict liability in cases of lawful conduct of business. The Supreme Court disagreed with so limited a doctrine and in so doing laid down its views concerning strict liability as follows:

> The second objection to this charge is, as it seems to us, that it unwarrantably limits the operation of the maxim, *Sic utere tuo ut alienum non lædas,* so as to allow the owner of a tract of land to so use his own land in the prosecution of any lawful business as would necessarily or probably injure his neighbor, provided he takes all reasonable care to prevent such injury. This we do not understand to be the law. On the contrary, we think if one uses his own land for the prosecution of some business from which injury to his neighbor would either necessarily or probably ensue, he is liable if such injury does result, even though he may have used reasonable care in the prosecution of such business. This doctrine is supported not only by reason, but by the weight of authority . . . .[52]

Rylands v. *Fletcher* was referred to with approval. Here again we find no limitation to "non-natural user" but instead a very broad enunciation of a doctrine of strict liability, far broader than the principles initially derived by the English courts from *Rylands* v. *Fletcher.*

A Maryland case, *Susquehanna Fertilizer Co.* v. *Malone,*[53] also involving a fertilizer plant producing sulphuric acid fumes, affords a somewhat similar broad theoretical base for the doctrine. In this case the plaintiff was the owner of several dwelling houses in one of the suburbs of Baltimore. On the adjoining lot was the defendant's large fertilizer factory from which, so the plaintiff charged, noxious gases escaped, not only to the great physical discomfort of his tenants and himself, but also to cause material injury to the property itself. The court, in its opinion, specifically negated the possibility of submitting

[52] *Id.* at 409.

[53] 73 Md. 268, 20 Atl. 900 (1890).

to the jury the question as to whether or not the factory was located in a convenient and proper place for carrying on such business, *i.e.*, whether, under all of the circumstances it was a "natural use" of the land. Citing *Rylands* v. *Fletcher* among other authorities the court expressed itself as follows:

> No principle is better settled than that where a trade or business is carried on in such a manner as to interfere with the reasonable and comfortable enjoyment by another of his property, or which occasions material injury to the property itself, a wrong is done to the neighboring owner, for which an action will lie. And this, too, without regard to the locality where such business is carried on; and this, too, although the business may be a lawful business, and one useful to the public, and although the best and most approved appliances and methods may be used in the conduct and management of the business.[54]

And further quoting from the opinion:

> We cannot agree with the appellant that the Court ought to have directed the jury to find whether the place where this factory was located was a *convenient and proper place* for the carrying on of the appellant's business, and whether such a use of his property was a *reasonable use,* and if they should so find the verdict must be for the defendant. It may be convenient to the defendant, and it may be convenient to the public, but, in the eye of the law, no place can be convenient for the carrying on of a business which is a nuisance, and which causes substantial injury to the property of another. Nor can any use of one's own land be said to be a reasonable use, which deprives an adjoining owner of the lawful use and enjoyment of his property.[55]

We must not fail to note the breadth of the doctrine thus enunciated and further, we should note the continual reference to "nuisance." In the opinions of many of the state supreme courts in the United States the doctrine of *Rylands* v. *Fletcher* becomes inextricably involved with doctrines of nuisance. The two are often used interchangeably to impose strict liability in those cases in which they are invoked. "Nuisance" is at best a vague concept of uncertain dimensions used in different ways by different courts. The breadth of the views enunciated by the Maryland court in the *Susquehanna* case are in part at least attributable to this fusion of doctrines, and results in a principle that runs far beyond

[54] *Id.* at 276.
[55] *Id.* at 276, 277.

that of *Rylands* v. *Fletcher* which is rather precisely limited to "non-natural" user resulting in an "escape" of substances "likely to do mischief."

A very recent case of significance is *Gotreaux* v. *Gary*.[56] This was an action against a farmer who employed a certain flying service to spray his rice crop with the chemical 2, 4-D. Unfortunately the chemical was carried by the wind to the plaintiff's premises three and one-half miles away, and there it served to destroy some thirteen acres of cotton and three acres of peas under cultivation. The Louisiana Code contained a provision reading as follows:

> Although a proprietor may do with his estate whatever he pleases, still he cannot make any work on it, which may deprive his neighbor of the liberty of enjoying his own, or which may be the cause of any damage to him.[57]

However, the legislature of Louisiana had adopted regulations concerning the use of 2, 4-D and permitting its use during periods of wind velocity of less than six miles per hour. With this limitation the defendant had complied. The defendant pleaded that fact and lack of negligence. The court, however, declared that it was unwilling to follow any rule which rejected the doctrine of absolute liability in cases of this nature. The court stated that nuisance was not involved but based its holding for the plaintiff upon the principle that in such circumstances negligence or fault is not a requisite to liability, but that liability should follow irrespective of the fact that the activities resulting in the damages were conducted with reasonable care and in accordance with modern and accepted methods. Said the court without mentioning *Rylands* v. *Fletcher* but reaching a like result:

> . . . [I]t is true that the Legislature consented to the use of herbicides, but this did not entitle the defendants to injure plaintiff's crops. Although the use of the spraying operation was lawful, it was carried out in such a manner as to unreasonably inconvenience plaintiff and deprive him of the liberty of enjoying his farm.[58]

One other case should be given consideration in this discussion of the *Rylands* doctrine in United States courts. In *Green* v. *The General Petroleum Corporation*[59] the plaintiff instituted an action to recover damages for injuries to his property occasioned by the defendant's oil

[56] 232 La. 373, 94 S.2d 293 (1957).
[57] La. Rev. Civ. Code art. 667.
[58] *Supra* note 56 at 378.
[59] 205 Cal. 328, 270 Pac. 952 (1928).

drilling operations. It appeared that in the process of drilling for oil, although the defendant had exercised ordinary care and was not guilty of negligence in any particular, a stream of oil, gas, mud, and rocks was shot into the air and onto the plaintiff's property located about two hundred feet from the well. The defendant denied liability, asserting that under the California decisions there was no such thing as liability without negligence. The court, outlining the California law on the subject, indicated that, quite apart from negligence or the commission of a nuisance *per se,* neither of which existed in this case, and notwithstanding the fact that the production of oil is a legitimate and lawful business, nevertheless, a doctrine of strict liability should be applied. Without referring to *Rylands* v. *Fletcher* the court stated the rule in California to be as follows:

> Where one in the conduct and maintenance of an enterprise lawful and proper in itself, deliberately does an act under known conditions, and, with knowledge that the injury may result to another, proceeds, and injury is done to the other as the direct and proximate consequence of the act, however carefully done, the one who does the act and causes the injury should, in all fairness, be required to compensate the other for the damage done. The instant case offers a most excellent example of an actual invasion of the property of one person through the act of another.[60]

Thereupon the court after emphasizing the fact that there was here an actual invasion of the plaintiff's property, *i.e.,* a trespass upon his premises, said in holding the defendant to strict liability:

> Any other construction would permit one owner, under like circumstances, to use the land of another for his own purpose and benefit without making compensation for such use. We do not conceive that to be the law.[61]

We can note in this case another type of extension of the principle of *Rylands* v. *Fletcher,* which was limited on its facts to substances brought on to the defendant's land. In the *Green* case the substances were already on or under the land in extraordinary quantity, but the defendant by his activity put them in such a position as to make their escape possible. In other words the defendant did not *bring onto his land* a dangerous substance, but he used his land in such a way as to *release* a substance already there.

Many more cases could be discussed but those which have been here

[60] *Id.* at 333, 334.
[61] *Id.* at 334.

set forth are illustrative of the breadth of the doctrine of strict liability as it has been applied by some of the state supreme courts to certain highly useful activities in this country. As we have already several times noted, those courts that are applying the doctrine do so in a manner which gives it greater coverage than that indicated for *Rylands* v. *Fletcher*. The purport of this for the operator of a nuclear reactor is apparent.

3. *Rylands* v. *Fletcher* Accepted but Not Applied, in View of the Circumstances of the Particular Case

From the standpoint of atomic enterprise the cases outlined in the preceding subsection would seem to leave but little room for the application of any less rigorous doctrine of liability in the case of radiation injuries than that of *Rylands* v. *Fletcher*. Indeed an even more severe doctrine may, and in all probability will, in many jurisdictions emerge and be applied in appropriate circumstances. Nevertheless, we should not immediately conclude that all cases of radiation overexposure will result in the imposition of the doctrine. We should now view briefly certain of the rather numerous cases arising in jurisdictions which accept the doctrine of *Rylands* v. *Fletcher*, but which have declined to apply it in the particular circumstances of the cases at hand. We shall see that in some of the states at least there is developing, as in England, a requirement of "naturalness of use," or "reasonableness under the circumstances," or "appropriateness in view of the public benefit derived," which may serve to mitigate the harshness of strict liability in connection with certain uses of atomic energy.

An illustration of this type of case is *McCord Rubber Company* v. *St. Joseph Water Company*,[62] an action for damages for the flooding of plaintiff's cellar with water, thereby destroying the value of a large quantity of merchandise stored therein. The defendant water company supplied water to the plaintiff's premises and also to the premises of a co-defendant who occupied quarters adjacent to the plaintiff's. The water pipes entering the co-defendant's premises were frozen and ruptured filling the co-defendant's cellar with water which then overflowed into the plaintiff's cellar ruining his stock of goods. The trial court instructed the jury on a negligence theory. A verdict was rendered for defendant. The plaintiff on appeal contended that the defendant should be held liable regardless of negligence and that the jury should have been so instructed. The plaintiff rested its contention upon *Rylands*

[62] 181 Mo. 678, 81 S.W. 189 (1904).

v. *Fletcher*. However, the court declined to agree. It distinguished the case from *Rylands* v. *Fletcher* saying:

> There is a wide difference between a great volume of water collected in a reservoir (*Rylands* v. *Fletcher*) in dangerous proximity to the premises of another and water brought into a house through pipes in the manner usual in all cities, for the ordinary use of the occupants of the house. Whilst water so brought into a house cannot literally be said to have come in in the course of what might be called in the language . . . of the Lord Chancellor "natural user" of the premises, yet it is brought in by the method universally in use in cities and is not to be treated as an unnatural gathering of a dangerous agent. The law applicable to the caging of ferocious animals is not applicable to water brought into a house by pipes in the usual manner.
>
> The learned counsel for the plaintiff tried their case on the theory that the defendants were negligent, and that is the only theory on which they could have tried it.[63]

In short, the Missouri court accepted the distinction stated in *Rylands* v. *Fletcher* between natural and non-natural uses, regarding only the latter as subject to the application of the doctrine of strict liability.

Two cases involving the coal industry of Pennsylvania, both with exceptionally well-reasoned opinions, illustrate the lines of division which properly can be drawn in the application of the doctrines of strict liability. In the first of these two cases, *Pennsylvania Coal Company* v. *Sanderson*,[64] it appeared that the plaintiff, Mrs. Sanderson, had bought a tract of land in the city of Scranton bordering on Meadow Brook. The existence of the stream, the purity of its water, and its utility for domestic and other purposes were inducements leading to the purchase. She erected a home and built dams across the brook to form a fish and ice pond and to supply a cistern. Thereafter the defendant, Pennsylvania Coal Company, opened coal veins upstream, and as a result of these operations a large volume of mine water was accumulated and was pumped into Meadow Brook, corrupting the stream to such an extent as to render it totally unfit for domestic use, destroying the fish, corroding pipes and apparatus, and rendering Mrs. Sanderson's equipment useless. A suit was brought to recover damages. The trial court entered a nonsuit on the ground of failure to show negligence. On writ of error

[63] *Id.* at 694, 695.

[64] 113 Pa. 126, 6 Atl. 453 (1886).

the plaintiff contended that a doctrine of strict liability should be applied. The Supreme Court of Pennsylvania disagreed, stating:

> It will be observed that the defendants have done nothing to change the character of the water, or to diminish its purity, save what results from the natural use and enjoyment of their own property. They have brought nothing on to the land artificially. The water as it is poured into Meadow Brook, is the water which the mine naturally discharges; its impurity arises from natural, not artificial causes. The mine cannot, of course, be operated elsewhere than where the coal is naturally found, and the discharge is a necessary incident to the mining of it.
>
> It must be conceded, we think, that every man is entitled to the ordinary and natural use and enjoyment of his property; he may cut down the forest trees, clear and cultivate his land, although in so doing he may dry up the sources of his neighbor's springs, or remove the natural barriers against wind and storm. . . .[65]
>
> * * * * *
>
> The defendants were engaged in a perfectly lawful business, in which they had made large expenditures, and in which the interests of the entire community were concerned; they were at liberty to carry on that business in the ordinary way, and were not, while so doing, accountable for consequences which they could not control. . . .
>
> * * * * *
>
> It may be said that . . . when the flow of water is increased artificially or is greater than would result from gravitation alone, the mine owner who causes it is liable for the increased injury; that this may be termed a non-natural use of the land, and the mine owner would be held for any injury, which would be sustained in consequence of this artificial increase in the amount. . . .[66]
>
> * * * * *
>
> But the defendants, in the case at bar, brought nothing upon the land; they accumulated nothing there; the water was there without any act of theirs, and it was the accumulation of it which they sought to prevent. They were in the natural user of their lands for a lawful purpose, and the discharge of the mine water was an absolute necessity in order to that use of the land. The distinction is obvious, and we cannot see how Fletcher *v.* Rylands can be supposed to have any application in the consideration of this case.[67]

[65] *Id.* at 145.
[66] *Id.* at 147.
[67] *Id.* at 151.

Then follows a significant sentence from one of the opinions filed in a previous review of the case, as follows:

> The trifling inconvenience to particular persons must sometimes give way to the necessities of a great community. Especially is this true where the leading industrial interest of the state is involved, the prosperity of which affects every household in the Commonwealth.[68]

We should not fail to take note of the fact that in this last sentence above quoted the court adds to the fact of "natural use" the idea that the *balance of convenience* for the community is a significant factor in determining whether or not the doctrine of strict liability shall be applied. This doctrine of balance of convenience appears also in other connections, and it may well be that, on balance, certain activities, even though somewhat hazardous, will be permitted in our modern technological age in view of the fact that the best interests of the entire community will be served thereby, notwithstanding the potentialities of the hazardous conditions. The chemical business is illustrative of this aspect of the law in an industrial age. Perhaps some aspects of the atomic business will furnish another illustration.

The second Pennsylvania case presents the other side of the coin. In *Robb* v. *Carnegie Brothers & Company*[69] Robb brought an action against Carnegie Brothers to recover damages for injuries to his land arising from the operation of certain coke ovens owned and operated by the defendants. In the course of such operations large volumes of smoke and gas were emitted from the defendants' ovens and carried over to the plaintiff's land. In consequence of this, the plaintiff contended, his timber and fruit trees were killed, and the productiveness of the greater part of his land was diminished to a point of almost total destruction. The earlier *Sanderson* case was argued by the defendant in support of its claim that, apart from negligence, there would be no liability. With this argument the court disagreed, holding the defendant strictly liable, distinguishing from the *Sanderson* case on its facts and using the following language:

> The coal company (in the Sanderson case) was using its own land in the only manner practicable to it. The harm done thereby to others was the least in amount consistent with the natural and lawful use of it own. . . . But the defendants are not developing the minerals in their land, or cultivating its surface. They have erected coke ovens upon it, and are en-

[68] *Id.* at 162.

[69] 145 Pa. 324, 22 Atl. 649 (1891).

> gaged in the manufacture of coke. Their selection of this site, rather than some other, is due to its location and to their convenience, and has no relation to the character of the soil, or to the presence or absence of underlying minerals. The selection was no doubt a wise one, quite secluded, and quite convenient to the several mines from which the material was to be obtained for the making of coke; but it was the selection of a manufacturing site, and is subject to the same considerations as though glass, or lumber, or iron had been the commodity produced, instead of coke. The rule in Sanderson's case has therefore no application to the facts of this case. The injury, if any, resulting from the manufacture of coke at this site, is in no sense the natural and necessary consequence of the exercise of the legal right of the owner to develop the resources of his property, but is the consequence of his election to devote his land to the establishment of a particular sort of manufacturing, having no natural connection with the soil or the subjacent strata.[70]

Accordingly, the court held that the plaintiff was entitled to damages without proving negligence, but at the same time he was held not entitled to an injunction to preclude the operation of a great industry important to the economy of the region. *Rylands* v. *Fletcher* was not mentioned by the court although it was cited and relied upon by the plaintiff.

The atomic industry also will be bringing something dangerous upon its premises and the analogy to the *Rylands* case is apparent. Yet at the same time the balance of interests and considerations related to general prosperity and welfare are significant in seeking an answer to the question of the extent of liability to be imposed upon peaceful uses of atomic energy. We are entitled to regard this new form of energy as something that, in due course, will have a pronounced effect upon the welfare of the nation. It must be encouraged so far as it can be done consistently with justice and equity.

Reference may now be made briefly to cases involving damage occasioned by fire. As we have already noted, the basic principles of liability for such damage, brought to this country from England, required proof of negligence, but, nevertheless, from time to time attempts have been made to impose strict liability in connection with such injuries. Two cases decided by the Minnesota Supreme Court are worthy of note. In the earlier case, *Day* v. *H. C. Akeley Lumber Company*,[71] it appeared

[70] *Id.* at 338, 339.

[71] 54 Minn. 522, 56 N.W. 243 (1893).

that fire had escaped in the form of sparks and cinders from large stacks used in connection with burning sawdust and refuse in the defendant's sawmill. The plaintiff requested an instruction for the jury based upon strict liability. Refusing it the court said:

> This request eliminated from the case any consideration by the jury of defendant's alleged negligence, and planted the plaintiffs' right to recover upon grounds independent of such negligence. The fire used by defendant was for manufacturing purposes, and, if used with proper safeguards and without negligence, no liability attached for damages caused by its escape. Any other rule would make the person who uses fire for manufacturing or mechanical or propelling purposes, or even for heating, an insurer against accidents. . . . Doubtless, one who employs the element of fire for manufacturing or mechanical or propelling purposes, or who employs it for any purpose under circumstances which render it especially dangerous to others, is held to the exercise of more care and caution than is one who employs the same element for a less dangerous purpose. Yet the degree of care is the same, for in either case reasonable care, or, what is the same thing, ordinary care, only is required.[72]

In short, the court declined to apply the doctrine of strict liability to this useful instrumentality.

In the second Minnesota case, *August Berger* v. *Minneapolis Gaslight Company*,[73] to which reference has hitherto been made, the Supreme Court of Minnesota did apply a doctrine of strict liability to the defendant from whose premises quantities of crude petroleum were discharged through the soil to the plaintiff's premises where the damage was caused. The earlier *Day* case was relied upon by the defendant, but the court disposed of it using the following language:

> The case of Day v. Akeley Lumber Company . . . relied upon by defendant's counsel, is . . . not in point, for it was a case where fire escaped from the defendant's premises, and destroyed the plaintiffs' property, and it was correctly held that there could be no recovery without proof of negligence on the part of the defendant. Fire is, and has been ever since the statute of 6 Anne, c. 31, an exception to the rule that, where a person receives and keeps upon his premises anything not naturally there, the natural tendency of which is, if it escapes, to injure others, he is liable, without reference to any considerations of care and skill on his part. It is difficult to see

[72] *Id.* at 527, 528.
[73] *Supra* note 49.

> why fire should have ever been included in the rule, for fire is one of the most beneficent servants of man,—an absolute necessity,—and, from its own nature, does not necessarily injure surrounding persons and things.[74]

This is strictly in line with American case law dealing with liability for fires occasioned by industrial operations,[75] although in most states there are special statutes imposing more or less strict liability upon railroads and sometimes other activities in cases of fire damage.

The foregoing cases are illustrative of the special limitations that are imposed upon strict liability in some of the courts in this country. They reveal a thoroughly reasonable approach—one that may prove to be of interest in connection with problems of radiation liability that are likely to arise in the future. We shall discuss their possible application later in this chapter.

4. Special Cases—Blasting and X-Rays

Blasting cases. The courts may, when required to determine the liability of a reactor operator, look for precedent to cases of handling explosives and blasting operations. In a recent article,[76] Harley J. McNeal of the Cleveland Bar notes that the majority of the current decisions result in absolute liability, but he calls attention to the confused state of the law in connection with such cases. He finds that questions of negligence, nuisance, and absolute liability are thoroughly intermingled, that *Rylands* v. *Fletcher* is applied in some states in blasting cases, but not in others, that fine spun distinctions are being based upon differences between direct and indirect trespasses to adjoining property, that some courts refuse absolute liability for considerations related to the social utility of blasting as an agency used for the benefit of mankind, and that liability is often dependent upon the location of the blasting and the foreseeability of damage with respect to other persons and property. He points out that the balance of equities as revealed in current case law tips towards the blaster in direct proportion to the distance of his activity from the major population centers, and hence in inverse ratio to the likelihood of causing serious harm should a mishap occur.

Mr. McNeal divides the cases into three categories: (1) those in which strict liability is enforced for all foreseeable harm, (2) those in

[74] *Id.* at 300, 301.

[75] See 2 Harper & James, Torts §14.15 (1956); see also Prosser, Torts 326-328 (2d ed. 1955).

[76] McNeal, "Use of Explosives and Liability Questions Involved," 23 Ins. Counsel J. 125 (1956).

which no liability is imposed except for negligence, and (3) a rather indefensible intermediate position that blasters are to be held strictly liable for their activities if the explosions cause direct trespass to adjacent land by casting rocks or other debris upon it, but not if the same explosions cause harm by vibration or percussion. The latter are deemed indirect in their effect and not trespasses in the historical sense. The principal purport of the blasting cases so far as the atomic energy problem is concerned is to place emphasis upon the location of the activity and its relationship to foreseeable harm on the one hand, and direct trespasses to valuable property on the other.

Certain courts in blasting cases have reached a result of absolute liability through application of the doctrine of nuisance. This is true, for example, in New York state where in fact the doctrine of *Rylands* v. *Fletcher* has been disapproved. In *Vincent* v. *Hercules Powder Company*[77] the defendant, a munitions plant, suffered a devastating explosion which damaged the plaintiff's home situated at a considerable distance. The defendant contended that it should be protected from strict liability because of the provisions of a state statute which fixed the relative locations of powder magazines, the quantity which each might contain, and their distances from the buildings, railroads, and highways. The defendant had complied with this statute and argued that an act which the law sanctions and authorizes cannot be deemed a nuisance, although it may cause damage to individual rights on private property. The analogy to the licensed atomic reactor is apparent. Notwithstanding the argument of the defendant, however, the court held the defendant strictly liable on a theory of nuisance and, in addition, citing *Richards* v. *Washington Terminal Company*,[78] declared that under the Due Process Clause of the Constitution, the legislature, although it might legalize what otherwise would be a public nuisance could not confer immunity from suit on the theory of private nuisance such as to amount, in effect, to a taking of private property for public use.

So far as atomic operations are concerned we can draw some general conclusions from the blasting and explosive cases which in fact indicate a clear leaning and trend toward strict liability in most of the state courts in this country. Conclusions that may be stated with assurance are as follows:

1. The trend of the more recent decisions reveals an increasing number of courts moving in the direction of absolute liability for damages resulting from blasting.

[77] 228 App. Div. 118, 239 N.Y.S. 47 (1930).
[78] 233 U.S. 546, 34 S. Ct. 654 (1913).

2. Even in those jurisdictions where negligence must be proved, it would appear that the degree of negligence required to be proved in such cases is slight; or, in reverse, that the standard of due care is correspondingly high,—more so than in situations involving less hazardous activities.

3. There are a few courts, possibly seven or eight in number, that continue to adhere to the distinction between direct and indirect trespasses, imposing absolute liability in blasting cases only for the former.[79]

4. It is generally held that no recovery of damages can be expected for injuries so remote that they cannot reasonably be foreseen or anticipated.[80]

5. As distinguished from the blasting cases, the storage of explosives in quantity in places adjacent to crowded areas, if followed by an explosion, is quite likely to result in the individuals involved being held absolutely liable for all injuries inflicted upon others, regardless of negligence or failure to exercise due care.[81]

One cannot avoid a feeling that, in view of the current trend in the blasting and explosive cases, they are certain to be used in support of strict liability in the event of a reactor burn-up, which although not an explosion in a technical sense would have many similar characteristics.

X-ray cases. Before leaving the subject of liability under the doctrine of *Rylands* v. *Fletcher* we should also take account of the numerous cases involving injuries by overexposure to X-rays. X-ray macines subject persons engaged in operating them, as well as persons undergoing treatment or examination by means of them, to two primary dangers, namely, the possibility of harm from the X-rays themselves and also from the powerful electric currents necessary to the production of the X-rays. It is generally held that the principles of law normally applicable to physicians and surgeons, *i.e.,* that a medical practitioner is subject to no more severe requirement than the duty of exercising reasonable skill and care in his patient's behalf, is also applicable to an action against a physician for X-ray injuries to patients.[82]

The same result has been reached in connection with injuries resulting from industrial uses of X-ray machines. For example, in *Rakowski* v.

[79] See cases cited in Prosser, Selected Topics on the Law of Torts 161, n. 175 (1953).

[80] See cases cited in McNeal, *supra* note 75 at 132, n. 4.

[81] See Exner v. Sherman Power Construction Company, 54 Fed.2d 510 (1931), and many cases cited in Anno., 80 A.L.R. 692. Judge Augustus Hand in the Exner case said of those who store explosives or engage in blasting "When a person engages in such a dangerous activity, useful though it be, he becomes an insurer."

[82] See many cases cited in 41 A.L.R.2d pp. 329 *et seq.*

Ray-Bestos-Manhattan, Inc.[83] the court, speaking of the duty of an industrial employer toward an employee engaged in making X-ray examinations to disclose defects in manufactured products, pointed out that liability must be based upon negligence as distinguished from strict liability, but that a high degree of care, higher than in the ordinary affairs of life, must be exercised. A more extensive and inclusive measure of liability is achieved by enlarging the duty to exercise reasonable care, rather than by applying a doctrine of absolute liability.

The negligence doctrine as distinguished from strict liability has been applied to the use of X-rays by beauty specialists. *Greenberg* v. *Post*[84] was an action for X-ray burns sustained by the plaintiff while undergoing treatment by a beauty specialist for the removal of superfluous hair from her face. The court ruled that the specialist owed the plaintiff only a duty to exercise due care. She was liable only if the plaintiff proved negligence.

It is true that in most of these X-ray cases there was a contractual relationship between the operator of the machine and the victim, and this may constitute a partial distinguishing fact based upon a claim of assumption of risk by the injured party. This fact, however, by no means precludes the courts from imposing a doctrine of strict liability if they should deem the social pressures or other considerations to be sufficiently compelling. Indeed, patients do not intend to assume the burden of injuries whether accidental or otherwise, and hence the contractual relationship should not be of significance.

In actions involving X-ray machines it is conventionally held that the burden of proof rests upon the plaintiff, and that he must not only show the defendant's negligence, but also that the negligence proximately caused the harm. On the side of the plaintiff, applicability of the doctrine of *res ipsa loquitur* is frequently urged. The courts are in disagreement on the point, but there have been many decisions in which the doctrine has been held available to the plaintiff, thus making it necessary only for him to prove that he received an injury from overexposure to the X-ray apparatus, placing upon the defendant the burden of going forward with proof that he exercised due care under the circumstances. On the other hand, the defendant can be aided by proof of contributory negligence or by establishing an unusual susceptibility of the plaintiff to injury from X-ray.

From the standpoint of users of radioactive substances the important

[83] 5 N.J. Super. 203, 68 A.2d 641 (1949), *certif. den.*, 3 N.J. 502, 70 A.2d 908 (1950).
[84] 155 Fla. 135, 19 S.2d 714 (1944).

conclusion to be gleaned from the X-ray cases is the fact that the doctrine of absolute liability is not applied, coupled with the further fact of similarity of X-rays to other radioactive emanations so far as injury to man is concerned. Whatever may be the applicability of the doctrine of *Rylands* v. *Fletcher* to reactor operators and others who make use of the more highly dangerous fissionable materials, one can properly urge, on the basis of analogy, that the theory of liability imposed in the X-ray cases, namely, the requirement of the proof of negligence, should also be applied to the numerous medical, biological, agricultural, and industrial uses of radioisotopes. These are, after all, merely utilization of sources of ionizing radiation, varying in intensity and often even less hazardous than the X-rays given out by high voltage X-ray machines.

5. Concluding Observations with Respect to the Doctrine of *Rylands* v. *Fletcher*

Before we proceed to the next phase of the subject matter, we may ask ourselves what conclusions should be drawn from our examination of the cases discussing the doctrine of *Rylands* v. *Fletcher,* particularly insofar as they may apply to injuries caused by radioactive substances.

The first impression that one receives is that the English decisions present a reasonably precise and satisfactory pattern, but that there is utter confusion in the principles developed by the American courts. Under the English decisions there must ordinarily be a "dangerous substance" brought by the defendant to his premises or at least brought under his control, the activity must involve a "non-natural use," and there must be "an escape," not caused by an "act of God," or a "third party," or the plaintiff himself, which results "proximately" in damage to the plaintiff or to his property.

We in the United States inherit these specifications of the doctrine and apply them variously in different parts of the country. Moreover, we interject in varying degrees in different courts at least three significant corollaries to the English rule as above stated. Each of these corollaries involves a vague standard not easily applied.

First, the utility of the enterprise, in relation to the economy or general welfare of the community, has an important bearing upon whether or not the doctrine of strict liability shall be applied. This may be nothing more than a different approach to "non-natural user," but, in effect, it brings forth a "balance of convenience" doctrine under which many courts resort to equity principles originating in private nuisance cases to resolve strict liability problems.

Second, in a not inconsiderable number of cases the escaping substances, though somewhat "dangerous," create a relatively minor degree of hazard and, accordingly, the courts require proof of negligence rather than apply strict liability. Thus, in connection with fire which escapes, explosions which result in damage by concussion or vibration, X-rays which over-irradiate the victims in medical, industrial, or commercial applications, and other "lesser danger" instances, courts in general adhere rather consistently to conventional negligence doctrines.

Third, the rule of strict liability can be and sometimes is approached by the courts by using and extending the techniques of the law of negligence rather than by resort to *Rylands* v. *Fletcher*. The standard of care is raised to require "a very high degree of care" or even "the highest degree of care." Thus, the defendant, though he is not made an absolute insurer, is obliged to exercise such a high degree of care that the applicable principles do not fall far short of ultimate liability without fault.

This third point merits further elaboration for it has implications of especial concern to those who engage in atomic activities. By way of illustration consider the rather unique and striking circumstances in *Chase* v. *Washington Water Power Company*.[85] In this case an accident that was almost fantastic resulted in the burning of plaintiff's barn and wheat fields. Two chicken hawks, fighting while in flight, struck and short circuited the defendant's high tension wire, completing contact through a guy wire attached to one of the supporting towers. In addition, the weight of the hawks on the guy wire caused it to sag enough to contact a barbed wire fence connected with the plaintiff's barn and the accident resulted. The court, holding the electric company liable, said that was bound to exercise "a very high degree of care, indeed the highest that human prudence is equal to." This comes very close indeed to strict liability under the *Rylands* doctrine, reached by a different route—one that well merits attention in connection with our discussion of radiation injuries.

From all of the foregoing it becomes abundantly clear there is no single or simple formula of liability that will dispose of all of the cases from all of the states or even the majority of the cases from a majority of the states. Moreover, it would be a completely unacceptable oversimplification to attempt to set forth in summary form on the basis of existing case law what the effect of the *Rylands* doctrine is likely to be when atomic energy cases come before the courts and plaintiffs seek to impose strict liability. Finally, if certainty in the law is to be obtained,

[85] 62 Idaho 298, 111 P.2d 872 (1941).

it must be reached in some other way than through common law methods of evolution of the *Rylands* doctrine by judicial decision.

E. Strict Liability Under the American Law Institute Doctrine

The Restatement of the Law of Torts, published in 1938 under the auspices of the American Law Institute, purports to present a comprehensive and orderly statement of the common law of the United States, including not only the law developed by judicial decision, but also that which has grown from the application by the courts of generally accepted statutes that have been enforced for long enough periods to have become thoroughly imbedded in the law of the land. Since the Restatement may be resorted to by some courts in this country in deciding cases arising from radiation injuries, we must examine its scope and effect.

With respect to ultrahazardous activities in the law of torts, the Restatement expresses its principles in six short sections, which for the sake of complete understanding will be quoted in full as follows:

> §519. *Miscarriage of Ultrahazardous Activities Carefully Carried On.* Except as stated in §§521-4, one who carries on an ultrahazardous activity is liable to another whose person, land or chattels the actor should recognize as likely to be harmed by the unpreventable miscarriage of the activity for harm resulting thereto from that which makes the activity ultrahazardous, although the utmost care is exercised to prevent the harm.
>
> * * * * *
>
> §520. *Definition of Ultrahazardous Activity.* An activity is ultrahazardous if it
>
> (a) necessarily involves a risk of serious harm to the person, land or chattels of others which cannot be eliminated by the exercise of the utmost care, and
>
> (b) is not a matter of common usage.
>
> * * * * *
>
> §521. *Ultrahazardous Activity Carried On in Pursuance of a Public Duty.* The rule stated in §519 does not apply if the activity is carried on in pursuance of a public duty imposed upon the actor as a public officer or employee or as common carrier.
>
> * * * * *
>
> §522. *Contributing Actions of Third Persons, Animals and Forces of Nature.* One carrying on an ultrahazardous activity is liable for harm under the rule stated in §519, although the harm is caused by the unexpectable
>
> (a) innocent, negligent or reckless conduct of a third person, or

(b) action of an animal, or
(c) operation of a force of nature.

* * * * *

§523. *Participants in Ultrahazardous Activities.* The rule stated in §519 does not apply where the person harmed by the unpreventable miscarriage of an ultrahazardous activity has reason to know of the risk which makes the activity ultrahazardous and

(a) takes part in it, or
(b) brings himself within the area which will be endangered by its miscarriage
(i) without a privilege, or
(ii) in the exercise of a privilege derived from the consent of the person carrying on the activity, or
(iii) as a member of the public entitled to the services of a public utility carrying on the activity.

* * * * *

§524. *Effect of Contributory Fault.*

(1) A plaintiff is not barred from recovery for harm done by the miscarriage of an ultrahazardous activity caused by his failure to exercise reasonable care to observe the fact that the activity is being carried on or by intentionally coming into the area which would be endangered by its miscarriage.

(2) A plaintiff is barred from recovery for harm caused by the miscarriage of an ultrahazardous activity if, but only if,

(a) he intentionally or negligently causes the activity to miscarry, or

(b) after knowledge that it has miscarried or is about to miscarry, he fails to exercise reasonable care to avoid harm threatened thereby.[86]

In an accompanying commentary the authors of the Restatement point out by way of illustration that the term "ultrahazardous" includes such items as the operation of airplanes, the storage and transportation of explosive substances, and the drilling of oil wells. They also include blasting for clearing woodlands and otherwise. On the other hand, they do not include the ordinary automobile because of the fact that it is a matter of "common usage" and thus is excluded by reason of Section 520(b).

The question which confronts us is whether or not under the Restatement doctrine any or all phases of atomic enterprise will be included within the range of strict liability. Should we conclude that *all* uses of atomic energy "necessarily involve a risk of serious harm which cannot

[86] See 3 Restatement, Torts, ch. 21, pp. 41-53.

be eliminated by the exercise of the utmost care"? Or may we argue with good reason that certain uses of less dangerous radioisotopes fall on the other side of the line? Or may we so interpret the phrase as to exclude certain types of reactors or certain processes involving the handling of critical quantities of fissionable materials when the reactors or processes become well established, with well understood technology and good safety records? Do they then become "matters of common usage"? What is to be deemed "common usage" under the circumstances?

As Dean Prosser has pointed out so clearly,[87] the Restatement doctrine is more inclusive than the rule of *Rylands* v. *Fletcher* in at least one respect, for by ignoring the effect of the place where the activity is carried on and its surroundings, even a location far removed from population centers would be included. Also it falls short in another respect, namely, in the insistence placed upon the necessity of extreme danger and the impossibility of eliminating it with all possible care. This sharply limits the list of "dangerous substances." Accordingly it would follow that, under the Restatement, the fact that an atomic reactor is located in the middle of a desert would not constitute a defense, but, on the other hand, a cobalt 60 source used for the irradiation of food or drugs might not be deemed so extremely dangerous as to warrant the imposition of strict liability. The Restatement doctrine was not formulated until 1938, and thus far only a very few cases have been decided in which it has been interpreted and applied. In California, for example, the courts seem to have adopted the Restatement rule, possibly for the reason that they have in at least three cases expressed disapproval of the rule of *Rylands* v. *Fletcher* and they are seeking some basis for granting relief in proper cases. *Luthringer* v. *Moore*[88] is illustrative. There the California court took advantage of the Restatement and applied it to impose strict liability in a case involving the use of hydrocyanic acid gas for fumigating operations on certain premises. The gas escaped into an adjoining building where it injured the plaintiff. The court regarded the use of the gas under the circumstances as "a hazardous activity," holding that it was "perilous and likely to cause injury even though the utmost care is used" and that "the use of it under these circumstances [*i.e.*, the circumstances of the case] is not a matter of common usage within the meaning of the term." Thus the Restatement paved the way to the plaintiff's recovery.

[87] Prosser, Selected Topics on the Law of Torts 158 (1953).
[88] 31 Cal. 2d 489, 190 P. 2d 1 (1948).

On the other hand, in another California case, *Guy F. Atkinson Co.* v. *Merritt, Chapman & Scott Corporation,*[89] the federal court, following what it believed to be the law of California, declined to apply either the *Rylands* case or the Restatement doctrine to a case of water damage caused to plaintiff's property by the failure of a cofferdam built by the defendant. There was no charge of negligence involved, and the cofferdam failed because of flood conditions. Refusing to find ground for imposing strict liability the court said with respect to the Restatement doctrine:

> This court does not believe that this doctrine has been or should be extended to damage by water under the circumstances set forth in the complaint.[90]

The Oregon Supreme Court relied upon the Restatement doctrine in *Bedell* v. *Goulter,*[91] which involved injuries to real property caused by concussion and vibration from blasting operations. The court quoted Sections 519 and 520 of the Restatement and concluded that "blasting is ultrahazardous because high explosives are used." Continuing, the court said, "The one who causes the injury must be held to engage in the dangerous activity at his peril 'because it is impossible to predict with certainty the extent or severity of its consequences.' "

In another blasting case the Supreme Court of Pennsylvania reached a like result, also relying upon the Restatement. In *Federoff* v. *Harrison Construction Co.*[92] it appeared that the plaintiff's house, distant some 1,600 feet from the defendant's blasting operations, was damaged by vibration and concussion. The defendant was held liable. The court, relying primarily upon the Restatement, said:

> We think the record supports a finding that the damage was caused by the blasting, thus bringing the case within the rule stated in Section 519 of the Restatement of Torts: that, subject to exceptions not now material, "one who carries on an ultrahazardous activity is liable to another whose person, land or chattels the actor should recognize as likely to be harmed by the unpreventable miscarriage of the activity for harm resulting thereto from that which makes the activity ultrahazardous, although the utmost care is exercised to prevent the harm."[93]

The Restatement principle has also been applied in the state of Connecticut. In *Whitman Hotel Corp.* v. *The Elliott & Watrous Engineer-*

[89] 123 Fed. Supp. 720 (1954).
[90] *Id.* at 722.
[91] 199 Ore. 344, 261 P.2d 842 (1953).
[92] 362 Pa. 181, 66 A.2d 817 (1949).
[93] *Id.* at 183.

ing Company[94] the court relied upon the doctrine in a case involving damage caused by dynamite blasting within the city of Norwich, the damage again having been caused by vibrations of the earth set in motion by the activities of the defendant. In the absence of proof of negligence the court nevertheless held the defendant liable, referring to Sections 519 and 520 of the Restatement and stating:

> The rule [*i.e.*, the Restatement rule] is adhered to in Connecticut. It has been stated as follows: A person who uses an intrinsically dangerous means to accomplish a lawful end, in such a way as will necessarily or obviously expose the person of another to the danger of probable injury, is liable if such injury results, even though he uses all proper care.[95]

The foregoing brief examination of the cases is a summary of the rather limited number of judicial decisions in which the Restatement doctrine has been directly applied in support of the imposition of absolute liability. Only twenty years have elapsed since the publication of the Restatement, and it is therefore not surprising that the number of decisions based upon it is not great.

There have been several opinions in which the courts have cited the Restatement doctrine with general approval, but have declined to apply it to the facts of the particular cases at hand. For example, in *Smith* v. *Okerson*[96] an action was brought to recover the cost of fodder which the plaintiff purchased to feed his cattle after the defendants, while spraying their potato crop with arsenic solution, had rendered the plaintiff's alfalfa crop useless. It appeared that some of the arsenic spray had drifted to the plaintiff's adjoining fields. The court, stating that the New Jersey courts have declined to follow *Rylands* v. *Fletcher*, also observed that it was doubtful if they would go as far as indicated by the Restatement rule. Section 519 of the Restatement was cited, the court saying:

> The prevailing American rule admits liability in the absence of negligence, only in connection with an activity that is not a matter of common usage and that necessarily involves a risk of serious harm to others, and not even in such case if the activity is carried on in pursuance of a public duty. . . . I doubt whether in New Jersey we go even that far.
>
> * * * * *

[94] 137 Conn. 562, 79 A.2d 591 (1951).
[95] *Id.* at 565.
[96] 8 N.J. Super. 560, 73 A.2d 857 (1950).

> I conclude that the defendants are not answerable to plaintiff unless they were negligent in the spraying of the arsenic solution.[97]

The fact of "common usage" of arsenic solution spray for potato fields would have saved the day for the defendant in the absence of proof of negligence, but unfortunately for the defendant in this particular case the court found evidence of negligence on the basis of which the plaintiff recovered a judgment for damages.

Again, in a Delaware case, *Fritz* v. *E. I. DuPont de Nemours & Co.*[98] an action was brought against the company for personal injuries occasioned when the plaintiff was overcome by a concentration of chlorine fumes which escaped from a plant operated by the defendant. The court, although urged to do so, declined to apply the doctrine of absolute liability either under *Rylands* v. *Fletcher* or under the Restatement, stating its position as follows:

> In the present case it was not unlawful for DuPont to have on its premises chlorine gas, nor was its presence there unusual, and it cannot be said that the mere possession of chlorine gas by DuPont without more was dangerous per se in the light of recognized industrial use. To say that any corporation or individual possessing or using dangerous substances upon its or his premises should be held liable as an insurer in the event of injury to others by reason of the mere possession, use, or escape thereof would be but to strangle corporate and individual enterprise in many well recognized fields of endeavor. If the rule of absolute liability is to be adopted in this State, it seems to me that its application should be confined to those operations which have connected with them a history of doing injury to others or the destruction of their property, and only in those cases where a nuisance by reason of their presence or use can be established.[99]

Chlorine gas would seem to be a reasonably dangerous commodity, perhaps fully as dangerous as some forms of radioisotopes. Yet the court, persuaded in part by considerations of relative utility—a balance of convenience—reduced the scope of the Restatement doctrine as well as *Rylands* v. *Fletcher* to uses having a "history of doing injury."

Again, in South Dakota, in *Midwest Oil Company* v. *City of Aberdeen*[100] the court, in the absence of proof of negligence, declined to apply

[97] *Id.* at 564, 565.
[98] 6 Terry 427, 75 A.2d 256 (1950).
[99] *Id.* at 437, 438.
[100] 69 S.D. 343, 10 N.W.2d 701 (1943).

the Restatement doctrine to impose absolute liability in a suit for damages inflicted upon plaintiff's gasoline filling station by a break in the defendant city's water main. In regard to the applicability of the Restatement doctrine the court said:

> The present facts disclose water being sent through a ten-inch main in the manner now generally accepted for the purpose of furnishing a water supply to city dwellers. We think it clear that such a distribution of water does not constitute an ultrahazardous activity. The definition of an ultrahazardous activity as set forth in Section 520 in the Restatement of the Law of Torts is as follows: [Thereupon Section 520 is repeated.]
>
> Water mains are universally in use in cities, and to hold that a proper and reasonable use of such mains "necessarily involves a risk of serious harm to the person, land or chattels of others" would be contrary to the experience of at least several generations.[101]

This is, of course, quite like the result that would be reached by most courts in applying the doctrine of *Rylands* v. *Fletcher*.

By way of conclusion, we may suggest that the doctrine of the American Law Institute Restatement of the Law of Torts, though not yet widely applied, is, at least, a worthy attempt to achieve precision and definiteness in the field of absolute liability. At the same time, although there is not enough case law as yet available to warrant reaching a definite conclusion on the matter, it would seem likely that the Restatement would not accomplish the desired result of bringing order out of chaos in strict liability. In the twenty years in which it has been available the courts have been inclined to ignore it and to rely upon previously developed common law principles derived from *Rylands* v. *Fletcher*. So, at the very most, we can only say that the Restatement gives us one more doctrine of occasional utility to be added to the welter of confusion under American law, and that, up to the present time at least, it has not made a significant contribution to the solution of strict liability problems.

Moreover, there are several good reasons why the Restatement doctrine is not likely to contribute much in the future to the solution of problems of liability for radiation injuries. Not only has it not as yet enjoyed wide acceptance by the courts in this country, but, more importantly, its rigid coverage runs counter to the flexible application of *Rylands* v. *Fletcher*, which is current practice in this country. Further-

[101] *Id* at 347

more, it may be said with accuracy that certain courts both in England and the United States have receded somewhat from their earlier enthusiasm for the *Rylands* doctrine. Finally it should be noted that the language of Sections 519 to 524 of the Restatement departs rather markedly from the patterns of liability for radiation injuries that are currently being developed by statute in other important countries—in England, Germany, Switzerland, and elsewhere in the world. Both the scope of the coverage and the specified exceptions differ radically from current thinking elsewhere. It is far more likely that European influence will be effective than that the American Law Institute doctrine will be accepted even in the United States, for the former is better and more realistically fitted to the facts of radiation injuries. The foreign proposals will be examined later in this chapter.

F. Private Nuisance Doctrines—Absolute Nuisance

1. Nuisance Doctrines and Remedies

In order to complete the review of American doctrine involving or related to absolute or strict liability we must give brief consideration to a considerable group of cases disposed of either wholly or in part under the law of private nuisance.[102] Of especial interest is a doctrine that has been developed which for want of a better name has often been called "absolute nuisance," or "nuisance *per se*," although the addition of the words "absolute" or "*per se*" cannot be regarded as either significant or definitive.

By way of definition we may say that, in general, a private nuisance may result whenever there is an interference with the use or enjoyment of the land of the plaintiff occasioned either by the intentional misconduct of the defendant, or conduct which is negligent, or conduct with respect to which the courts are inclined to apply strict liability without proof of either intent or negligence. It is this third category with which we are primarily concerned. A nuisance case normally is disposed of by a petition in equity in which the plaintiff seeks an injunction to restrain continuance of the nuisance and perhaps asks damages as well. However, the decisions reveal that the courts of law also, in actions in which damages alone are sought, frequently refer to nuisance principles and apply them in reaching the conclusion that the circumstances call for the imposition of the equivalent of an absolute liability.

[102] We are not concerned with public nuisance which is, in effect, a crime and is punishable as such.

In considering the possible relation of nuisance doctrines to liability for radiation injuries we should take account of two classes of cases. The first includes cases in which the defendant intentionally maintains an activity in a neighborhood where in normal operation it causes annoyance or injury to occupants of property in the vicinity, *e.g.*, the operation of a plant which gives off sulphuric acid fumes, or, in the atomic field, possibly radioactive gases. The second covers cases of unduly hazardous operations which, in normal and successful operation cause no harm whatsoever, but if an accident takes place trouble ensues, *e.g.*, storage of nitroglycerin, or, in the atomic field, operating a reactor or a fuel processing plant. In both instances the courts work out and apply a "balance of convenience" doctrine with the result that no nuisance is found and no liability is imposed apart from negligence, if the activity is reasonable in relation to its location, its proximity to population, its economic worth, and other related factors. If otherwise, however, the court will enjoin or will give judgment for damages, or will afford both such remedies as the equities may require. It is apparent that such a doctrine will embrace many cases that would fall within the scope of *Rylands* v. *Fletcher* as currently interpreted, and therefore the two doctrines are concurrent in effect to a considerable degree. We need not be surprised, therefore, when we find some courts using the two doctrines interchangeably, or perhaps using both in the same opinion. Doubtless, defendants in radiation accident cases will encounter the double-barrelled approach with considerable frequency in the years to come.

For example, we have previously referred to the case of *Berry* v. *Shell Petroleum Company*,[103] an action for damages in which the court based its conclusion of absolute liability both upon a theory of nuisance and also upon the precedent of *Rylands* v. *Fletcher*. Many such cases could be cited and, indeed, several of the other cases previously referred to in this chapter reveal more or less of the same dual reasoning.

It is also apparent that many courts which purport to reject the principle of *Rylands* v. *Fletcher* do in fact reach like conclusions under the name of absolute nuisance. As stated by Dean Prosser:

> There is in fact no case applying *Rylands v. Fletcher* which is not reasonably duplicated in all essential respects by some American decision which proceeds on the theory of nuisance.[104]

[103] *Supra* note 43.

[104] Prosser, Selected Topics on the Law of Torts 170 (1953).

A wealth of authority could also be cited in support of the foregoing statement, but the following will serve as illustrative and typical cases. In none of them was there a showing of either negligence or wrongful intent. In *Longtin* v. *Persell*[105] the plaintiff recovered damages in an action involving use of explosives producing vibrations which were held to constitute an actionable nuisance; in *Holman* v. *Mineral Point Zinc Co.*[106] the plaintiff was refused an injunction but was awarded damages in an action to abate as a nuisance and to recover damages for losses caused by defendant's plant emitting sulphuric acid fumes; in *Bartell* v. *Ridgefield Lumber Co.*[107] the plaintiff also recovered damages but was denied an injunction asked by him to prevent the operation of defendant's saw mill which emitted sparks, smoke, and soot; in *Whittemore* v. *Baxter Laundry Co.*[108] the plaintiff brought an action to restrain the storage of inflammable liquids on the defendant's premises adjacent to those of the plaintiff, and under the circumstances the court held that an injunction should issue. In the *Holman* and *Bartell* cases, in which the injunction was denied, the court based its action on balance of convenience under the particular circumstances in each instance. In the *Whittemore* case, the injunction was issued, but actual construction had not yet commenced, thereby illustrating a phase of the nuisance remedy not available under the *Rylands* doctrine. Other cases that might be cited involve percolating water, storage of explosives, fireworks, oil wells, mining operations, the accumulation of sewage, and bad odors, noxious gases, smoke, dust, *etc.* In other words, the cases in which American courts have resorted to an absolute nuisance doctrine as the basis of strict liability cover much the same territory as that covered by cases directly based upon *Rylands* v. *Fletcher* and the doctrines developed thereunder.[109]

Professor Warren Seavey, an eminent authority in the field of tort law, is inclined to criticize the theory underlying these cases and to feel that this broad application of the doctrine of nuisance is unjustifiable. He asserts that it should not be applied to accidents arising from lawful conduct but only in cases involving tortious conduct.[110] He main-

[105] 30 Mont. 306, 76 Pac. 699 (1904).
[106] 135 Wis. 132, 115 N.W. 327 (1908).
[107] 131 Wash. 183, 229 Pac. 306 (1924).
[108] 181 Mich. 564, 148 N.W. 437 (1914).
[109] Dozens of other cases are cited in Prosser, Selected Topics on the Law of Torts 166-171 (1953).
[110] See Seavey, *supra* note 7.

tains that some *wrongful* act, either intentional or negligent, should be established as a proper basis of the charge of nuisance. He says:

> The primary function of nuisance as a separate topic in the law of torts is to mark out the area within which it is unreasonable for one to subject his neighbors or the public to noise, vibrations, fumes, immorality or the risk of physical harm. Where there is a nuisance because of the risk of harm, nuisance overlaps negligence. But its rules are neither esoteric nor eccentric; they follow the normal pattern of tort principles. A few courts have been misled by incautious statements, especially statements dealing with harm resulting from a public nuisance. But the results reached by those courts are not representative. In general it may be said that legal fault is a requisite for nuisance and that contributory negligence is a defense to an action for harm caused by a nuisance resulting from merely negligent conduct, whether or not the physical condition which was the cause of the harm was intended.[111]

Mr. Seavey is undoubtedly right so far as the historical origin of the doctrine of nuisance is concerned. But the plain fact is that the American courts have, in large numbers of cases, ignored the historical distinctions and have spoken in terms of nuisance when they have wished to impose strict liability in situations where the activity itself was not illegal either by reason of wrongful intent or negligence. This being the case, we can only take account of these decisions as existing factors of importance in the current juristic scene. Therefore, we must perforce recognize the existence of an absolute nuisance doctrine when we seek to appraise the likelihood of strict liability being imposed upon the atomic industry of the future.

2. Some Special Features of Absolute Nuisance as Compared with *Rylands* v. *Fletcher*

We have already called attention to the fact that, under the doctrine of *Rylands* v. *Fletcher,* the location of the dangerous instrumentality becomes important, for if it is located at a sufficient distance from others who might conceivably be injured by it, or if, because of the customs of the community or the nature of the activity, it is appropriate to the place where it is maintained in the light of the character of that place and its surroundings, no strict liability will ensue. The doctrine of nuisance embraces an equivalent line of reasoning, and that which might

[111] *Id.* at 995, 996.

be deemed a nuisance in a congested community would not be so regarded if located in a desert miles removed from human habitation.

With respect to another feature, however, there would seem to be an important difference between *Rylands* v. *Fletcher* and the doctrines of nuisance. The *Rylands* theory focuses primarily upon the "dangerous nature" of the instrumentality, and if it escapes and it "does mischief," strict liability is imposed without further question. On the other hand, the nuisance doctrine, in accord with the general approach of courts of equity where most of the cases arise, is more likely to produce decisions based upon a balance of public convenience or a balance of interest between the plaintiff and the defendant. The court of equity has discretionary authority, particularly (although not exclusively) used in connection with issuing the injunction. Intangible factors, including among others a high measure of social utility or economic value, may serve to exculpate an activity that otherwise would be deemed a private nuisance. The fact that the strict liability cases which we are now considering normally (although not always) have arisen in courts of equity has given rise to the idea of balancing of equities. It should be observed that this element not only serves to mitigate undue hardship, a worthy consideration, but also it serves to create a decidedly vague and indeterminate standard to be applied. Under such a theory the lines of demarcation between strict liability and otherwise become shadowy indeed.

One other point of interest is the distinction that is sometimes asserted to the effect that in order to constitute a nuisance the defendant's conduct must result in a *continuing* or *recurring* damage to the plaintiff, whereas the doctrine of *Rylands* v. *Fletcher* contains no such limitation and a single event may give rise to liability. This distinction finds some justification in American decisions for most of them involve situations in which the damage has been a continuing one. It is a fact, however, that courts have, in a number of instances, found an absolute nuisance to exist when but a single damaging event has taken place, such as a single accidental explosion setting off a powder magazine or the setting off of a single charge of blasting powder.[112] Accordingly, we may conclude that the singleness of the act is no absolute bar to resort to the application of the nuisance doctrine, although the duration or recurrence of the interference with plaintiff's property is always a factor to be weighed in determining whether or not the damage is sufficiently substantial to constitute a nuisance.[113]

[112] See Heeg v. Licht, 80 N.Y. 579 (1880), and Patrick v. Smith, 75 Wash. 407, 134 Pac. 1076 (1913). Also see the discussion of the subject in Prosser, Torts 397 (2d ed. 1955).

[113] See 4 Restatement, Torts 245, Comment on §827.

Wholly apart from the fine points of refinement relative to the precise scope of the doctrine of absolute nuisance and the remedies which it affords, we must conclude that in a general way the doctrine parallels that of *Rylands* v. *Fletcher,* and that courts in the United States are inclined to use the two doctrines more or less interchangeably and even simultaneously, although not coextensively. As Dean Prosser has pointed out, although the two remedies have a large area in common, the nuisance remedy is primarily directed toward providing redress for injuries to land, and does not cover personal injuries not connected with land. Moreover, it can lead to the issuance of an injunction as well as an award of damages. On the other hand, *Rylands* v. *Fletcher,* strictly a damage remedy, reaches personal injuries but does not, so far as the decisions reveal, reach certain relatively non-hazardous types of injury, such as those arising from noise, for example, which might conceivably be subject to attack under the nuisance doctrine. It is clear that both doctrines must be taken into account in dealing with radiation hazards.

G. Defenses to Strict Liability—Defendant's Contributory Negligence or Assumption of Risk—Third Party Actions

We have hitherto noted that the rule of *Rylands* v. *Fletcher* has been held not to apply in case the escape of the dangerous substance arises from plaintiff's contributory negligence, or from an act of God, or of a third party stranger, or if its activity is specifically sanctioned by statutory authority.[114] We have also noted that the American Law Institute Restatement specifically provides for exemption in case of activities carried on in pursuance of a public duty (Restatement, Sec. 521), in case of an assumption of risk by the person harmed (Sec. 523), in case of action by the person harmed which causes the dangerous activity to miscarry (Sec. 524), or, after knowledge that the activity has miscarried or is about to do so, in case he fails to exercise reasonable care to avoid harm (Sec. 524).[115]

It is desirable, before concluding this discussion of strict liability under common law doctrines, to give further brief consideration to certain of these defenses. They are often resorted to in connection with ordinary actions based upon negligence. This is true of contributory negligence, assumption of risk, and contributing third party action. These defenses may be pleaded and relied upon in actions for damages based upon strict liability for radiation injuries. Are they to be deemed valid

[114] See text at notes 25-28 *supra.*

[115] See text at note 86 *supra.*

defenses when the action is based upon the *Rylands* theory, or the Restatement, or the doctrine of nuisance? Are they valid under all circumstances, or, if not, to what extent may they be relied upon?

Defendant's Contributory Negligence and Assumption of Risk. It is frequently said that contributory negligence is not a defense in cases of strict liability whether such liability is based upon *Rylands* v. *Fletcher* or upon a doctrine of nuisance. Yet this statement is only partially true. The Institute Restatement seeks to clarify the point by dividing contributory activities of the plaintiff into two categories. The plaintiff is not barred from recovery on the ground of contributory action if it consists of negligently failing to observe the dangerous situation, or of intentionally coming into proximity to the hazard (Restatement, Sec. 524(u)). However, he is barred if he precipitates the miscarriage of the dangerous substance, or if, after learning of the hazard, he fails to take reasonable care to avoid personal harm (Sec. 524(2)). In other words, he is barred in those instances in which his own default or his own assumption of the risk has contributed to his injury in such manner as to suggest the injustice of holding the defendant to the absolute liability. If contributory negligence and assumption of risk are to be accepted as valid defenses in an action based upon negligence when the defendant is proved guilty of a social wrong, *i.e.*, negligence, it would seem only just that a somewhat equivalent defense be available when the defendant is by hypothesis innocent of social wrongdoing. This the Restatement seeks to achieve. Moreover, the cases and text writers bear out a like conclusion with respect to actions based upon *Rylands* v. *Fletcher* and also those based upon nuisance.[116] Therefore the generalization to the effect that these defenses are not valid in strict liability proceedings is inaccurate.

Third Party Activities. It can and sometimes does happen that a third party contributes in a significant way to the incident causing the damage, and the question arises as to whether or not such third party action will exculpate the defendant from strict liability. So far as radiation injuries are concerned, one of the principal problems raised by third party activities is the possibility of two or more users of atomic energy each contributing to stream or air pollution under such circumstances that neither acting singly would have caused damage or created a nuisance, but the combination of the several users does so. What should be the effect of these third party contributions? In cases of a similar

[116] See Prosser, Torts 341-343, 423-426 (2d ed. 1955); also Harper & James, Torts, Vol. I, p. 81-85, Vol. II, p. 802-805.

nature based upon the nuisance theory it has been consistently held that each contributor to the plaintiff's injury is liable jointly with his fellow contributors for the full amount of the damage, although, if apportionment of damage can readily be made, the court may undertake to do so.[117] A like result would be reached under Section 522 of the Restatement. On the other hand there have been a number of cases tried under the *Rylands* doctrine in which third party action has intervened in such manner as to relieve the defendant of his strict liability.[118] In short, the confusion and inconsistency of doctrine to which reference has hitherto been made in another connection also prevails with respect to these special defenses.

H. Conclusions Concerning Common Law Doctrines

We should now attempt to shape some conclusions from the foregoing review of case law, particularly having in mind the problem of obtaining redress for persons injured by radioactive substances.

(1) We must keep general principles in mind. It is a principle not only of the common law but also of the Roman law and the Codes based upon it that no one is to be held liable unless he is guilty of negligence or wrongful intent. However, today, under all responsible legal systems, there is a tendency to gravitate from liability only in case of fault toward the principle of absolute liability—"liability without fault." Over-all absolute liability without any restrictions or limitations whatsoever is rare. It is too severe and too unsophisticated. Instead the law seeks (and should seek) what has been aptly called "the golden mean" between too much and too little—between the ancient Roman principle that persons are responsible only for negligence, (a principle under some circumstances too generous to the defendants) and the primeval common law principle that persons who cause injury are to be held unconditionally liable in all circumstances (a principle too generous to the plaintiff).

The basic problem in connection with users of radioactive substances is to find this "golden mean," the middle way suited to the atomic user's circumstances, appropriate in view of the desirability of encouraging the development of atomic enterprise, yet taking due account of justice to the injured persons.

(2) As we have noted, there are two directions from which the

[117] See Northup v. Eakes, 72 Okla. 66, 178 Pac. 266 (1918), a stream pollution case; see also Prosser, Torts 422 (2d ed. 1955).

[118] See Prosser, Torts 340, 341 (2d ed. 1955) and cases cited.

"golden mean" may be approached. On the one hand we may extend the concept of negligence by expanding the standard of due care in such manner as to facilitate recovery by the injured person, thus promoting justice without taking the ultimate step of invoking a doctrine of absolute liability. Or, on the other hand, we may create absolute liability, yet, by attaching appropriate conditions and limitations to the concept, bring it into line with justice and good sense. Each approach is exemplified by judicial decisions in more or less analogous fields. It is apparent, however, that the approach of absolute liability with exceptions is the more in harmony with current thinking.

(3) We must take account of the *Rylands* v. *Fletcher* doctrine, including the many variations found in different states of the Union. Yet this doctrine has not helped us to the "golden mean," but has left us with a welter of indefinite boundary lines and differences of judicial views.

(4) We must also take account of the American Law Institute doctrine of ultrahazardous activities. Although this doctrine has been formulated by eminent authority, it has not yet been fully ripened by judicial decisions. However, it is sufficiently important to have been accepted in several jurisdictions. At the same time, for the purposes of atomic energy, it seems quite unlikely to bring about an orderly and acceptable solution.

(5) We must also take account of the vague contours of the doctrine of absolute nuisance, with its possibilities for injunction as well as judgments for damages. This doctrine, although frequently invoked, does not provide the precise answers necessary to dispose adequately of civil liability for radiation injuries.

(6) None of the foregoing theories leads us to any helpful drawing of lines of demarcation in the atomic field. For example, a reactor containing critical quantities of uranium is relatively more dangerous than a cobalt 60 radiography capsule, and the latter is worse than a radioisotope thickness gage. In one sense all are "dangerous substances," likely to "cause mischief" if they escape. Yet a line must be drawn unless we wish to place all atomic uses in a single category so far as liability is concerned. This would not be realistic, yet common law methods offer very little help in resolving the difficulty.

(7) In view of this complicated and uncertain state of affairs of one thing we may be certain, namely, that before we move very many years into the atomic age, state legislatures will be taking action to provide statutory rules covering the matter of liability in radiation injury cases,

thus making an effort to bring order out of choas, giving certainty to the law, and attempting to satisfy contemporary ideas concerning justice for injured persons. We should not anticipate the discussion later in this chapter but we may merely suggest that in the near future statutes will be enacted, as they have been, for example, in connection with fires caused by railroads, to impose calculated, though varying, degrees of liability upon users of radioactive substances. Indeed, as we shall later see, a statutory solution of the problem of liability for radiation injuries may well become the standard of practice throughout the civilized world, both in common law countries and in those basing their law upon civil codes.[119]

I. Factual Analysis of Applications of Atomic Energy to Show Basis of Liability

Up to this point we have examined the existing law, with only occasional references to atomic energy uses and radiation accidents. We must now, before attempting to reach final judgments concerning the law that will be applied to such accidents, undertake to get a fairly detailed view of the highly variant kinds of accidents and injuries that may take place. We will then be in a position to draw some informed conclusions. These fact situations vary widely in extent, severity, character, and quality, and we can predict with certainty that courts will react differently depending upon individual circumstances. They will no doubt be sympathetic with the applications of doctrines of strict liability in certain of the aspects of this new development, but they are far less likely to do so in others.

1. Early History of Radiation Accidents

Hitherto in this volume we have called attention to the fact that at an earlier day the pitchblende miners in Czechoslovakia were found to be dying of pulmonary ailments at a rate approximately thirty times greater than that of the general population. They were in fact dying of lung cancer although the nature of the ailment was not known at that time. It is believed that the inhalation of the radioactive radon, a gas created from the disintegration of pitchblende, caused the cancerous growths and resulted in the high degree of mortality.

We have also called attention to the fact that, when radium was first discovered, the earlier workers with the element suffered radiation in-

[119] This idea of a statutory liability receives interesting support in a recent brief article by Professor Warren A. Seavey, "Torts and Atoms," 46 Cal. L. Rev. 3-13 (1958).

juries as a result of undue exposure. The same has been true of X-rays, for, in the early stages of development of that useful instrumentality, the scientists and technicians working with it were frequently overexposed, with the resultant development of malignancy.

One of the most highly publicized of the earlier cases involves the radium dial painters of New Jersey. The well-known case is *LaPorte* v. *United States Radium Corporation.*[120] In this case it appeared that the decedent had been employed for approximately a year and a half painting watch dials with radioactive luminous paint. She had been following the common practice of pointing the bristles of the paintbrush with her lips, thereby ingesting small quantities of radioactive material. Twelve years after she left the company she began to exhibit the symptoms of radium necrosis. She commenced an action for damages, and shortly thereafter she died. The action was revived by her legal representative.

There was a two-year statute of limitations. The action, which took the form of a suit in equity to enjoin the defendant from pleading the statute of limitations as a bar, was dismissed. Because of the statute, the plaintiff was unable to recover damages.

2. Radiation Accidents Since World War II

We now turn to injuries which have been suffered in more recent years as a result of undue exposure of persons and property to radioactive substances. These are the World War II and later developments connected with the important contemporaneous expansion of nuclear enterprise.

In general, there are three broad classes of injuries arising and likely to arise from atomic enterprise. There are those that arise from accidents of a conventional character although occurring in atomic installations, *e.g.,* ordinary cuts, bruises, broken bones, etc. Then there are accidents that are peculiar to atomic industry because they arise from materials or processes peculiar to that industry but do not involve radiation as such, *e.g.,* uranium scrap fires. Finally, there are those in which radiation is the principal or the exclusive cause of injury. Since we are concerning ourselves with the *unique* legal problems of atomic energy, we will direct our attention primarily to this third category. No doubt the shape of the law of civil liability is going to be very largely determined, as we have seen, by the characteristic hazards of the business, and we must try to appraise these hazards as they are revealed by experience. We can learn something from "the incidents" that have already arisen,

[120] 13 Fed. Supp. 263 (D.N.J. 1935).

although fortunately they are few in number. Thereafter, we will hypothesize the possibilities for the future, thereby obtaining a complete, though necessarily speculative, view of the field.[121]

(1) *Criticality Incidents.* During the earlier years of experimentation with fissionable materials several tests at Los Alamos, New Mexico, involving the assembly of critical quantities of such material, resulted in accidents. Two deaths ensued, one in 1945 and the other in 1946. Thereafter, remote control devices were utilized, strict regulations were imposed governing the conduct of criticality experiments, and the most meticulous precautions were taken to prevent further accidents. Although several other unexpected criticality incidents have taken place since then, and several staff members have been overexposed to radiation, there have been no observable, untoward symptoms. However, these incidents reveal the need of the highest degree of care and skill and the utmost in precautions to be taken in carrying out all experiments or operations in which supra-critical masses may be assembled. If a private reactor operator should have an accident with off-site injuries to persons or property, it would seem certain that a court which follows *Rylands* v. *Fletcher* would impose strict liability upon him. Moreover, the same result would probably be reached under the Restatement principle and also under nuisance doctrines unless the court should insist upon a continuing or recurring activity before relying upon the latter.

(2) *The NRX Reactor at Chalk River, Ontario.* The Chalk River reactor which commenced operation in 1947 was a high power reactor being used for experimental purposes. Natural uranium was the fuel; heavy water, the moderator; and ordinary water, the coolant. The reactor was used for general reseach purposes and for the production of radioisotopes as well as plutonium. In December 1952, when a special experiment was being carried on, a power surge took place which resulted in the reactor "running away." The incident is thought to have been due to a combination of human and mechanical errors. Melting caused the failure of the aluminum sheathing of some ten per cent of the uranium rods in the reactor. Both melting and oxidation of the uranium accompanied the failure. As a result a considerable quantity of radioactive fission products was carried into the coolant water. Simultaneously gaseous fission products spread throughout the reactor structure and into the ancillary equipment. The reactor vessel was damaged beyond repair. It contained highly radioactive uranium which could not

[121] See Hayes, "A Summary of Accidents and Incidents Involving Radiation in Atomic Energy Activities, June, 1945 Through December, 1955," published by the AEC, Safety and Fire Protection Branch, Wash., D.C. (1956). TID—3360.

be withdrawn in the ordinary way. All the ancillary equipment was radioactively contaminated, and the basement was flooded with radioactive water. The ceiling, walls, and floors of the upper part of the building were also contaminated. About a million gallons of radioactive water had to be pumped to a remote deposit area. It was, however, found possible by using entirely new techniques to decontaminate the surrounding property, and by early 1954 the reconstructed reactor was working again. There were no personnel injuries, although about ten thousand curies of fission products were released. So far as legal implications are concerned the incident can be regarded as illustrative of the fact that even a major reactor disaster can take place without unduly serious results excepting to the plant itself, and yet there is an "escape" of a dangerous substance and the potentialities are such that strict liability for damages may well be deemed a certainty. Moreover, the radioactive effluent would produce a continuing condition of private nuisance that would without question support a finding of absolute liability on that theory.

(3) *The Argonne Control Rod Test Incident.* On June 2, 1952, at Argonne National Laboratory a damaging incident took place in connection with an operation involving the testing of a series of newly manufactured control rods. The standard procedure for inserting a new control rod required that the water moderator of the critical assembly be first drained away, thus reducing reactivity and permitting the safe withdrawal of the control rod for which substitution was to be made. However, in the particular operation that resulted in an accident, the water was not first removed. One of four test crew members proceeded to withdraw one of the control rods by hand. As he did so a bluish glow was emitted by the center of the reactor core. A large bubble formed and an explosion took place. The operator immediately dropped the rod and automatic devices drained the water from the core. All four operators left the assembly room. Later tests showed exposures of 190, 160, 70, and 12 rems respectively. Two of the operators suffered nausea, but there were no other observable symptoms. Clinical tests revealed increase in excretion of urinary amino acids and decreased sperm counts, although these effects disappeared in due course. No damage to the eye lenses was observed. What the future may hold for the victims no one can say.[122] Apparently the human being can absorb a very substantial

[122] For a report of these four cases see Hasterlik & Marinelli, "Physical Dosimetry and Clinical Observations on Four Human Beings Involved in Accidental Critical Assembly Excursion," 11 Proceedings of the International Conference on the Peaceful Uses of Atomic Energy 25 (Geneva 1955).

overexposure for a short period without suffering immediate and observable damage, although it is usually estimated that a total dosage of 450 rems will be fatal to about one half of the population, *i.e.*, this is the "mean lethal dose." Although the injuries were limited to persons employed on the premises, it is quite conceivable that under a proper combination of circumstances, off-site damage could take place, and again one can hardly doubt that the dangerous nature of the test device would lead to strict liability.

(4) *Borax No. 1 Run Away.* A small experimental reactor at Arco, Idaho, known as Borax No. 1, was constructed in 1953 with water as both coolant and moderator. The core assembly consisted of plates made from an alloy of enriched uranium and aluminum, clad in aluminum and immersed in water inside a steel tank. In July 1954, after more than 200 tests on the reactor, it was decided that it should be sacrificed in an experimental runaway. Control rods were withdrawn, the last one rapidly. The results were much as expected. Most of the fuel melted, and the reaction from the molten metal in contact with the water burst open the tank. The control rod mechanism was carried away, and the remains of the reactor core were ejected high into the air. Most of the fuel element fragments fell within a radius of two hundred feet. There was no appreciable radioactive fallout except within a radius of a few hundred feet. The explosion by ordinary standards was a mild one, being comparable with that which would be produced by a few pounds of TNT. Indeed those who may feel concern lest peaceful atomic industry may result in explosions approximating those of atomic weapons may take comfort from the fact that this is virtually an impossibility. Highly specialized techniques are required to produce sharp explosions. Industrial atomic reactor accidents even if serious will inevitably be of a milder character, although this is not to say that extreme precautions are not desirable and even necessary. If, instead of taking place miles from the nearest habitation, Borax No. 1 had "run away" on the outskirts of a city, the question of legal liability would be presented. In view of the precedents involving explosions, nuisances, and escaping dangerous substances there can hardly be a doubt of strict liability under such circumstances.

(5) *The EBR-1 Reactor Accident.* In November 1955 at the Arco testing station a partial meltdown and release of radioactive substances took place in an experimental breeder reactor being operated under the supervision of the Argonne National Laboratory. Dr. Walter H. Zinn, Director of the Laboratory, described the accident as follows:

EBR-1 had been used for a number of years in an experimental program, mostly in the physics of fast reactors. The core loading was reaching the end of its useful life and it was scheduled to be removed from the reactor early in 1956. As a last series of experiments with this core, it was decided to make measurements on transient temperature coefficients. The experiments consisted of measuring changes in reactivity of the reactor as the temperature of the fuel elements was increased. . . . Because it was desired to obtain the temperature coefficient of the fuel only, it was necessary to shut off the flow of the liquid metal coolant.

* * * * *

Increasing the temperature of the uranium rapidly involved very considerable chance of distorting the fuel element jackets, especially since uranium metal and stainless steel form a eutectic at about 725° C. This is very little above the temperature to which it was desired to pulse the fuel elements.

That there was some risk of melting the fuel elements was well appreciated.

* * * * *

In previous experiments of this type, it had been possible to interrupt the excursion and return the reactor to low power by making use of the motor-driven control rods. These subtract reactivity slowly. In this excursion, the technician at the control panel was expected to use the fast-acting shut-off rods upon receipt of a spoken instruction from the scientist in charge. . . . Upon receiving instruction to shut down the reactor, the technician repeated the use of the slower control rods. The staff scientist, as soon as he realized the situation, reached over and pressed the rapid shut-off button and, simultaneously, the automatic power-level trips responded to activate the shut-off rods. The delay in time, which was almost two seconds, was sufficient to permit the reactor power to overshoot to a point where the alloying of uranium and steel and melting of the uranium took place.

The reactor shut down and there was no way by sound or sight to know that anything untoward had occurred. . . . After a period of fifteen minutes, detectors for radioactivity installed both in the cooling system, . . . and in the ventilation exhaust ducts . . . began to show readings higher than normal.[123]

A dangerous quantity of radioactivity escaped into the atmosphere of the test building, but material damage was restricted to the reactor core and the inside of its vessel. There was severe distortion of the elements

[123] Forum Memo, June 1956, pp. 26-28.

but there were no personnel injuries. The incident illustrates the possibility of human fallibility and the need for protection against accidents by use of all possible mechanical devices, shields, protective envelopes, and other safeguards, just in case something does go wrong.

If similar human fallibility connected with a private reactor should result in off-site damage, the ensuing law suits will raise many interesting questions involving not only strict liability under its various doctrines, but also questions related to the standard of care to be exercised in connection with such an operation. Yet the time may arrive in the distant future when fast breeder reactors will be used to produce a significant percentage of the electric power supply. When that time arrives the technical problems will have been resolved, the safety of the facilities will be assumed, the installations will become numerous and commonplace. Under such circumstances there will be much force in the argument that they have become "matters of common usage" subject only to liability for negligence.

(6) *The Saclay Reactor.* A reactor at Saclay, France, was fueled with natural uranium using heavy water as the moderator and carbon dioxide as the coolant. The reactor was used for the preparation of radioisotopes for research purposes and for the production of small quantities of plutonium. Continuous operation at a high power level was permitted. In June 1956, a rupture occurred, breaking the sheathing enclosing one of the fuel rods. This caused a slight contamination of the cooling circuit. The incident lead to release through the ventilation system of a quantity of slightly radioactive carbon dioxide gas. Measurements of radioactivity on the instruments located near the reactor showed only a modest increase, and there was little, if any, contamination of personnel. The incident was such that repair could be effected quickly with only a temporary holdup in operation. The incident was a minor one, but it reveals the dangerous possibilities inherent in a defect in a minor component part, in this case the sheathing on one of the control rods. We can anticipate that the highest of mechanical skills will be required in the fabrication of essential component parts of atomic equipment, that private reactor operators will be held to the very highest inspection standards, and that mechanical faults must be completely eliminated if liability for legal fault is to be avoided. Even if all this is done, strict liability seems a virtual certainty under present day theories and circumstances.

(7) *The Benjamin Zawacki Case.* Every half hour throughout the evening of January 10, 1956, and all during the night, radio and tele-

vision stations in Connecticut and New York flashed emergency bulletins ending with this sharp warning:

> The life of the person carrying the radioactive cylinder missing from a construction job at Devon is in danger. Dispose of it in a remote area at least a hundred feet from any house. Call the police, giving them its location. Then go immediately to the nearest hospital.

Benjamin Zawacki was the man who had the radioactive cylinder. As an electrician he had been working on a new building being erected on the outskirts of Bridgeport, Connecticut. Late in the afternoon he was seeking a piece of cord to tie down a cable that was being installed. Nearby, passing through a hole in the concrete floor, there was a twelve-inch steam pipe. Loosely tied to this pipe and hanging down to the floors below was a long strand of cord, apparently not serving any useful purpose. Zawacki pulled the cord up through the hole and detached it from the steam pipe. After tying up the cable, he observed that there was a little weight hanging on the end of the remaining cord. He automatically dropped the capsule into his shirt pocket. Upon leaving the job he tossed the contents of his pocket, including the capsule, into the glove compartment of his car. Another electrician rode with him into Bridgeport, and later in the evening a friend also rode some distance in Zawacki's automobile.

The next morning another construction worker rode with Zawacki to the job site. As they approached the watchman's gate they saw a long line of cars waiting, each being tested for radioactivity. When Zawacki's car reached the test point, the Geiger counters began to click violently, and the capsule was discovered in the glove compartment. The capsule was a cobalt 60 source, 1,280 millicuries in strength, which had been used for radiography on the construction job. The radiographer had left it unguarded and no warning signs were posted.

Two weeks of hospitalization and much testing failed to reveal any outward signs of physical disorder. However, the incident had a substantial demoralizing effect not only on Zawacki but on his companions as well. Various psychosomatic disturbances resulted.

A suit for $200,000 in damages for negligence has been filed against the contractor on the construction job and against the subcontractor who was engaged in radiological inspection. If this incident cannot be regarded as actually prophetic, at the very least it indicates that in the atomic future unusual care must be taken in instructing workmen, in posting danger signals, and in alerting the public generally to the

hazards involved. We can and must learn to live with these hazards as we have learned to live with other dangerous instrumentalities, *e.g.*, the automobile, but we must also learn how to protect ourselves against overexposure to radiation. Whether or not the use of cobalt 60 in radiography will call for an application of the doctrine of *Rylands* v. *Fletcher* remains to be seen, but it may well be that such uses are already so commonplace as to be deemed "common usage" as that term is used both in the *Rylands* case and in the Restatement.

(8) *The M. W. Kellogg Company Incident.* The M. W. Kellogg Company was an Atomic Energy Commission licensee doing business in South Houston, Texas, engaged in the task of encapsulating and selling iridium 192, a radioactive isotope which is used for industrial radiography. On March 13, 1957, irradiated pellets of a mixture of compressed iridium 192 and aluminum metal powder were broken while being handled. The incident resulted in severe contamination of the laboratory. The laboratory was not used for several days thereafter and was partially decontaminated by the company. Two employees were present at the time of the incident and at least one of them may have have inhaled some of the radioactive powder. The exposure to external radiation was not believed to have been large. Investigation indicated that the clothing of at least the two employees was contaminated and was not removed until after the employees arrived home. Radioactivity was detected in the home of one of the employees and also in a trailer where the other lived at the time of the incident. Some of the clothing of other members of the family was found to be slightly radioactive, presumably as a result of being washed along with the employee's clothes.

The Atomic Energy Commission immediately directed a temporary suspension of the license of the company and issued an order to show cause at a hearing in Washington as to why the order should be modified or vacated. Subsequently the Commission modified the order sufficiently to permit salvaging and sale of the inventory of radioactive material, but the company was not permitted to resume its normal activity.[124]

Only careful and competent operation can be tolerated, and the regulatory power of government must be utilized to protect against the careless and the incompetent. However, even rigorous compliance with governmental regulations will be no more than evidence of due care and will not relieve the defendant if strict liability principles are applied.

(9) *Oak Ridge National Laboratory "Wrong Room" Incident.* On

[124] See AEC Release No. 1213, Nov. 6, 1957.

October 4, 1957, an employee of the Atomic Energy Commission's Oak Ridge National Laboratory accidentally received an exposure to radiation when he mistakenly entered a room containing highly radioactive material. He was looking for a wrench which he had actually left in another nearby room in which he had been working. He entered the wrong room although the door was clearly marked with radiation hazard signs. The incident was discovered when laboratory technicians noted that his pencil-type radiation detection instrument revealed the overexposure. The facts were confirmed when the film badge was subsequently processed. Investigation revealed that he received an exposure of about 63 roentgens in the period of about one minute in the room. The incident involved only exposure to external radiation with no internal contamination involved. According to all appearances the employee was inexcusably careless, but in the atomic age especial care will have to be exercised to protect others against employee inattention and even stupidity. The defense of assumption of risk will be applied only under unusual circumstances when the claim is based upon strict liability.

(10) *The Windscale Accident.* On October 17, 1957, one of Britain's plutonium producing reactors located at Windscale, Cumberland, produced the free world's worst nuclear accident to date from the standpoint of off-site injuries to persons and property. Although at this writing a security blackout masks the cause of the accident and the extent of the damage, it is clear that it was a major occurrence possibly involving as much as several hundred tons of uranium. Seemingly a really major catastrophe was averted only by a successful, on-the-spot emergency action led by nuclear experts.

The reactor was an open-cycle, air-cooled machine (thus to be differentiated from Calder Hall's closed-cycle, pressurized gas-cooled type with carbon dioxide used as the coolant). According to reports, the Windscale reactor was shut down for routine maintenance. It was then discovered that a considerable number of the fuel elements were glowing red hot. This meant that they were several hundred degrees hotter than they should have been, and that uranium was fissioning in the supposedly idle reactor. Also it meant that radioactive products were being discharged from the stack being carried by the rising column of coolant air. The immediate threat was the escape of volatile fission products, principally radioactive isotopes of iodine which could pass through the chimney filters. Solid particles such as radioactive strontium and cesium were for the most part trapped in the filters. After careful consideration water was applied to quell the overheating.

Milk samples from freshly milked cows in the vicinity were rushed to Harwell and showed traces of radioactive iodine. In twenty-four hours the content had rocketed to six times the permissible tolerance level. Soon a special press conference announced a shutdown of all milk distribution within a three-mile radius, an area that was later extended to cover 200 square miles. All contaminated milk was discharged into the sea.

Speculation has indicated that the cause of the unexpected heating effects lay in fission products trapped in the fuel elements the heat producing reactions of which continued after the reactor was closed down. Further study will be necessary to determine the exact cause of the difficulty, and doubtless an official report will be issued in due course.

This incident is the first that has resulted in extensive damage to persons or property off the plant site, although the Chalk River affair gave rise to a certain amount of neighborhood inconvenience. The fact that such incidents can occur is certainly of significance in appraising the theory of civil liability to be applied to atomic operators, but at the same time the rarity of such occurrences is also both significant and encouraging. It is understood that the people in the vicinity who have suffered damage will be fully compensated for their losses by the Atomic Energy Authority, for under Section 5(3) of the Act of 1954 the Authority is made absolutely liable for injuries occasioned by the escape of radioactive substances. However, even so, there will be troublesome questions of damages to resolve. For example, will compensation be paid for diminution of property values caused by popular fears of another such accident? This question has arisen at Windscale and up to the moment has been answered negatively by the Authority.

(11) *The Hot Fish Study.* The disposal of radioactive wastes is one of the primary obstacles to widespread use of atomic energy. A three-year study was recently initiated by the U. S. Atomic Energy Commission and the Tennessee Valley Authority for the purpose of determining if the partially purified liquid wastes discharged by the plant into White Oak Lake had any ill effects on fish life in the lake. The study brought forth the significant information that discharge water released by the plants produces "hot" fish many times more radioactive than the water in which they live.

The study particularly revealed that two species of fish, the bluegill and the blackcroppe, absorbed and concentrated in their bone structures large quantities of radioactive strontium. This substance is readily deposited in bone tissue much the way calcium is deposited. Skeletons of

these fish were found to contain radioactive strontium in concentrations 20 to 30 thousand times as great as that of the lake water itself. For example, it was noted that the body of a seven-inch blackcroppe produced on the average well over one microcurie of radioactivity. Moreover, it was noted that the fish in White Oak Lake not only grew more slowly than those of the same species in nearby reservoirs but that they died younger.

Studies such as this may well give pause to those who would dispose of radioactive wastes in the ocean depths or in fresh waters inhabited by fish on which man relies for food supply. Damage suits will be a certainty, and strict liability will probably be the applicable rule of law. Moreover, if there are several contributors, each may be held fully liable although his own contribution is well below tolerance levels.

(12) *The Oak Ridge Y-12 Radiation Accident.* In June 1958, at Oak Ridge, a quantity of highly enriched uranium bearing solution, normally stored in "always safe" tanks of such geometric configuration that a critical quantity could not be assembled, was permitted by a most unusual series of events to flow into an ordinary 55-gallon drum. A critical quantity was thus assembled and a chain reaction followed. Eight persons were within fifty feet, one being not over six feet away. Injuries to personnel seemed to be temporary only, but the incident illustrates the possibilities that exist when handling critical quantities of fissionable material. As stated in the official report, the accident "could not have happened unless a chain of about twelve unusual and unrelated events happened in just the right order. None of these twelve events was by itself sufficient to be called an error. The chance of just these twelve events occurring in just the right sequence is so small as to be rightly called impossible." [125] An accident of this sort would seem to involve an ultrahazardous activity that would satisfy even the restricted category of Section 520(a) of the Restatement doctrine.

(13) *Miscellaneous Minor Incidents.* In addition to the foregoing that may be regarded as the major and more striking radiation incidents, we should refer briefly to a number of other minor occurrences which, although they caused no serious damage, nevertheless indicate the kinds of hazards to which the atomic business may be subject. For example, there have been instances of contamination of premises due to the breaking of radium sulphate capsules used in laboratories; similar results have followed the rupture of neutron source capsules (such as those containing polonium and beryllium); there is one recorded instance of

[125] See Forum Memo, August 1958, p. 39.

considerable quantities of radioactive mesothorium being discharged into a city sewer system where it was handled in a "complete treatment" sewage plant, from which the dry sludge (with fairly high radiation levels) was spread as a fertilizer; a tank trailer containing 1500 gallons of radioactive uranyl nitrate hexahydrate has overturned and spilled its contents on a highway; fires have taken place in contaminated waste accumulations, in uranium scrap, in plutonium turnings, etc. (These metals are pyrophoric in nature, and although natural uranium is of negligible radioactivity, U-235 and plutonium can cause serious contamination). These are illustrative of the possibilities and indicate the wide range of events of possible legal consequence against which those who engage in nuclear enterprises must guard.[126]

Summary. The foregoing is a virtually complete list of the principal nuclear "incidents" that have taken place during the thirteen years following World War II. The period really shows a remarkable record of freedom from serious accidents. The Atomic Energy Commission has taken extraordinary precautions to minimize the hazards both for personnel working on plant sites and even more so for outsiders. Very few workers have been exposed beyond the allowable limits of radiation. A few accidents have resulted in injury and even death. A few workers have undergone technical overexposure but without untoward symptoms. Indeed the entire history of the thirteen year period affords considerable assurance that operations utilizing radioactive substances can, by proper precautions, be made extraordinarily safe. Such installations may eventually become rather highly regarded as good places in which to work and good neighbors in the community. When that time arrives the facts should have a material bearing upon the rules of law to be applied. Developing still further the remarkably safe record up to the present time, in a complete tabulation set forth in the July-December, 1956, report of the Atomic Energy Commission can be found a complete listing of all incidents involving radiation overexposure during the period 1945 through 1956 in Atomic Energy Commission activities. In that period of time some sixty-nine persons were overexposed in eight separate incidents. There were two fatalities, the two previously noted as occurring at Los Alamos. Twenty-eight of the total number of overexposures resulted from an unexpected fallout in the course of a weapons test in the Marshall Islands. Of the total sixty-nine exposed, nineteen suffered only skin injury and several other exposures were comparatively minor. In a word, to date, the atomic energy business has

[126] For a more complete coverage, see Hayes *supra* note 121.

proved to be an exceedingly safe operation so far as employees are concerned.

With respect to persons and property off the plant sites, the fact is that the public has not suffered in any material degree, notwithstanding the potentialities of the business and the rather widespread extent of its utilization. Adequate safety precautions seem to make the activity fully as safe as many other types of industrial enterprise—as safe, for example, as the chemical business. A reference to the Texas City disaster involving nitrate fertilizer [127] and the East Cleveland disaster involving a large gas container,[128] each resulting in many deaths and much property destruction, is all that is necessary to indicate that an industrial economy necessarily involves certain limited hazards. They must be minimized and guarded against as well as possible but an occasional accident is almost inevitable. To date, then, the atomic industry has no cause for concern about its safety record. It has been remarkably good. In regard only to the safety of reactors, as distinguished from other atomic activities, in over twelve years of operation, the Atomic Energy Commission reported two years ago that it has operated twenty-five nuclear reactors for a total of 606,868 hours using 17,799,000 man hours with no accidents involving either contamination of off-site property or personnel exposure sufficiently serious to cause lost time. This is good evidence that reactors can be safely operated, as safely, perhaps, as the more conventional sources of heat energy. When they become commonplace and a necessary part of the economy, there would be good reason for urging that they be subjected to the legal principles applicable to other industrial units with equivalent safety records.

3. Some Hypothetical Possibilities of Radiation Accidents

Although the record of atomic industry up to the present time has been an extraordinarily good one, remarkably free from incidents resulting in damage to persons or property, we should not for this reason alone become too optimistic with respect to the future. When peaceful applications of atomic energy become widespread throughout industry, agriculture, medicine, and the numerous other possible areas of utility, we can expect that accidents will take place, that people will be injured, and that property will be damaged and destroyed. Safety regulations will, of course, be in effect, at both state and national levels. But, with

[127] See Dalehite v. United States, 346 U.S. 15, 73 S. Ct. 956 (1953).

[128] See Moran v. Pittsburgh-Des Moines Steel Company, 166 F. 2d 908 (3d Cir. 1948).

the large number of persons utilizing radioactive substances, persons of varying degrees of knowledge and competence, and with the many possibilities of dispersion of radioactivity here and there throughout the numerous areas of human activity, we can be reasonably sure that injuries will ensue.

We are seeking to determine the nature and extent of the remedial rights of the individual whose person or property is subjected to overexposure to radiation. Is liability to be predicated on doctrines of negligence or, taking account of the possibilities, is the operator to become strictly liable for the damage resulting from his atomic activities? In order to further place this problem in proper perspective, let us now add to the previous account of actual accidents by trying briefly but systematically to envisage hypothetically the principal types of accidents which may be anticipated in the atomic future if something goes wrong, as it may well do. Examination of these types will give us background for more adequate consideration of the legal theories that should be made applicable. Let us consider a dozen or so hypothetical possibilities starting with those displaying the more serious potentialities.

(1) *A large power reactor meltdown.* We shall start with the type of accident that, although extremely unlikely to happen, could be the most devastating of all—a reactor "burn-up." As of June 30, 1958, one full-scale civilian power reactor was in operation, four more were being built in the United States, and some ten more were being planned. These operations contain certain inherently dangerous potentialities against which proper precautions must be taken. In the first place, each reactor contains an amount of fissionable material considerably in excess of the critical figure, *i.e.*, in excess of the quantity which if properly concentrated would result in a chain reaction. Secondly, in addition to the fuels themselves, after operation for a period of time a reactor will contain a considerable inventory of radioactive byproducts. Some of these byproducts are said to be from three million to two billion times more toxic than chlorine, the most potent common industrial poison. Moreover, these substances cannot be detected by the senses, even in lethal concentrations, and they are capable of producing injuries which may not become evident until many years after exposure.

Although the reactor will not explode in the sense of an atomic bomb explosion, it may, if the unexpected takes place, become overheated, the fissile elements may melt, perhaps become vaporized, and the rapid formation of gaseous products create pressures which will rupture all containment structures, and release radioactive fission products to the environment. Operating personnel on the plant site may be injured or

killed, and a cloud of lethal gas with radioactive particles in suspension may escape from the reactor building and drift downwind toward inhabited areas. Fallout of radioactive material may take place which will contaminate farms, animals, and buildings, as well as people in the vicinity. Radioactive materials may be deposited on or in the ground and be carried by the percolating ground waters to adjacent rivers or other water supply sources. Under certain atmospheric conditions a radioactive cloud of gases and particles in suspension may proceed downwind for many miles at approximately ground level, carrying its destructive potentialities along with it.

All of this is decidedly on the pessimistic side and is quite unlikely to happen especially in view of the extensive precautions taken by the Atomic Energy Commission in evaluating plans and facilities prior to issuing operating licenses. Moreover, all power reactor accidents are not necessarily going to be as violent as that indicated. There may be no rupture of the containment vessel. Or if there is a rupture, the radioactive cloud may rise vertically and disperse itself without damage to persons or property on the ground. Nevertheless, if an accident of major character takes place within a short distance of a major center of population, it is theoretically possible, assuming a high percentage of dispersion of the core inventory of fission products and unfavorable inversion type of atmospheric conditions to produce a serious situation that might require the evacuation of the population and possibly result in widespread damage to persons and property. Unlikely as all of this may be, it is within the range of remote possibility and must be taken into account in appraising the applicability of various doctrines of legal liability.[129] Should an accident such as that described take place, at least during the earlier years of atomic industry, there can be little doubt that strict liability will be imposed upon the reactor operator. He must protect himself by appropriate insurance coverage.

(2) *A contained power reactor accident.* The above-stated case is an extreme. Let us assume that, instead of the foregoing extensive disper-

[129] For a full scale study of this problem, see Gomberg, Bassett, & Velez, "Report on the Possible Effects on the Surrounding Population of an Assumed Release of Fission Products into the Atmosphere from a 300-Megawatt Nuclear Reactor Located at Lagoon Beach, Michigan," published by Engineering Research Institute, University of Michigan, July 1957, 2506-1-F. Also see the so-called "Brookhaven Study," officially and lengthily entitled "Theoretical Possibilities and Consequences of Major Accidents in Larger Nuclear Power Plants—A Study of Possible Consequences if Certain Assumed Accidents Theoretically Possible but Highly Improbable were to Occur in Large Nuclear Power Plants," written by a team of Brookhaven staff members with Kenneth W. Downes as Project Director, March 1957.

sion of radioactive products, we have the massive large scale reactor meltdown but the gaseous fission products are retained within the reactor containment vessel—a structure that has become an essential feature of reactor design. The only leakage is relatively minor, consisting perhaps of gamma radiation penetrating the walls of the containment vessel which may affect persons within a narrow radius, or possibly leakage through the foundations or otherwise which result in some contamination of underground waters, which in turn affects wells in the vicinity and possibly water supply sources of larger communities. This may be referred to as a partially contained accident, and the question arises as to whether or not the fact of more or less successful containment should affect the principles of liability. One can only speculate on the answer, but in view of the decided cases and the general trend of thought of the present day, the fact that a critical mass of fissionable material has been brought by the operator to the premises would doubtless result in the imposition of strict liability.

(3) *An accident involving a small privately owned research reactor.* Consider the possibility of the small research reactor with a thermal capacity of perhaps one or two megawatts "running away" and distributing a limited amount of radioactive substance over a limited area, compelling evacuation of farmers and others in the vicinity, and contaminating agricultural products and farm animals within a relatively limited radius. Such a reactor might be owned by an industrial organization which utilizes it for research purposes, or it might possibly be owned by a university or a research institute. Again, legal liability principles come up for consideration. Is the same principle of strict liability to be applied as to the large power reactor with its more lethal potentialities? The law has not, in evolving its strict liability doctrines differentiated on the ground of size.

(4) *An atomic fuel-reprocessing plant radioactivity accident.* Consider the possibility of an accident taking place in a fuel-reprocessing plant, with the result that radioactive fission products escape by some means other than an uncontrolled chain reaction, either into the air or into adjacent water supply, thus causing damage to nearby persons or property or both. The damage might be no more extensive than that which would result from the escape of chemicals as a part of an accident in a chemical plant. However, it would involve radioactive substances in a plant containing critical quantities of fissionable materials, and for this reason alone it may subject the operator to a strict rule of civil liability. Yet the fact that no chain reaction is involved means that the potentiali-

ties are less severe, and this fact affords a significant distinction that could well affect the legal result. Should it do so? The available case law is inconclusive.

(5) *An atomic fuel-processing plant non-radioactivity accident.* Consider the possibility of an atomic fuel-processing plant having an accident involving the explosion of zirconium oxide or some other material connected with the atomic industry but not of itself fissionable or radioactive. Such accidents have taken place; for example, at the Sylvania Products Company plant on Long Island and at Oak Ridge, Tennessee. Employees may be injured, and we may assume also that minor elements of damage may be inflicted upon surrounding property as a result of the force of the explosion. Such an event would be comparable to and not significantly different from an accident in any industrial installation where explosive materials are kept on hand as a part of the process. Should the principles of legal liability be different simply because the accident is connected with atomic energy? It would seem otherwise.

(6) *An accident in a radiation laboratory connected with an industrial plant.* Let us suppose that a chemical plant maintains for developmental purposes an experimental radiation laboratory in which it carries on various types of testing and experimentation with radioisotopes or possibly with high level radiation sources, all in an endeavor to find new ways of making articles useful to mankind. Let us assume that by accident some of the radioactive isotopes are discharged into the sewage system and thence to the river or lake water supply or possibly into a sewage treatment plant. Damage to individuals or possibly to farm animals can ensue if these radioactive elements become incorporated in a drinking water supply or fish life or vegetation. What will be the theories of liability to be imposed in such instance? Should they be different from those applicable to a chlorine plant? Should the fact that radioactive substances are permitted to escape result in the same strict liability as that applied to the reactor in which a chain reaction takes place? The available case law does not afford the answer.

(7) *An escape of radioactivity from a waste disposal plant.* Consider the legal status of an operator who is licensed by the Atomic Energy Commission to carry on activities which involve the disposition of radioactive waste products. Presumably either the terms of the license or general Commission rules will include appropriate specifications for operation which will cover matters of health and safety, including the maximum concentrations of radioactivity that may be dispersed into

air, water, sewers, etc. Suppose the licensed operator proceeds in accordance with the specifications without exceeding prescribed limits, but nevertheless damage ensues (a) if radioactivity is deposited on land, by pollution of air or underground waters, or, (b) if deposited at sea, by pollution of fisheries, or (c) if discharged in diluted form into a sewage system, by eventual damage to fish, animal, or vegetable life. Will the fact that the operator under such circumstances has proceeded in accordance with specifications of the Atomic Energy Commission license preclude his being liable, or, at least, to strict liability? Or consider another possibility, namely, that the operator has accidentally or negligently permitted the release of radioactive substances and in so doing he has failed to act in accordance with the specifications in his license. Will he then become *per se* liable and if so, shall it be on the basis of strict liability or merely for negligence? Discussion in the next section will throw some light on these questions, but the answers are far from crystal clear.

(8) *An accident in food or drug irradiation plant.* Consider the possible liability of an operator of a food or drug irradiation plant, who by reason of accident over-irradiates the articles involved, thus causing unexpected changes in the irradiated products and damage to persons or animals who consume the products. What is to be the nature and measure of the operator's liability under such circumstances? Under American decisions he probably will be deemed an insurer since the end products are intended for human consumption.

(9) *An accident involving an industrial user of radioactive isotopes.* Suppose an industry makes use of radioisotopes for thickness gages, or for tracers in connection with wear testing, or in the form of a cobalt 60 gamma ray source to be used in radiography. Assume that certain of these radioactive substances, through accident, are removed from their protective shielding and get into contact with persons or property either on the plant site or possibly off-site as a result of transmission through the air, water, or otherwise. Again we must ask ourselves whether or not the operator is to be held liable on the theory of negligence or on the basis of a doctrine of strict liability. Since no chain reaction is involved, it is not unreasonable to argue that the same rules of negligence should be applied as would be used if the incident had involved chemicals of a less hazardous nature.

(10) *An accident involving medical uses of radioactive substances.* Suppose a doctor of medicine is engaged in operating a teletherapy unit on a cancer patient, or is using a radioactive tracer to locate the seat of a malignancy, or administers a radioactive substance to be taken internally

for therapeutic purposes. Assume an overdose or overexposure, due to accident. Is the medical operator to be held strictly liable if it can be proved that the injury to the patient bears a causal relation to the exposure to radiation? Or is he to be held liable merely for negligence as seems to be the case in connection with the X-ray operators? Both reason and precedent would indicate that only the principles of negligence should be applied, but can this conclusion be reconciled with the strict liability cases?

(11) *An accident involving transportation of radioactive substances.* Radioactive substances will be transported throughout the country by bus, truck, rail, and airplane. They may also be transported across the ocean by surface vessel. Suppose the truck overturns, or the train is in an accident, or the airplane crashes, or the vessel sinks in the harbor. The radioactive substances may be either relatively inoffensive tracers, or they may be high energy cobalt, or they may be even more dangerous objects, such as irradiated fuel elements that have been taken from a power reactor and are being returned to a processing plant for separation of the unexpended fuel from the fission products. Are all of these operations to be treated alike so far as legal liability is concerned? Or is strict liability to be applied in certain instances and not in others? Unless normal principles of liability of those who operate transportation facilities are applied, law suits for such accidents will become decidedly complex. Again, current case law fails to afford the answers.

4. Conclusions Concerning Types of Accidents and Injuries

The foregoing hypothetical possibilities might be multiplied many times over, and doubtless some of them will materialize in the form of actual incidents as the atomic age becomes a reality. However, the types of situations exemplified by the recapitulation of the accidents that have already taken place, together with the dozen or so hypothetical suggestions, present sufficiently well the kinds of fact situations with which the law must now concern itself.

Let us now proceed to take a broadly perspective view of the entire range of possibilities of injury from overexposure to radiation.

First of all, we note the wide range of possible incidence of overexposure, *i.e.,* from injuries to many persons and much property, both on-site and off-site, to very minor affairs, involving possibly the pollution of a single well or a slight overexposure to gamma radiation of one or two persons. Second, we note that the damages may extend in intensity throughout a wide range—from death and widespread devasta-

tion of property, to trivial injuries of no real consequence. Third, we note that the undertakings causing the injuries may vary from activities of fairly serious potentialities to rather commonplace, routine, and relatively non-hazardous affairs; the meltdown of a reactor illustrating the former, the use of a radioactive isotope for industrial wear test representing the latter. Fourth, we note that in the nature of things the locations in which the activity will be carried on will range all the way from unpopulated deserts to great population centers in industrial areas, —from Frenchman's Flat, Nevada, to New York City. Finally, we note that the utilization of atomic energy in its peaceful applications will range all the way from well-established, long-tried, and generally accepted operations that eventually become quite conventional, to new and unusual applications of an experimental but promising nature, well worthy of trial, but not yet fully accepted as a safe and normal procedure.

In short, in thinking about the problem of the nature of civil liability for radiation overexposure we cannot think of a single, simple operation or activity. This would be unwarranted oversimplification. There is instead a vast spectrum of possibilities, of coverage, of damage, of hazards, of locus, and of uniqueness. Nevertheless, sooner or later we must come to grips with the problem as to whether or not and to what extent we must accept and apply the doctrine of strict liability or its equivalents, or, in the alternative, be satisfied with an application to any or all atomic injuries of the more widely accepted doctrines of negligence. Can we properly say that the same rule of legal liability should be applied throughout all of the spectra? This would be both unrealistic, unwise, and unnecessary.

In turning to our attempt to reach solutions of these problems we shall take into account both the foregoing spectra of possibilities and also the fact that to date, at least, the atomic energy business has been extraordinarily successful in minimizing the overexposure of persons or property. In the final section of this chapter we shall assemble our conclusions based upon the decided cases, the general trend of the times, and the nature of the fact situations likely to arise. Before reaching this point, however, we must give consideration to various statutory enactments that bear on the problem and that suggest some helpful ideas.

J. Statutory Provisions Affecting Strict Liability

With the chaos of case law, and the great variety of possibilities as to radiation accidents laid before us, we can now give consideration to

possible statutory means of bringing some measure of order out of the juristic confusion facing operators in the atomic field. We shall first examine certain statutory provisions which may, to a greater or lesser extent, immunize defendants from strict liability. Thereafter, we shall consider certain other statutory possibilities which serve to extend strict liability, incorporating appropriate exceptions and limitations, and introducing helpful statutory clarification of the applicable rules.

1. Statutory Immunization from Strict Liability

At this point we are confronted with a question of policy. In view of social trends is there any justification whatsoever for considering the possible immunization of atomic activity in whole or in part from the non-intentional and non-negligent accidents which are certain to take place?

Recognizing that it is desirable to encourage and promote the development of atomic enterprise, should this be done by holding it within the limits of liability for negligence only, and thereby minimizing the costs —doing this, however, at the expense of persons who may, without fault of their own, be damaged by overexposure to radiation. All members of society must pay a price in the form of inconvenience or even assumption of loss for the privilege of living in an improved society. If accretion to general welfare will be sufficiently accelerated by relief from strict liability, then it is possible that society should pay the price in the form of individual assumption of the risks and burdens. On the other hand, there are those who argue for the proposition that industry should pay its own way by being subject to strict liability excepting, perhaps, for catastrophic disasters, in which event the government should step in with indemnity from the public treasury. The trend of present day thinking is, as we shall see, toward the latter alternative. It is socially more acceptable, and accordingly we shall not find much current emphasis on statutory immunization.

a. Statutory Franchises, Licenses, or Privileges and Their Effect

There is some authority, mostly in the form of early court decisions, for the proposition that activity which would otherwise entail strict liability may be privileged because conducted under statutory authority, or because it involves the performance of a public duty, to the extent of relieving that activity from the burden of responding to strict liability, holding it, however, within the conventional standards of the doctrines

of negligence. This proposition has been most frequently applied to transportation facilities and public utilities which, although they may in fact constitute dangerous activities, are, nevertheless, highly valued for their social utility and, by virtue of their franchises, licenses, or privileges, are given a special place by the governing authority of the state as an essential part of the economy. The rationale seems to be that statutory authorization and regulation amount to a government declaration that the activities concerned are sufficiently necessary to the public welfare to justify immunity from strict liability. There is also to be found in the cases the suggestion that such functions are compulsory and are quasi-governmental in nature and should therefore share the ancient sovereign immunity to the extent of relief from liability without fault. In view of the necessity of obtaining licenses for the conduct of atomic activities, this theory has an obvious possible application to atomic industry.

A brief examination of some of the pertinent decisions will show more precisely the limits of this doctrine. In reviewing the cases it should be remembered that, although immunity from strict liability may perhaps be conferred, a result almost the equivalent of strict liability may be reached through the application of the doctrine of *res ipsa loquitur,* or by an elevation of the standards of care to which the industry is subjected. Therefore, the change may be of but little significance.

In an early English case, *Price* v. *South Metropolitan Gas Co.,*[130] the plaintiff was injured by an explosion of the defendant public utility's gas line. The court of the Queen's Bench refused to apply strict liability, saying:

> It is clear, too, that where a gas company such as this, having statutory authority to lay pipes, does so in exercise of its statutory powers, the . . . [rule of] *Fletcher* v. *Rylands* is inapplicable.[131]

In an early American case, *Actiesselskabet Ingrid* v. *Central Railroad of New Jersey*[132] the court voiced a somewhat different reason for a similar immunity. The action was based upon a theory of strict liability, the complainant demanding compensation for injuries inflicted upon him by the explosion of a quantity of dynamite then in transit on the defendant's railroad. The court held that, since the defendant was a

[130] 65 L.J.Q.B. 126 (1895).
[131] *Id.* at 127.
[132] 216 F. 72 (1914).

common carrier, it was obliged by law to transport explosives as well as other commodities, and, this being so, it would be unduly harsh to impose the additional burden of an insurer's liability.

The type of statutory authorization deemed to immunize a quasi-public enterprise from strict liability was defined in *Cogswell* v. *New York, New Haven, & Hartford Railroad Co.*[133] In that case the court made the following statement:

> But the statutory sanction which will justify an injury to private property, must be express, or must be given by clear and unquestionable implication from the powers expressly conferred, so that it can be fairly said that the legislature contemplated the doing of the very act which occasioned the injury. This is but an application of the reasonable rule that statutes in derogation of private rights, or which may result in imposing burdens upon private property, must be strictly construed. For it cannot be presumed, from a general grant of authority, that the legislature intended to authorize acts to the injury of third persons, where no compensation is provided, except upon condition of obtaining their consent.[134]

Occasionally the question has arisen as to whether or not such statutory privilege will serve to immunize the operator so that he may conduct a nuisance adversely affecting the lawful utilization of neighboring property. On this point a distinction must seemingly be drawn between the right of the aggrieved person to obtain an injunction to prevent the continuance of the alleged nuisance, and his right to obtain a judgment for damages to the extent he has suffered loss. There are several cases in which it has been held that the aggrieved party cannot enjoin a licensed activity.

For example, in *Strachan* v. *Beacon Oil Co.*[135] an attempt was made to enjoin the defendant from maintaining and operating his business of refining and distributing petroleum. The defendant had invested many millions of dollars in his plant and many more millions were invested in tank steamers and other materials used in his business. The site of the plant was well fitted for the conduct of such a business. A permit for the building of the refinery and its operations had been duly issued by the proper authorities to the defendant, and it was found that there was no failure on the part of the defendant to comply with the statutes and regulations, as well as the conditions of his license. The court found

[133] 103 N.Y. 10 (1886).
[134] *Id.* at 21.
[135] 251 Mass. 479, 146 N.E. 787 (1925).

that, although the normal conduct of the business resulted in more or less pollution of the air, nevertheless, on balance, these acts did not constitute a nuisance in view of all of the circumstances. But the court also addressed itself to the question of the effect of the licenses held by the defendant. Said the court:

> The question remains whether the defendant has conducted its business in conformity with the licenses granted to it. It is settled that under statutes similar to those under which the defendant was granted the licenses, if the licensee has complied in all respects with the terms, what he does thereunder cannot be considered a nuisance or be restrained, even if without such licenses the acts done would be a nuisance.[136]

The court cited many cases in support of its conclusion as thus stated and dismissed the bill.

However, so far as damages are concerned two leading cases decided by the United States Supreme Court throw light on certain constitutional aspects of this question of statutory immunity. The cases are *Baltimore & Potomac Railroad Co.* v. *Fifth Baptist Church*[137] and *Richards* v. *Washington Terminal Co.*[138] In the latter case it was claimed by the plaintiff that his property had been damaged by large quantities of dense black smoke and dust, together with dirt, cinders, and gases, emitted from trains while passing in and out of a tunnel in the District of Columbia. A fan system caused all such gases to be forced out of the south portal of the tunnel and the plaintiff's nearby property was especially damaged thereby.

The Court held that in view of the act of Congress which authorized the establishing of the railroad and specifying its location within the District, the activity could not be deemed a public nuisance. Nevertheless, said the Court, the acts referred to, if done without legislative sanction, would form the subject of an action by the plaintiff to recover damages as for private nuisance, and, with respect to this element, the provisions of the Fifth Amendment to the Constitution are applicable to the effect that private property shall not be taken for public use without just compensation. The Court said:

> We deem the true rule, under the Fifth Amendment, as under state constitutions containing a similar prohibition, to be that while the legislature may legalize what otherwise would be a public nuisance, it may not confer immunity from action for a

[136] *Id.* at 487.
[137] 108 U.S. 317, 2 S.Ct. 719 (1883).
[138] *Supra* note 78

> private nuisance of such a character as to amount in effect to a taking of private property for public use.[139]

Accordingly, it was held that, although the railroad duly licensed by public authority would not be subject to the issuance of a restraining injunction, an action for damages would be available. As to the extent of recoverable damages, the Court held that there would be a limited immunity with respect to those damages that naturally and unavoidably result from the proper conduct of a railroad, such as are shared generally by property owners whose lands lie within the range of the inconveniences necessarily incident to proximity thereto. This would include ordinary noises, vibrations, and the necessary emission of smoke and sparks from locomotives. The Court pointed out that this limited immunity from liability for incidental injuries, although it is attended by a considerable degree of hardship to the private landowner, nevertheless is a necessity unless the company is to be made liable for damages for these minor items in which case the practical result would be to bring the operation of the railroad to a standstill. But this principle, held the Court, does not carry to the point of construing the act of Congress in the light of the Fifth Amendment to authorize the imposition of a special, direct, peculiar, and substantial burden upon the plaintiff's property without compensation to him. Accordingly, the defendant was held subject to liability for damages suffered by the plaintiff over and above those incidental inconveniences suffered by all who live nearby a railroad right of way. In short the statutory privilege precludes the injunction and the payment of damages for incidental inconveniences, but the Constitution prevents closing the door to damages for special and severe losses. This principle would clearly be applicable to licensees of the Atomic Energy Commission.

We may conclude from the foregoing that, although there is some possibility in view of the case history of a limited immunity deriving from statutory privileges, such immunity has not been particularly significant in the more recent evolution of the law, and it is unlikely to play an important part in atomic activity except perhaps to preclude the use of the injunction against Atomic Energy Commission licensees.

b. Statutory Limits on Maximum Liability

Statutory limits upon the recoverable damages seem destined to be a significant feature of atomic liability legislation, not only in the United States but in other countries as well. We have long been used to the

[139] *Id.* at 553.

imposition of such limits in workmen's compensation legislation where fixed dollar limits serve to offset the broader liability coverage. As to atomic energy in the Anderson-Price Act, adopted in 1957, amending the United States Atomic Energy Act, it is provided that the liability of a licensee shall not exceed the amount of insurance coverage prescribed in his license (not to exceed the approximately $60,000,000 available in the insurance market) plus the government indemnity that covers amounts in excess of the insurance up to $500,000,000.

In other countries, similar liability limits are under consideration. In England, a limit of £5,000,000 for any one accident may be adopted; in West Germany the figure is DM 15,000,000; in Switzerland, Sw fr 30,000,000. Some form of government indemnity in excess of those sums is also under consideration in Germany and Switzerland. Accordingly, it may be concluded that atomic industry, although it may be subjected to strict liability in connection with its more hazardous activities, will have the benefit of definite monetary limits on such liability, probably also supported by governmental indemnity. Such limits will permit insurance companies to enter the field with assurance of manageable losses, and operators will be enabled to protect themselves by covering predictable maximum risks by insurance. Such provisions serve to promote the development of a new and useful field of activity, and we may conclude that they stand a good chance of becoming universally a part of the pattern of atomic legislation for the future.

c. The Federal Tort Claims Act

The Federal Tort Claims Act [140] provides a major exception to the rule of sovereign immunity from private legal action. The government is made liable for certain of its torts. It is interesting to note, however, that courts are in effect establishing an "exception to the exception" to the effect that in no case shall the government be held subject to strict liability while in the execution of certain of its public duties. It is this feature that interests us especially in connection with atomic energy liability.

The Tort Liability Act permits an injured party to sue the United States government for a tort claim brought because of harm caused by activities that would otherwise enjoy sovereign immunity on account of their governmental character. However, an important limitation is embodied in Section 2680 which prevents action being brought upon

[140] 28 U.S.C.A. §§1346, 1402, 1504, 2110, 2401, 2402, 2411, 2512, 2671-80 (1952 Supp.).

claims for harm caused by "discretionary acts" of government officials. Then there is another limitation which does not expressly appear in the act but is implied by the federal courts. It is that the government cannot be found liable without fault in connection with harm caused by legitimate pursuit of activities of a purely governmental character. This is in interesting contrast to the British policy under Section 5(3) of the United Kingdom Atomic Energy Authority Act which provides for strict liability without limit.

The most dramatic case that has arisen up to the present time under the act is *Dalehite* v. *United States*.[141] This case involved an action for both personal injuries and property damage caused by an explosion of a shipload of ammonium nitrate while in transit to Europe to be used as fertilizer.[142] The fertilizer was produced from surplus military explosives and was being sent to the Continent as a part of the government's plan to aid European agricultural development. Action was brought under Section 1346 (b) and Section 2680 of the Federal Tort Claims Act and was based upon negligence. The Court denied recovery on the ground that, even if the accident had been caused by negligence of government personnel, the government could, nevertheless, claim immunity under the "discretionary exemption" provision of Section 2680.

It is in a dictum, however, that the item of especial interest in connection with this examination of the doctrine of strict liability is to be found. The court, interpreting Section 1346(b), stated that the government could not be held to liability without fault in an action prosecuted under the Tort Claims Act. This aspect of the opinion is particularly applicable to the government owned nuclear industry, since, in the event of a reactor burn-up, evidence of negligence would be most difficult to come by and much of it would doubtless be obliterated in the accident. Hence strict liability would be the only recourse.

The court's dictum that the government was not to be held liable without fault uder the Federal Tort Claims Act was actually followed in a later case, *Bartholomae Corp.* v. *United States*.[143] In that case action was brought against the government for damages to the plaintiff's building caused by shock waves produced by atomic weapons that were being

[141] *Supra* note 127.

[142] The ship was in the harbor at Texas City when the explosion occurred, so the mishap is now known as the "Texas City disaster." The incident is somewhat like a possible though unlikely major reactor disaster because of the enormous amount of damage involved. A large area of Texas City was laid waste by the explosion and some 300 claims were filed totaling approximately $200,000,000 dollars.

[143] 135 F. Supp. 651 (1955).

tested on the government's proving grounds at Los Alamos, New Mexico. The plaintiff's buildings were about 150 miles away from the scene of the testing. In an action under the Federal Tort Claims Act, one of the four counts was based on a claim of absolute liability. The court denied recovery on that count, saying:

> There is an additional reason why there can be no recovery on count three which is founded on a theory of absolute liability without fault where the government is engaged in an ultra-hazardous activity. In Dalehite v. United States, supra, the court stated that liability under the Tort Claims Act does not arise by virtue of the United States engaging in an extra-hazardous activity and that it is to be invoked only on a negligent or wrongful act or omission of an employee.[144]

The Tort Claims Act thus limits recovery to actions based upon negligence. By implication strict liability has no place in actions against the government. In effect the government claims the immunity that its licensees or franchise holders might conceivably derive under the theory of the utility cases heretofore referred to in this chapter.

2. Statutory Extension of Strict Liability

As we have indicated hitherto, the trend in judicial decisions is in the direction of extending strict liability rather than limiting it. We shall find that, in line with general social policies of the day, the same is true in the field of statute law, which we now proceed to examine.

a. Illustrations of Legislation in the United States Imposing Strict Liability

Strict liability is no novelty in contemporary legislation. The example which comes first to mind is the workmen's compensation legislation, almost universally enacted in this country. Under such legislation the burden of industrial accidents is placed upon the employer if injuries "arise out of and occur in the course of the employment." Negligence is not a factor. Strict liability for occupational diseases of many different kinds is also imposed. Such legislation is based upon a desire to provide summary relief for injured employees, and also to place the burden of industrial accidents upon the employer who is in the better economic position to bear the burden or shift it to the public.

Another kind of strict liability legislation is exemplified by the Federal Safety Appliance Act which requires interstate railroads to install pre-

[144] *Id.* at 654.

scribed safety devices, making the railroads subject to absolute liability for injuries caused by any deficiency in complying with the terms of the statutes or regulations. Again, we find many of the Pure Food and Drug Acts making the manufacturer or the seller of defective food or drugs absolutely liable to the injured consumer, without regard to questions of negligence or reasonable care.

In the field of aeronautics a dozen states have adopted a rule of absolute liability for "ground damage" through statutory enactment of the Uniform Aeronautics Act, promulgated in 1922 by the National Conference of Commissioners on Uniform State Laws. Several other states have adopted limited versions of the Uniform Act. Still other states, influenced no doubt by the safety records and the wide extent of use of civil aviation, have leaned more recently toward a negligence rule, and at least two states, namely Pennsylvania and Idaho, have adopted laws affirmatively applying ordinary rules of negligence to aviation accidents. Three other states, Georgia, Nevada, and Maryland, have adopted a presumption of negligence rule, but stop short of absolute liability.[145]

b. Illustrations from Other Countries of Statutory Extensions of Strict Liability

Turning to other countries for further illustrations, Sweden, as long ago as 1902, adopted an act imposing strict liability upon operators of electric installations. In principle this act prescribes absolute liability for the operator for all damage occasioned by electricity flowing from the plant. The act, however, establishes certain exemptions from liability. Exempted are damages resulting from acts of God, or major external force, those resulting from the negligence of the injured party by infringing regulations or otherwise, those caused by installations operating with an electric potential of less than 150 volts, and those that result from facilities that are completely fenced in or placed underground. In short, Sweden has long since concluded that its social structure demands widespread, strict liability for the electric power industry utilizing its special kind of dangerous facility.

Germany likewise has entered the field with its Federal Law on Liability. Article 1 of this law imposes absolute liability upon operators of railroads. They can exempt themselves only by proving that the accident arose because of an act of God, or major external force, or because

[145] For statutory citations, see Eubank, "Land Damage Liability in Aircraft Cases," 57 Dickinson L. Rev. 188 (1953).

of the fault of the injured person. Article 1(a) of the German law deals with electric companies, providing that such companies also are to be held strictly liable if personal injury or property damage is caused by their activities. Again, strict liability is made subject to exceptions for acts of God, major external force, or fault on the part of the damaged person.[146]

These brief references to Swedish and German laws illustrate the fact that in other highly developed legal systems, social regard for the injured party has resulted in legislative measures to assure the payment of damages regardless of proof of negligence.

c. Atomic Energy Acts and Proposed Acts Establishing Strict Liability for Atomic Activities

We may most assuredly anticipate that in the atomic field we shall find legislatures moving in the direction of establishing strict liability by statute. Such legislation in effect will be forced by the completely unsatisfactory state of the common law on the subject; the confusion of *Rylands* v. *Fletcher,* the Restatement, and nuisance doctrines leaves too much to be desired.

In England, the country of origin of *Rylands* v. *Fletcher,* the most positive and sweeping legislation along this line has been placed in effect. The Parliament of the United Kingdom in adopting its Atomic Energy Authority Act of 1954 made the Atomic Energy Authority absolutely liable for all radiation injuries both from reactor operations, and also from all other nuclear activities, by providing in Section 5(3) of the Act as follows:

> It shall be the duty of the Authority to secure that no ionising radiations from anything on any premises occupied by them, or from any waste discharged (in whatever form) on or from any premises occupied by them, cause any hurt to any person or any damage to any property, whether he or it is on any such premises or elsewhere.

This section places the English Atomic Energy Authority under an absolute duty which permits of no exceptions whatsoever, even for acts of God, except that possibly the Authority can plead a counter-claim to

[146] See Gesetz betr. die Verbundlichkeit zum Schadenersatz für die bei dem Betriebe von Eisenbahnen, Bergwerken usiv. herbeigeführten Tötungen und Körperverletzungen (Reichshaftpflichtgesetz) vom 7. Juni 1871 (R.G. Bl. 207) §1 and §1a. Also see Gesetz über die Haftpflicht der Eisenbahnen und Strassenbahnen für Sachschaden vom 29. April 1940 (R.G. Bl. I 691) in der Fassung des Gesetzes vom 16. Juli 1957 (B.G. Bl. I 710), §1.

any action brought by a person who by his own negligence or willful act causes or contributes to the escape of radioactivity. Moreover, the act covers all kinds of radioactivity, both that resulting from chain reactions and that from less dangerous sources. Thus, the Authority in Britain is under an exceptionally broad duty to see that their reactors and all other atomic activities are proof against acts of God, falling airplanes, and mishandling by strangers, as well as the vicissitudes of normal operational activity. Finally, the Authority's liability is without financial limit.[147]

It should be noted, however, that Section 5(3) applies only to the Atomic Energy Authority, namely the British government agency. It does not apply to private industry. At the present time such industry is not actively engaged in England in reactor operation but it doubtless will be so engaged in the near future; and if an accident takes place, the doctrine of *Rylands* v. *Fletcher* would then be controlling, unless in the meantime legislation is enacted.

But Parliament is about to act. On February 10, 1958, the British government announced its intention to introduce legislation providing for the licensing and inspection of all privately owned atomic energy operations, announcing, further, that all such private owners would be subject to the same duty as that of the Atomic Energy Authority with respect to the prevention of damage and the obligation to make recompense for personal injury or property damage occasioned by their operations. In other words, the British do not seem to feel that *Rylands* v. *Fletcher* is adequate for atomic energy purposes, and they intend to provide a very comprehensive strict liability measure covering atomic operations, government, private, and otherwise. There is some uncertainty as to whether or not the act to be applied to private industry would require strict liability for escaping radioisotopes as distinguished from chain reactions. A high government official has indicated that he does not believe the act in its final form will be quite so drastic. In any case this proposed measure represents the current thinking in the land of origin of the common law—one of the principal competitors for the world's atomic business in the future.

In Germany also the matter of liability for atomic injuries has recently received extensive and intensive consideration. As early as 1955

[147] See discussion by C. J. Highton, General Counsel for the U.K. Authority, in a paper entitled "International Problems of Tort Liability and Financial Protection Arising Out of the Use of Atomic Energy—Law Relating to Atomic Operations in Great Britain" presented to the International Bar Association Convention, Cologne, Germany, July 21, 1958.

German lawyers and insurance experts were studying the liability problems likely to arise from peaceful uses of atomic energy. As a result of these deliberations a draft of a Federal Atomic Energy Act was prepared. In 1957 this draft was ready for adoption, but because of political obstacles final action was deferred. In the meantime several of the West German Länder having research reactors operating or under construction have felt the need for enacting provisional laws on the subject. In January, 1958, Land Nordrhein-Westfalen adopted a measure that included a brief interim treatment of civil liability and insurance coverage therefor and other somewhat similar measures have been adopted in Bavaria, the City of Berlin, the City of Bremen, the City of Hamburg, Hesse, Schleswig-Holstein, and Württemberg-Baden.

The 1957 German draft bill as proposed by the government of the Federal Republic of West Germany contains an exceptionally thoughtful treatment of the question of liability, and it will be worth while to summarize these provisions.[148] They may become useful in connection with the formulation of American legislation. The principal articles of Part IV on Liability for Injuries are in substance as follows:

> *Article 21.* (1) Should any person suffer death, bodily injury or any deterioration in health or should property sustain damage owing to the effect of a nuclear fission process or of radiation from a radioactive substance emitted from an installation within the meaning of article 7 (installations for the production or fission of fissile materials or for the processing of irradiated fissile materials) or from equipment forming part of such installation or from any operation, including the disposal of waste, the owner of the installation shall be required to pay compensation for such damage in accordance with the provisions of articles 23 to 31. Liability for compensation shall not arise where the damage is caused by act of God.
>
> (2) Where the use of property has been impaired by the effects of radiation from a radioactive substance, this shall be deemed to be damage to property for the purpose of the regulations under this Part.

Note that this provision does not spell out strict liability for *all* radioactivity from reactor plants, but merely from the reactor itself and the disposition of waste products. If there should be other radioactive substances involved, the question of liability would fall under Article 22.

[148] The original draft of this measure was submitted to the Bundestag in a report dated May 9, 1957, (Paper 3502) as a result of the deliberations of the 38th Parliamentary Commission on Atomic Questions. A revised version, translated into English by Centre D'Etudes de la Commission Permanente du Risque Atomique (CERA) can be found in Information Bulletin No. 12, July 1958.

This differentiation in liability between cases falling within Article 21 and those under Article 22 is most important.

> *Article 22.* (1) Should any person suffer death or bodily injury or any deterioration in health or should property sustain damage through the effects of a nuclear fission process or of the radiations from radioactive substances in cases other than those set out in article 21, the possessor of the substance affected by the nuclear fission or the radioactive substance from which the radiation is emitted shall be required to pay compensation for the damage arising therefrom in accordance with articles 23 to 31. Liability shall not arise where the damage is caused by an event which the possessor, his servants or agents cannot avoid, even by taking every precaution possible in the circumstances, and which is due neither to faulty safety arrangements nor to faulty workmanship.

The effect of this rather obscure inversion of language is to provide that there will be no liability if proper care is utilized, but the burden is placed on the defendant to exculpate himself,—a so-called "inversed burden of proof."

It is further provided in Article 22 that the burden will not be reversed if the radioactive material is used by a physician or dentist in medical treatment of the plaintiff, nor will it be reversed if there is a legal relationship between the operator and the plaintiff whereby the latter accepts the risk occasioned by the dangerous material.

Article 23. This article deals with the so-called "contributory responsibility" of the injured. It is provided here that, if damage is caused by his "cooperative fault," another provision of the German Civil Code shall be applied, prorating the damages according to the respective faults—an adaptation of a "comparative negligence" theory.

Article 24. This article provides the specific items of damages to be compensated. They include medical treatment, loss of earnings, funeral expenses in case of death, and maintenance costs of legal dependents, but no provision is made for pain and suffering. This subject needs careful treatment in any such statute.

Article 27. This article deals with limits upon the liability. In case of death a maximum of DM100,000, or in case of injury a yearly payment of not to exceed DM6,000 is provided. The total amount to be paid by the operator or his insurance carrier for any one accident shall not exceed DM15,000,000, except in case of negligence for which there is no limit.

Article 28. The statutes of limitations are revised. All claims under the act continue alive for two years after the time the injured person

obtains knowledge of the damage done and the person liable, but not more than thirty years from the time when the overexposure took place.

Article 29. This article deals with forfeiture and provides that the person entitled to the compensation will lose his right under the law if he does not furnish the liable person with notice of the damage within three months after becoming conscious of his injury. This "notice of damage" must be followed by bringing the suit within two years as provided by Article 28.

It is contemplated that the foregoing provisions will be supplemented by another federal enactment, somewhat like the United States Anderson-Price Act, requiring insurance and providing indemnity by the government to the extent of DM500,000,000 over the amounts of private liability stipulated in Article 27.[149]

The foregoing provisions illustrate the very thorough current thinking in the West German Republic with respect to statutory extension of liability for overexposure to radioactivity.

A somewhat similar measure is being currently drafted in Switzerland. In fact, a second draft of this measure was completed by the commission charged with the task on May 6, 1958, and is now ready for submission to the Swiss Parliament. This draft also provides for absolute liability for injuries caused by those who engage in "nuclear processes," a term which is defined to be the substantial equivalent of "nuclear criticality," *i.e.,* processes involving chain reactions. It should be observed that on this point the Swiss draft is the reasonable equivalent of that of West Germany. In short, absolute liability is to be limited in both countries to the chain reaction process and its necessary radioactive auxiliaries. It will not include other radioactive substances which are therefore left to the ordinary principles of negligence.

Moreover, the Swiss draft excludes damages resulting from acts of God, earthquakes, events of war, or grave faults of the injured person. Neither the German nor the Swiss draft exempts from strict liability any accidents resulting from the activities of third persons. The Swiss draft, like the German draft, limits the amount of liability per accident, the Swiss figure being Sw fr 30,000,000, which is the maximum amount of insurance coverage available in the Swiss Insurance Pool. Under Swiss policies a deduction will be made from the face value of the policy for any amounts paid out or incurred for prior accidents during the policy period. Accordingly, the Swiss draft provides that when the remaining

[149] For a complete discussion of the proposed West German law, see a paper entitled "International Problems of Tort Liability and Financial Protection Arising Out of the Use of Atomic Energy" presented on July 21, 1958, by Dr. H Fischerhof to the International Bar Association at Cologne, Germany.

maximum liability is reduced by one-tenth or more, the insured must seek additional coverage to meet the deficiency.

The Swiss draft includes a statute of limitations of only ten years from the date of the accident, but provision is made for a "delayed damages" fund to cover cases that turn up after the expiration of the statutory period. This fund, which would be administered by the State, would be accumulated by contributions required of all operators in the form of a supplementary payment of an amount not to exceed one-third of the insurance premium.

We may anticipate that these German and Swiss bills will become law in substantially the form stated within the next year or two. Moreover, they are likely to set a pattern for legislation in other countries of Western Europe and perhaps for other parts of the world. They have value to the United States as precedents. First, they confirm, so to speak, the wisdom of the Anderson-Price Amendment by imposing similar requirements, *i.e.,* by requiring insurance, providing government indemnity, and limiting maximum liability; and second, they point the way toward a solution of the civil liability problem by statutory prescription of absolute liability in its proper field with clearcut definitions and appropriate exceptions. Of especial importance is the segregation of the chain reaction elements, making them subject to strict liability, but leaving other radioactivity subject to normal principles of negligence. This last named feature serves to establish an orderly system in place of the present unsatisfactory state of affairs and should provide a system of redress for injured persons based upon a careful legislative appraisal of the economic and social needs as well as the problems of a new industry. The search for such a wisely conceived statutory solution is the next important step in the law of the atomic age.

K. Conclusions Concerning Strict Liability

We have now sufficiently reviewed both the case law, the statute law, and the facts pertaining to the question of strict liability so that we may formulate some conclusions concerning its proper applicability to atomic activities, drawing together the tentative suggestions heretofore set forth and attempting to express a comprehensive prospectus of this area of the law. With a reasonable degree of assurance we offer the following:

(1) As has already been noted, the judge-made law, particularly that made by American courts, is in a state of confusion, with manifold uncertainties created by the indefiniteness of the standards to be applied. Under *Rylands* v. *Fletcher,* what are "dangerous substances?" What is

a "non-natural use?" Under the American Law Institute Restatement, what is the meaning of "ultra-hazardous?" When does an activity "necessarily involve a risk of serious harm?" What is "common usage?" Under the nuisance doctrine, how shall we evaluate the "balance of convenience" in connection with possible nuisances from atomic activities? All of these vague terms create uncertainties in the case law. The terms cannot be readily applied to users of atomic energy to determine who are included within strict liability and who are not, or what accidents fall within the exceptions and which do not, or what defenses are available in special circumstances. In addition, we find that variances between the views of different courts compound the difficulty. In short, common law processes seem ill-adapted to meet the atomic liability problem.

(2) The facts related to atomic injuries present widely variant patterns. Some radioactive substances are highly dangerous, others not so much so. Some atomic activities are unique or nearly so, others are or soon will be commonplace. Some will be carried on in centers of population, others in remote areas. No single rule can wisely be applied to all of the variants. These diverse facts further complicate the legal scene and bespeak a comprehensive rather than a piecemeal solution.

(3) Notwithstanding an excellent safety record to date, injuries to persons and property are certain to occur in the future in connection with peaceful uses of atomic energy. It is a fast moving technology, too swift, indeed, to be readily accommodated under the relatively deliberate evolutionary processes of the common law. Yet the law must provide a suitable framework for the new industry, both clarifying the duties and obligations of those who take part in it, and providing adequate, speedy, and certain redress for injured persons.

(4) Insurance and indemnity programs sponsored and administered by government are being made available to protect the industry against undue liability, but we have not yet really come to grips with the proper extent and nature of this liability so far as individual cases are concerned. This is an essential next step.

(5) In other leading countries constructive minds are coming to grips with the problem of civil liability by resort to statutory measures, with clearly expressed principles to guide the solution of problems in the field. Some statutes have already been adopted, others are in the drafting stage. It is a field in which the legislative process best serves the public needs.

(6) Certain European proposals are of especial interest by reason of the differentiation established between two classes of radiation accidents

(a) those connected with chain reaction, in which case strict liability is imposed, and (b) those due to other radioactive substances, in which case the usual rules of negligence prevail.

(7) In the United States we must give serious consideration to a similar statutory approach to determining liability for radiation injuries. The trend is towards strict liability, but exceptions must be worked out to achieve justice and avoid discouraging the development of a new and valuable technology. Many phases of nuclear enterprise can properly be fitted into the normal standards of negligence. Others must accept strict liability. The lines of cleavage must be carefully drawn.

(8) In the light of the materials presented in this chapter, we suggest the following principal points as essential to the formulation of a just and sensible law of civil liability for radiation injuries.

(a) Those who engage in atomic activity (including both private and government operations) involving critical quantities of fissionable material, or the disposition of waste fission byproducts therefrom, and those who have in their possession critical quantities of fissionable materials, should be held strictly liable for injuries occasioned by any accidental escape of radioactivity resulting from such operations, if the escape is in excess of the permissible tolerance limits specified by the Atomic Energy Commission or state regulatory bodies. This would include the power reactor "runaway," the EBRI situation, the Chalk River, and Windscale types of accidents, the fuel processing and reprocessing plants, and waste disposal facilities and even the small research reactor accident which some may feel should not be subject to such strict liability.

(b) If in connection with activities included in (a) radioactive effluents escape, not by accident, but necessarily in the ordinary course of operations but in quantities less than the officially prescribed tolerance levels, liability should be based upon principles of negligence only. This will afford reasonable latitude for normal operations without the harassment and expense of constant litigation. For example, the hypothetical escape of radioactivity from a waste disposal plant would be covered by this provision.

(c) Those who engage in atomic activity of kinds other than those included in (a) which involve the irradiation of food, drugs, or other articles for human consumption should likewise be held strictly liable for injuries caused by their products.

(d) Exceptions, if any, from strict liability should be clearly spelled out and defined. Such exceptions should be kept at a minimum, limited

at the most to acts of God, acts of war, and results that flow from the intentional acts of the injured person. The availability or otherwise of defenses in the nature of contributory negligence, assumption of risk, or actions of third parties should also be spelled out and defined. In general, if there is good reason for strict liability, there is an equally good reason for keeping the exceptions and defenses within the narrowest possible bounds.

(e) Those who engage in any atomic activity not included in (a) or (c) above should be held liable for negligence only. This would include radiography, thickness measurement, the use of tracers, medical diagnosis and therapy, and the dozens of other highly valuable applications of radioisotopes. Again, there is a good argument for including in this category small research reactors of conventional types and proved stability. Dividing lines between negligence and strict liability situations would thus be sharply drawn in common-sense way, and all concerned would profit thereby.

(f) Statutes of limitations should be revised to extend substantially the period within which suit may be brought, thus to take account of the fact that the damaging effects of overexposure to radioactivity frequently do not become apparent for many years. A reasonable period, perhaps two years, should be allowed after acquisition of knowledge of the injury and identification of the person liable, with possibly an overall limit of twenty years from the date of the accident. Such a provision would give redress to the victim who after many years develops cancer, cataract, or leukemia.

(g) Statutory provision must be made to deal with the extraordinary problems of evidence and burden of proof that will arise in radiation cases. In negligence cases the proof of negligence will be extremely difficult and it is possible that the only feasible solution will be the "inserved burden of proof" of the German draft. Moreover, it may be necessary to resolve problems of causation by resort to statutory presumptions based upon roentgens of exposure or other available objective data.

* * * * *

A statutory approach to the problem of strict liability utilizing as a framework the foregoing points, and taking advantage of the West German and Swiss thinking on the subject, would minimize litigation, bring prompt justice to injured persons, and, at the same time clarify the law to facilitate the growth of a new type of industry.

Chapter V

ENTERPRISE LIABILITY IN ATOMIC ENERGY

A. Product Liability

1. Introduction

Ascertaining the potential liability of designers, manufacturers, wholesalers, retailers, and suppliers of goods and services in an atomic energy industry is extremely difficult. This is due in part to the fact that the theories of liability are in a state of ferment and in part because there is a confusion between tort and contract law concepts and the application of each in particular fact situations. Out of the confusion, we can draw one conclusion. There is a marked tendency to provide compensation to persons injured by defective chattels or services by the imposition of a type of "enterprise liability," apparently on the assumption that suppliers can shift the economic loss through price increases and by obtaining liability insurance coverage.

The importance of determining the extent of liability under existing legal doctrines is perhaps obvious from the standpoint of obtaining recoveries for persons injured by atomic radiation and also of advising entrepreneurs of desired insurance coverage and of possible measures to limit liability. Nonetheless, a few hypothetical questions may indicate some problems that will have to be dealt with by lawyers in the atomic age. Will or should the designer of a nuclear reactor be liable for injuries caused to persons subjected to radiation outside the facility? Will or should the manufacturer of radioisotopes be liable for injuries caused as a result of leaks in packaging even though a wholesaler or retailer had control over the goods after the manufacturer? Will or should the supplier of a mechanical device used in conjunction with radioactive materials be liable for radiation injuries caused by a defect? Does it make any difference if the supplier had no knowledge that his product was to be so used? What is the effect of failing to warn a purchaser that a radioisotope should not be used for particular purposes? What duty rests on the manufacturer or supplier to know the propensities of his product for causing injury? What liabilities may be imposed as a result of statements made in advertisements? Can the scope of liability for defects be limited by disclaimers and notices? These are only a few of the many questions that must be answered. Some conclusions can be

drawn on the basis of analagous cases involving product liability in other types of endeavor. Therefore, we shall proceed to discuss some of the significant features of the law governing the liability of suppliers of goods and services, emphasizing throughout the landmark and frontier cases and their possible applicability in the light of specific atomic energy fact situations.

2. Negligence

a. Historical Background

Although it is clear today in many jurisdictions that a supplier of chattels is liable for injuries to any person caused by his negligent conduct, this was not the case less than a century ago. The liability of suppliers for injuries caused by defects in chattels was considered to extend only to those who were in privity with the supplier under the contract of sale. Since this evolution in doctrine is of comparatively recent origin and since there continues to be considerable doubt in some jurisdictions as to the applicability of negligence and strict liability doctrines, a discussion of the landmark cases will be helpful in supplying the necessary perspective to deal with the new atomic energy situations.

The rule of law to the effect that the supplier of chattel was not liable to persons not in privity was first announced in the English case of *Winterbottom* v. *Wright*.[1] There the defendant had contracted with the postmaster general to furnish a mail coach and keep it in repair. As a consequence of the defendant's negligent failure to keep the coach in repair, the driver, who was in the employ of another contractor with the postmaster general, was injured. Lack of a contractual relationship between the driver and the defendant was held to preclude liability, because "unless we confine the operation of such contracts as this to the parties who entered into them, the most absurd and outrageous consequences, to which I can see no limit, would ensue." [2] This rule of law protected the supplier from bearing certain burdens, but it failed to provide any redress for the persons injured by the supplier's negligence.

Only ten years after the *Winterbottom* case, the New York court in *Thomas* v. *Winchester* [3] made an exception to the rule of no liability to third parties. In that case the defendant negligently mislabeled, as a harmless medicine, a jar of a poisonous extract of belladonna. The plaintiff had purchased the poison from a physician who had obtained

[1] 10 M. & W. 109, 152 Eng. Rep. 402 (1842).
[2] *Id.* at 114.
[3] 6 N.Y. 397, 57 Am. Dec. 455 (1852).

it from a druggist who in turn had purchased it from the defendant. In allowing the plaintiff to recover, the court distinguished the fact situation from those in which a rule of non-liability prevailed, stating:

> No such imminent danger existed in those cases. In the present case the sale of the poisonous article was made to a dealer in drugs, and not to a consumer. The injury therefore was not likely to fall on him, or on his vendee who was also a dealer; but much more likely to be visited on a remote purchaser, as actually happened.[4]

The second landmark case in the development of the doctrine that persons not in privity with a supplier could nonetheless recover damages for injuries under negligence theories is *Huset* v. *J. I. Case Threshing Machine Co.*[5] In allowing recovery to an employee of the purchaser of a threshing machine which was inadequately shielded, the court outlined three exceptions to the general rule of no liability in the absence of privity. These exceptions, which were to exert considerable influence in future litigation, were said to be:

> The first is that an act of negligence of a manufacturer or vendor which is imminently dangerous to the life or health of mankind, and which is committed in the preparation or sale of an article intended to preserve, destroy, or affect human life, is actionable by third parties. . . .
>
> The second exception is that an owner's act of negligence which causes injury to one who is invited by him to use his defective appliance upon the owner's premises may form the basis of an action against the owner. . . .
>
> The third exception . . . is that one who sells or delivers an article which he knows to be imminently dangerous to life or limb to another without notice of its qualities is liable to any person who suffers an injury therefrom which might have been reasonably anticipated. . . .[6]

In analyzing the court's statement of the exceptions, Professor Bohlen forcefully brought out its incongruities.[7] He observed that under the court's formulation of the rule, manufacturers of chewing tobacco and drinks would be liable to persons not in privity, but the manufacturers of automobiles, high-powered machines, boilers, etc. would not be liable for negligence since such articles are not intended to affect human life and are not immently dangerous in their use when free of defects.

[4] *Id.* at 409.

[5] 120 Fed. 865 (1903).

[6] *Id.* at 870-871.

[7] Bohlen, "Liability of Manufacturers to Persons Other than their Immediate Vendees," 45 L.Q. Rev. 343 (1929).

Perhaps the best known case in the area of liability of manufacturers to third parties is that of *MacPherson* v. *Buick Motor Company*,[8] in which Justice Cardozo wrote the opinion. There the plaintiff was injured when a wheel collapsed on a car manufactured by the defendant and purchased by the plaintiff through a dealer. Although the wheel came to the defendant from a supplier, the defect was such that reasonable inspection would have disclosed it. In holding the defendant liable under negligence doctrines, the court said:

> We hold, then, that the principle of *Thomas* v. *Winchester* is not limited to poisons, explosives, and things of like nature, to things which in their normal operation are implements of destruction. If the nature of a thing is such that it is reasonably certain to place life and limb in peril when negligently made, it is then a thing of danger.[9]

The court, however, did indicate some limitations on this test, by stating:

> If to the element of danger there is added knowledge that the thing will be used by persons other than the purchaser, and used without new tests, then, irrespective of contract, the manufacturer of this thing of danger is under a duty to make it carefully. That is as far as we are required to go for the decision of this case. There must be knowledge of a danger, not merely possible, but probable. It is *possible* to use almost anything in a way that will make it dangerous if defective. That is not enough to charge the manufacturer with a duty independent of his contract. . . . There must also be knowledge that in the usual course of events the danger will be shared by others than the buyer.[10]

The culmination of the establishment of a general rule of liability of manufacturers based on negligence was reached in *Carter* v. *Yardley & Co., Ltd.* by the Massachusetts Supreme Judicial Court.[11] In that case, the plaintiff, a remote purchaser, had been injured by the use of perfume manufactured by the defendant. The court swept aside the distinction between things "inherently dangerous" and others not so, stating the rule to be as follows:

> In principle, a manufacturer or other person owning or controlling a thing that is dangerous in its nature or is in a dangerous condition, either to his knowledge or as a result of

[8] 217 N.Y. 382, 111 N.E. 1050 (1916).
[9] *Id.* at 389.
[10] *Ibid.*
[11] 319 Mass. 92, 64 N.E.2d 693 (1946).

> his want of reasonable care in manufacture or inspection, who deals with or disposes of that thing in a way that he foresees or in the exercise of reasonable care ought to foresee will probably carry that thing into contact with some person, known or unknown, who will probably be ignorant of the danger, owes a legal duty to every such person to use reasonable care to prevent injury to him.[12]

Instead of stating the rule in form of an exception to the general rule as established in *Winterbottom* v. *Wright* the court stated:

> The time has come for us to recognize that that asserted general rule no longer exists. In principle it was unsound. It tended to produce unjust results. It has been abandoned by the great weight of authority elsewhere.[13]

Thus in slightly more than a century the law has been completely reversed from a doctrine of non-liability of manufacturers to persons not in privity by contract to a doctrine of liability for negligence. Not all courts have had occasion to enunciate the broad doctrine of the *Carter* case, but it can be expected that in most jurisdictions liability based upon negligence will become the established rule of law. Although the negligence doctrine as applied to product liability situations seems to be established in most jurisdictions today, problems in its application still remain. Furthermore, there appears to be some tendency in the cases to impose what amounts to strict liability.

b. The General Nature of the Duty

In general, a supplier of chattels has a duty to use care and skill when a reasonable, prudent man occupying the position of the supplier would recognize that a failure to use such care and skill would cause an unreasonable risk to other persons.[14] This duty is owed to every person who may foreseeably be injured by a failure to exercise the care and skill required.[15] The duty may be breached by several types of acts, including a failure by the supplier to disclose the unfitness of the chattel for the purchaser's purpose, a failure to exercise reasonable care in manufacturing or inspecting the chattel, a failure to produce a safe product as a result of errors in design, a misrepresentation of the quali-

[12] *Id.* at 96.

[13] *Id.* at 104.

[14] See James, "Nature of Negligence," 3 Utah L. Rev. 275, 280 (1953); James, "Products Liability," 34 Tex. L. Rev. 44 (1955).

[15] For a discussion of the foreseeability issue in atomic energy cases, see Chapter III, *supra.*

ties of the chattel or their fitness for a particular purpose, or a sale to a person who is incompetent to handle the chattel safely.[16] Because of the several forms which the negligence may take, the duty owed by the supplier is often phrased more specifically in the cases and in discussions of the product liability field. For example, the duty may be described as a duty to disclose defects in the product or its dangerous nature or as a duty to inspect.[17] Thus, the general duty owed by suppliers of chattels is not expressed judicially, but it can be derived from an accumulation of the principles developed in the cases. Nonetheless, it is clear that suppliers in the atomic energy industry undertake duties in respect to their goods, a breach of which will result in the imposition of liability under negligence doctrines.

c. By Whom Is the Duty Owed?

The general duty to exercise reasonable care in conjunction with supplying chattels extends to manufacturers, wholesalers, retailers, lessors, bailors, donors,[18] and even repairmen who return chattels with knowledge of defects due to the repairs they were employed to undertake.[19] In addition, it should be noted that the manufacturer may be held liable for negligence, even if he did not produce the defective article but incorporated it into the final finished product.[20]

In connection with the atomic energy industry, the duty will extend to all manufacturers, wholesalers, and retailers of nuclear devices. Perhaps more important, however, is the fact that suppliers of non-nuclear devices which are used in conjunction with reactors may subject themselves to tremendous liabilities if the failure of the device results in a major nuclear accident. Thus, the unusual feature of the supplier's liability in atomic energy is the vastness of the potential liability. For example, the supplier of a defective gear may normally expect to incur liability, but in all probability it will be confined to employees of the purchaser and occasionally a limited number of other third parties.

[16] Prosser, Torts §83 (2d ed. 1955).

[17] See Restatement, Torts §388, and the several comments thereunder.

[18] Restatement, Torts §388, comment *c* (1934); James, "Products Liability," 34 Tex. L. Rev. 44, 45 (1955), especially at Note 8 where cases are cited in which donors have been held liable as well as cases which are *contra*. See also Prosser, Torts §83 at 493 (2d ed. 1955), indicating Dean Prosser's opinion that the gratuitous bailor or donor only has the duty to disclose dangers of which he has knowledge.

[19] Restatement, Torts §388, comment *c* (1934). But see Hanson v. Blackwell Motor Company, 143 Wash. 547, 255 Pac. 939 (1927).

[20] MacPherson v. Buick Motor Company, 217 N. Y. 382, 111 N.E. 1050 (1916), wheel supplied to car manufacturer by independent supplier.

However, supplying a defective gear which causes a nuclear accident may cause injury to hundreds and even thousands of persons, as well as causing substantial property damage.

Because there is a practice in the atomic energy industry for one group to design reactors or reactor components and another to engage in their manufacture or construction, a question arises as to whether the designers owe duties equivalent to those of the manufacturers of the product. The Restatement of the Law of Torts [21] and Professor James [22] both take the position that negligence in design is a basis for recovery against the manufacturer even where the product was designed by others, although Professor James acknowledges that the courts have been reticent in allowing recovery in cases based upon negligence in design where the manufacturer was responsible for the design.[23] We are unaware of any cases holding a designer, as distinguished from a designer-manufacturer, liable to third persons injured as a result of use of a chattel. In the case of architects the courts have refused to allow recovery by third persons injured by defects in design.[24] However, as we shall note later in this chapter, the courts have generally followed more restrictive rules in cases against building contractors and have not allowed recovery when the building has been accepted, apparently on the basis that the contractor has no control over subsequent acts concerning the realty and because of the lack of privity. When third parties have initiated actions against architects for negligence in design, recovery has generally been denied on the same theories employed in the building contractor cases. In contrast, the owners of the premises have been successful in obtaining recovery for injuries caused by the negligence of the architect.[25] However, in 1956 an Appellate Division of the Supreme Court of New York held that an allegation of negligence by an architect causing injury to a third person stated a cause of action.[26] Furthermore, the New York court even suggested that the architect may be liable and the building contractor not liable because the building contractor may have been justified in relying on the plans and specifica-

[21] Restatement, Torts §§389, 398 (1934).

[22] James, "Products Liability," *supra* note 18 at 50 *et seq.*

[23] *Ibid.* For a discussion of the difficulties involved in seeking recovery for injuries on the basis of negligence in design, see Katz, "Negligence in Design as a Basis of Liability: The Auto Industry," 1956 Ins. L.J. 466.

[24] See *e.g.*, Geare v. Sturgis, 14 F.2d 256 (1926).

[25] See Annotation, "Responsibility of one acting as architect for defects or insufficiency of work attributable to plans," 25 A.L.R.2d 1085 (1952).

[26] Inman v. Binghamton Housing Authority, 1 App. Div. 2d 559, 152 N.Y.S.2d 79 (1956).

tions. Therefore, the question of liability for negligence in design of designers of chattels who do not also manufacture the product remains doubtful. Nonetheless, we are of the opinion that the ultra-hazardous nature of an improperly designed atomic device may lead the courts to employ general negligence doctrines in suits by third parties against designers. Moreover, the general trend of the law in the field of product liability has been to broaden the field of application of negligence concepts. Therefore, we conclude that there is considerable likelihood that designers of chattels for atomic industry will be held to a general duty similar to that owed by manufacturers.

One additional factor should be noted. The specific nature of the duty owed by the various types of suppliers may differ. For example, a retailer or wholesaler may not be subject to the same duty to inspect a product as the manufacturer. Similarly, the manufacturer may not be under a duty to disclose to an ultimate purchaser the unsuitability of his product for the particular use contemplated by the purchaser whereas the retailer may be under such a duty when he knows of the contemplated use.

In the field of atomic energy a special problem exists because of the activity of the federal government. The Atomic Energy Commission actively engages in the production and marketing of radioactive by-product materials, and the United States is the exclusive owner of special nuclear material.[27] Furthermore, under contract arrangements the AEC may supply research facilities, possible designs, and fuel refabrication services. As a supplier of goods, is the United States liable for negligent acts on the same basis as private suppliers? Since the government can be held liable only to the extent of the waiver of its immunity from suit, the answer lies in the applicable provisions of the Federal Tort Claims Act.[28] Generally, if injury results from the performance of other than a discretionary act upon the part of government officials and employees, the government has waived its immunity. Therefore, it would appear that if the AEC supplies a negligently mislabeled radioisotope, the government may be held liable. However, if the negligence consists of improperly licensing an unqualified person, the government probably cannot be held liable because of the discretionary nature of the

[27] Section 53e of the Atomic Energy Act of 1954, as amended in 1957, requires that special nuclear licenses be subject to the condition that the licensee "hold the United States and the Commission harmless from any damages resulting from the use or possession of special nuclear material by the licensee" except to the extent that the indemnification and limitation of liability provisions of the act apply.

[28] 28 U.S.C. §§1346(b), 2680(a) (1950).

negligent act.[29] An additional question is whether governmental liability under the Federal Tort Claims Act can be based solely upon ownership of special nuclear material, absent any showing of negligence.[30] In the Texas City litigation, the Supreme Court answered this question negatively:

> . . . [T]he statute requires a negligent act. So it is our judgment that liability does not arise by virtue either of United States ownership of an "inherently dangerous commodity" or property, or of engaging in an "extra-hazardous" activity.[31]

d. To Whom Is the Duty Owed?

When the courts in the last century required privity as a condition to recovery for injuries occasioned by negligence in supplying a chattel, the purchaser could, of course, fulfill that requirement in an action against his immediate supplier. However, in the *MacPherson* case an ultimate purchaser was allowed to recover from a remote vendor, and since the date of that case the principle of liability for negligence has been gradually extended to cover members of the purchaser's family,[32] the purchaser's employees, other users of the product,[33] casual by-standers, and even second-hand purchasers of the product.[34] However, not every jurisdiction has had occasion to consider the extension of negligence doctrines to include non-users of a product, so some doubt exists as to the exact legal situation now prevailing. For example, the Washington court has declined to hold a repairman liable to a guest-passenger for negligence in the repair of an automobile,[35] but the Kentucky and Wisconsin courts have reached an opposite result.[36] The trend appears to be to enlarge the class to whom the duty is owing and thereby to broaden the liability based on negligence doctrines.

Moreover, both the direct purchaser and in some cases the ultimate purchaser may also be able to recover on the basis of either express or

[29] For a discussion of the nature of discretionary acts, see Dalehite et al. v. United States, 346 U.S. 15, 73 S.Ct. 956 (1953).

[30] For an interesting discussion of the possible governmental liability, see Hearing before the Joint Committee on Atomic Energy on Governmental Indemnity, 84th Cong., 2d Sess. pp. 109-114 (May 16, 1956).

[31] Dalehite et al. v. United States, *supra* note 29 at 45.

[32] White Sewing Machine v. Fiesel, 28 Ohio App. 152, 162 N.E. 633 (1927).

[33] Hoenig v. Central Stamping Co., 273 N.Y. 485, 6 N.E.2d 415 (1936).

[34] Prosser, Torts §84, p. 501 (2d ed. 1955).

[35] Hanson v. Blackwell Motor Co., *supra* note 19.

[36] Olds Motor Works v. Shaffer, 145 Ky. 616, 140 S.W. 1047 (1911); Flies v. Fox Brothers, 196 Wis. 196, 218 N.W. 855 (1928).

implied warranties. Recovery under warranty doctrines is based upon a contractual type of liability and, as such, results in the impostion of a kind of strict liability, as contrasted with negligence. Recovery on warranty theories will be discussed later in this chapter. The fact that a purchaser may in some cases recover under either doctrine (negligence or warranty) has resulted in confusion in the cases. In any event, suppliers of chattels in atomic energy industry must take account of both doctrines in ascertaining the potential scope of their liability and in devising methods of providing protection, either by limiting the basis for recovery in warranty through contract terms or by seeking adequate insurance coverage.

Because of the unusual nature of radiation, the most difficult question confronting suppliers of chattels in atomic energy industry is whether the duty is owed to remote non-users. Normally, a supplier whose negligence causes an accident can expect relatively few persons in areas immediately adjacent to the chattel to be injured. But this may not be the case in respect to defective chattels supplied in connection with operations creating radiation hazards. For example, if the negligence of a manufacturer of a reactor control mechanism causes the reactor to melt-down and release radiation into the atmosphere, personal and property damage of outsiders may be measured in millions of dollars. Moreover remote and unexpected injuries may ensue, as for example if a supplier's negligence causes injury to a person who eats fruit covered by radioactive wastes released several miles away.

Under ordinary negligence doctrines the duty to the remotely injured person is resolved on the basis of foreseeability. It would appear that once recovery based upon negligence is permitted, the same tests of foreseeability should be employed in the atomic energy product liability cases as used in other negligence cases. However, the Restatement of the Law of Torts and Dean Prosser depart from the usual foreseeability concepts employed in discussing negligence when they describe the liability of suppliers of chattels to third persons. Both express the liability of the supplier in terms of persons who may be expected to be "in the vicinity of the chattel's probable use." [87] A literal application of these statements of the rule may suggest a more restrictive scope of liability for suppliers of products in atomic energy cases involving radiation injuries suffered in places far removed from the location of the chattel.

[87] Prosser, Torts §84, p. 497 (2d ed., West Pub. Co., 1955). As expressed in the Restatement, Torts §388 (1934), the supplier's liability is "to those whom the supplier should expect to use the chattel with the consent of the other or to be in the vicinity of its probable use."

On the other hand, use of this statement of the rule may result in even greater liabilities because the statement takes no account of the device employed in ordinary negligence cases of finding no duty in respect to the "unforeseen" injured person.[38]

It is doubtful whether any distinction can be justified between the tests of duty in pure negligence cases and those applied to product liability cases. For example, in *Margulies et al.* v. *Denner et al.*[39] the owner, the agent of the owner, the supplier of the product, the trucking company, and the truck driver were held jointly liable to a group of persons who, while subway passengers, inhaled chlorine gas escaping from a defective tank in a truck when the driver, upon noticing the escape of gas, stopped near a subway grating. It is difficult to conclude that the subway passengers were in the vicinity of the probable use of the chlorine gas; nonetheless the court found a duty on the part of the supplier to the passengers, apparently on the basis of ordinary foreseeability tests.

As we shall see, the dangerousness of the product also plays a role in determining the existence and nature of the duty.[40] Accordingly, it can be expected that a supplier of radioisotopes who ships them in a defective container will be held liable to persons exposed along the shipping route. Moreover, all persons who may foreseeably be injured by radiation exposures caused by defective chattels will, in all probability, be found to be among the class of persons to whom a duty is owed, no matter how remote from the source of injury both in space and in time.[41]

e. The Dangerous Nature of the Product

In the *MacPherson* case Justice Cardozo indicated that liability for injuries to third persons, not in privity, would be imposed if the manufacturer knew or should have known that the product was a "thing of danger." A thing of danger was defined as a product which is "reasonably certain to place life and limb in peril when negligently made."[42] Other cases[43] have also expressed the opinion that manufacturers would

[38] See discussion of duty cases, *supra* Chapter III.

[39] 185 Misc. 139, 56 N.Y.S.2d 856 (1945), *aff'd* 271 App. Div. 827, 65 N.Y.S.2d 441 (1946), *aff'd* 297 N.Y. 562, 74 N.E.2d 481 (1947).

[40] See Restatement, Torts §293 (1934).

[41] Although some courts apparently attempted at one time to confine liability of suppliers to personal injury cases, today similar rules are followed whether the damage consists of injury to the person or to property. See Todd Shipyards Corp. v. United States et al., 69 F. Supp. 609 (1947).

[42] See quotes from the MacPherson case, *supra* at note 9.

[43] See, *e.g.*, Huset v. J. I. Case Threshing Machine Co., 120 Fed. 865 (1903).

be held liable in the absence of privity if the product is "imminently dangerous" or "reasonably certain to place life and limb in peril." [44] Similar language is often used by the courts today where the rules of ordinary negligence have not been extended to the product liability field.[45] In some of these opinions there apparently is an intimation that more than a simple breach of a reasonable standard of conduct is essential to establish liability of product suppliers. The dangerous nature of a product, of course, aids in the establishment of whatever greater breach of the standard of conduct may be required by the courts.

Because of the unusual dangers involved in radiation hazards, it appears that certain products, such as radioisotopes, containers for radioactive materials, reactor fuel elements, and reactor control systems, meet the "imminently dangerous" tests. On the other hand, such products as electronic tubes, gears, bolts, pins, etc., which may be incorporated into a reactor do not seem to meet the tests. However, there have been several decisions which have held similarly apparently innocuous articles to be "imminently dangerous," even including such normally innocent items as shoes, bar stools, and children's toys.[46] These cases represent the trend toward the application of ordinary negligence doctrines throughout the field of product liability although the courts still are basing their decisions on an exception to the old no-liability rule as stated in the *MacPherson* and other similar cases. In any event, it would seem that where the courts still employ the exceptions, as distinguished from ordinary negligence concepts, many of the products employed in atomic energy industry would appear to fall within the exceptions, and therefore it is doubtful if the suppliers can expect to avoid liability.

The dangerous nature of a product may have yet another effect on the duty owed. The burden may be imposed upon the product manufacturer to discover the possible dangers, and this duty may greatly increase the standard of reasonable care applicable in respect to dangerous products. For example, in *Chapman Chemical Co.* v. *Taylor, et al.*,[47] a manufacturer of 2-4-D weedkiller was held liable to a person whose cotton crop, which was located three-quarters of a mile from the place of spray-

[44] U.S. Radiator Corp. v. Henderson, 68 F.2d 87 (1933).

[45] See cases listed by James, "Products Liability," *supra* note 18 at 61.

[46] Pearlman v. Garrod Shoe Co., 276 N.Y. 172, 11 N.E.2d 718 (1937); S. Blickman, Inc. v. Chilton, 114 S.W.2d 646 (Tex. Civ. App. 1938); Gittelson v. Gotham Pressed Steel Corp., 266 App. Div. 866, 42 N.Y.S.2d 341 (1943). For a more complete listing of the cases, see James, *supra* note 18 at 62.

[47] 215 Ark. 630, 222 S.W.2d 820 (1949).

ing by aircraft, was injured when wind caused the chemical to drift and settle thereon. At the time, the manufacturer knew of the danger of the chemical to certain crops but neither it nor other manufacturers apparently knew of the tendency of 2-4-D to drift farther than other types of agricultural chemicals. Nonetheless, the Arkansas Supreme Court approved the following instruction by the trial court to the jury:

> It was the duty of the defendant Chapman Chemical Company before putting an inherently dangerous product on the market to make tests to determine whether or not it would damage crops of others; if you believe from a preponderance of the evidence in this case that the 2-4-D dust applied . . . [by the purchaser] . . . was an inherently dangerous product liable to damage property of others, and that such tests were not made, then you are told that the defendant Chapman Chemical Company is negligent.[48]

It is apparent that the court felt there was a duty to make more complete tests in respect to "inherently dangerous" articles. By its very nature, the additional duty, in effect, established a higher standard of care in dealing with the dangerous product. That the standard of care may be affected by the dangerous nature of a product is also indicated by the Restatement's conclusion that a supplier who knows that a product is unlikely to be made reasonably safe before being used is liable to users and others in the vicinity of use even though the supplier has informed the purchaser of its dangerous character.[49]

For those products in the atomic energy field that can be described as "inherently dangerous," it appears that additional duties and higher standards of care will be imposed by the courts. Which products may be so classified by the courts is a doubtful matter. As we have seen, some rather commonplace products have been so classified in certain instances. Radioactive materials having intermediate half-lives and emitting the more dangerous gamma rays will probably be classified as "inherently dangerous." Perhaps short-lived isotopes or those emitting alpha and beta radiation only may not be so considered. Possibly distinctions may

[48] *Id.* at 642.

[49] Restatement, Torts §389 (1934). The section reads as follows:

One who supplies directly or through a third person a chattel for another's use knowing that the chattel is unlikely to be made reasonably safe before being put to a use which the supplier should expect it to be put, is subject to liability for bodily harm caused by such use to those whom the supplier should expect to use the chattel or to be in the vicinity of its probable use and who are ignorant of the dangerous character of the chattel or whose knowledge thereof does not make them contributorily negligent, although the supplier has informed the other for whose use the chattel is supplied of its dangerous character.

be drawn by the courts on the basis of the likelihood of ingestion of the particular material if it is harmful as an internal source of radiation. A radiation detection device may be classified as inherently dangerous or not, possibly depending on whether the supplier knows that failure of the device may lead to harmful exposure of employees and others to radiation. The lines will be drawn by the courts, often on the basis of whether the supplier is more capable of bearing the economic loss caused by the injury. However, this concept is seldom mentioned in the opinions although it is recognized as being a very material factor by most legal scholars. One statement may be made with some assurance; namely, although the dangerous nature of the product will have a material effect upon the standard of care required of product manufacturers, there is as yet no certainty about the extent to which it will affect suppliers of the various kinds of products used in atomic devices. The law on this subject will be shaped by future decisions.

f. Warnings of Danger and Assurances of Safety

There are a number of devices and products utilized in atomic industry which have dangerous aspects that are known to the supplier. For example, a processor of radioisotopes may supply tracers, some of which may be safely used for diagnosis and treatment of humans but others, harmful to humans, may be useful only in conjunction with insecticides. Similarly, a supplier of reactor components may produce a device which is suitable for thermal reactors but unworkable if used with fast breeder reactors. Suppliers of radiation detection instruments may know that certain devices may not be satisfactory for protecting personnel of the purchaser from certain types of harmful radiation. Moreover, because many aspects of atomic energy technology and the nature of injury to humans remain unknown, though knowledge is constantly expanding, and because the theories of atomic structure still are in a continuous state of evolution, suppliers of atomic energy products must necessarily rely on knowledge currently existing although it may be assumed to be incomplete. Since the suppliers may be held liable for their negligent acts, among the most crucial questions to be answered are: What warning must be given to the purchaser and user of atomic energy products? What liabilities may result from a failure to warn? What liabilities may result from giving assurances of safety when supplying an atomic energy product? What liabilities may result even though warnings are given to the purchaser? It should be noted that these questions involve the possibility of liability of a supplier in some

cases even though no negligence can be shown in respect to the design or manufacture of the product.

The importance of the necessity of providing warnings is indicated by the Restatement's general rule governing liability of suppliers:

> One who supplies directly or through a third person a chattel for another to use, is subject to liability to those whom the supplier should expect to use the chattel with the consent of the other or to be in the vicinity of its probable use, for bodily harm caused by the use of the chattel in the manner for which and by a person for whose use it is supplied, if the supplier
>
> (a) knows, or from the facts known to him should realize, that the chattel is or is likely to be dangerous for the use for which it is supplied;
>
> (b) and has no reason to believe that those for whose use the chattel is supplied will realize its dangerous condition; and
>
> (c) *fails to exercise reasonable care to inform them of its dangerous condition or of the facts which make it likely to be so.* [Emphasis added.] [50]

Illustrative of the liability that may be imposed in conjunction with an inherently dangerous product where no notice of danger is supplied is the case of *Noone* v. *Fred Perlberg, Inc.*[51] In that case the manufacturer of a dress which was sized with an inflammable material was held liable, the court stating the rule to be applied as follows:

> The rule in this State is now settled that when a manufacturer sells an inherently dangerous article for use in its existing state, the danger not being known to the purchaser and not patent, *and notice is not given of the danger or it cannot be discovered by reasonable inspection,* the manufacturer is legally liable for personal injuries received by one who uses the manufactured article in the ordinary and expected manner. [Emphasis added.] [52]

In *Ebers* v. *General Chemical Company*[53] the defendant manufactured and marketed a new insecticide which the U. S. Department of Agriculture had tested in several states successfully. In its advertising, after giving directions for the use of the insecticide which was sold under the trade name E-D-E, the manufacturer supplied the following statement:

> The foregoing information is supplied by us gratuitously and is believed to be reliable and of value, but is in no way

[50] Restatement, Torts §388 (1934).

[51] 268 App. Div. 149, 49 N.Y.S.2d 460 (1944), *aff'd* 294 N.Y. 680, 60 N.E.2d 839 (1945).

[52] *Id.* at 152.

[53] 310 Mich. 261, 17 N.W.2d 176 (1945).

> guaranteed. The use of this material being beyond our knowledge and control and involving elements of risk to vegetation, we do not make any warranty, express or implied, as to the effects of such use, whether or not in accordance with directions or claimed so to be." [54]

The plaintiff applied the insecticide as directed but nearly one-fourth of his orchard trees died. Evidence was introduced by the plaintiff showing that in the following year both the defendant and the United States Department of Agriculture had changed their directions for use to include a warning that the product should not be sprayed on the tree trunks. The directions supplied to the plaintiff had recommended that some of the chemical be sprayed on the trunk. Despite the disclaimer the court held that the plaintiff has shown sufficient evidence of either a failure to make satisfactory tests or a failure to provide adequate directions for use to warrant submission of the case to the jury. In reversing the lower court's ruling directing a verdict for the manufacturer, the court stated:

> . . . . If it was negligent in placing such product on the market in Michigan without proper field tests to determine its effect on peach trees in this State, or if it gave improper direction for the use and application of the product, it cannot escape responsibility for such negligence merely by adding a disclaimer of warranty to its representation of safety.[55]

Both of these cases demonstrate the necessity of giving warning or adequate directions for use to purchasers of products. The adequacy of the warning or direction is, of course, a jury question, but it is clear that the adequacy will be determined on the basis of knowledge which should have been known.[56] In the *General Chemical Co.* case, the court infers that this knowledge should have been derived by tests in Michigan because of different climatic and soil conditions even though the product had been tested in a number of other states by the Department of Agriculture.

In addition, in *McClanahan* v. *California Spray-Chemical Corp.*,[57] the Virginia Supreme Court seems to have concluded that, even where the directions for use of a fungicide were not followed, the manufacturer had a duty to provide warnings concerning the possible damages in ad-

[54] *Id.* at 268.

[55] *Id.* at 274-275. See also E. I. DuPont de Nemours & Co., v. Baridon, 73 F.2d 26 (1934).

[56] See Hopkins v. E. I. DuPont de Nemours & Co., 199 F.2d 930 (1952).

[57] 194 Va. 842, 75 S.E.2d 712 (1953).

dition to supplying directions for safe usage. A pamphlet supplied by the defendant stated that the chemical was not to be used later than two weeks following petal fall, but the label on the container cautioned against use "later than petal fall." However, in both instances the directions inferred that the reason for the warning was "a possibility of residue remaining at harvest." In reversing the trial court, which had set aside the jury verdict for the plaintiff, the court stated, in part:

> It follows then, that a manufacturer of an economic poison in giving direction for use is fulfilling only a part of his obligation to the purchaser. He is saying simply "Here is a way to use this product which we guarantee will kill the weeds infesting your lawn or the scab infecting your orchard." Of course, that way must be a safe way. The manufacturer by instructing how to use is not necessarily saying, nor is he understood by the purchasing public to say, "This is the only safe way to use our product." [58]

Two justices dissented vigorously, stating:

> The prohibition as to application "later than petal fall" was positive, simple and direct. It could serve no purpose other than to warn of danger upon violation, a warning with special meaning to experienced orchardists who know the condition of the foliage on their trees at the time of petal fall. No additional warning was necessary under the statutes. To say that there should have been added a statement "Use only as directed, and not otherwise or damage may result," is a reflection upon the intelligence of the plaintiffs.
>
> * * * * *
>
> . . . It having been established that no injury would have been incurred by plaintiffs had they observed the directions and caution statement on the label . . . and the accompanying pamphlet, it must logically follow that their default was a proximate cause of the damage occasioned them. There is a question of wisdom and fairness of subjecting defendant to liability for damages under such circumstances. The majority opinion fashions a broad, new law of negligence in conflict with that which we have followed for many years,—one apt to cause embarrassment in the future.[59]

The applicability of these cases to atomic energy entrepreneurs is readily seen. The supplier of a radioactive sterilizer or food preserver must

[58] *Id.* at 862. The McClanahan case and several others concerning the duty to warn are ably discussed by Dillard and Hart, "Product Liability: Directions for Use and the Duty to Warn," 41 Va. L. Rev. 145 (1955).

[59] *Id.* at 870-871.

not only provide directions for safe usage, but he may also be required to warn against a possible dangerous usage, even though the Atomic Energy Commission may have conducted experiments and even issued statements concerning proper usage of the same or substantially similar radiation sources.

A failure to give proper warning to the purchaser may also be the basis for liability to third persons even if there is no evidence that the manufacturer should have known of the danger at the time of the purchase of the product, provided he becomes aware of the danger at a later time. In *DeVito* v. *United Air Lines, Inc.*[60] the plaintiff obtained a judgment for wrongful death against the purchaser and manufacturer of an aircraft, alleging negligence against the manufacturer for failure to warn the purchaser that carbon dioxide may enter the cockpit of the aircraft, thereby suffocating the pilots. The planes were purchased in the spring of 1947 and the evidence of the carbon dioxide danger did not come to the attention of the manufacturer until January 1948. The manufacturer thereafter conducted tests but failed to tell the purchaser of the potential danger and of the precautions to be taken to avoid suffocation.

Suppliers of products either directly or indirectly employed in conjunction with radiation sources may be subject to the extraordinary duty, therefore, to keep abreast of the almost daily new technological and theoretical developments in order to inform past as well as future purchasers of their products whenever evidence of danger is known to exist or should have been known to exist.[61] The question of precisely when a manufacturer may be charged with foreseeing harm so that he has a duty to warn cannot be definitively answered. However, the courts do not appear to have had too much difficulty in finding the duty where the facts involved "inherently dangerous" articles, of which there are many in the atomic energy industry. The burden placed upon manufacturers of new products in respect to the duty to warn and fulfilling that duty is not an easy one, especially with respect to prior purchasers. As stated in Dillard and Hart:

> In cases involving *new* products, it is thus clear that a duty to warn will depend on the extent to which knowledge of the danger should reasonably be attributed to the manufacturer. If the product is launched prior to "adequate" testing, to at-

[60] 98 F. Supp. 88 (1951).

[61] Thornbill v. Carpenter-Morton Co., 220 Mass. 593, 108 N.E. 474 (1915), holding the defendant liable although he had no knowledge of the dangerous character of the product since he did not manufacture the article but sold it under his name.

> tribute knowledge would seem reasonable. Furthermore, if products like drugs are launched while still in such a clinical stage that the manufacturer cannot be sure of their effects, a warning of that danger would also seem necessary. Paradoxically, the manufacturer should then be required to give warning of what he does not know. The paradox is an apparent one only, since he does or should know that, in general, the product is capable of harm.
>
> Clearly, we have here an area in which "law," "scientific knowledge," and the demands and price of "progress" sharply react upon one another. They do so in a way which makes rational reconciliation of conflicting interests unusually difficult. . . . [I]t would seem that the point at which the benefits of experimentation should be permitted to outweigh the rights of an injured plaintiff should be decided, not by a judicial balancing of interests, but by a common-sense jury determination of what was reasonably to be expected in view of the nature of the commodity and its foreseeable use." [62]

The full extension of this duty remains to be worked out in future decisions by the courts.

Even when warnings are given to the purchaser, or when warnings would be unnecessary because of actual knowledge of the danger on the part of the purchaser, the supplier may be held liable for failure to warn actual users of the product, including secondhand purchasers.[63] For example, in *Tomao* v. *A. P. De Sanno & Son,*[64] a manufacturer of a grinding wheel was held liable for injuries sustained as a result of his failure to indicate the maximum speed at which the wheel could be operated even though the defendant contended that the wheel was sold originally to the United States government. The court merely stated that it was foreseeable that the wheel might be acquired from the government by third persons. Similarly, in *Beadles* v. *Servel, Inc.,*[65] the secondhand purchaser of a gas refrigerator was allowed to recover for injuries because the manufacturer failed to provide notice of the necessity of cleaning certain component parts that had a tendency to clog after a lengthy period of operation. Where the warning has been given to the purchaser, but not to the actual user of the product, liability has also resulted. For example, in *Rosebrock* v. *General Electric Company,*[66] the manufacturer provided a warning on the bill of shipment,

[62] Dillard and Hart, *supra* note 58 at 159-160.

[63] For a recent case indicating the difficulties encountered by a court in determining the adequacy of a warning, see Jamieson v. Woodward & Lothrop, 247 F.2d 23 (1957).

[64] 209 F.2d 544 (1954).

[65] 344 Ill. App. 133, 100 N.E.2d 405 (1951).

[66] 236 N.Y. 227, 140 N.E. 571 (1923).

but failed to place a warning tag on the container to the effect that certain blocks placed in a transformer for shipment should be removed before use. The warning on the bill of shipment was filed by clerks and did not reach the personnel engaged in the unpacking and installation. The manufacturer was held liable for his negligence in not giving warning suitable for those persons who actually engaged in the installation process.[67]

Because of the dangerous nature of radioactive materials and devices using radiation, these cases demonstrate the probable high degree of care that must be used in giving warnings to purchasers and others who may come into contact with the products. Certain symbols and color schemes to denote radiation hazards have generally been adopted. Following the standards of the industry will undoubtedly be essential, but even these may not provide the kind of warning required to avoid liability. Adequacy of the warning is usually a jury question, with the results in specific cases always in doubt, especially because the standards imposed may be relatively high since radiation is not capable of detection by the human senses.[68]

If the manufacturer gives assurances of the safety of a product for the use intended, this fact alone makes it easier for injured persons to show negligence in fulfilling the duty to warn.[69] Thus, even where a warning was attempted to be given by directions concerning the use of an inherently dangerous product, other statements assuring or even intimating assurance of safety have made it difficult for the supplier to show the exercise of reasonable care.[70] Moreover, providing assurances of safety may give rise to a type of strict liability under theories of

[67] See also Gall v. Union Ice Company, 108 Cal. App.2d 303, 239 P.2d 48 (1951). In that case there was evidence that a letter had been sent to purchasers of the product four years before the injury to the third party plaintiff warning of the danger. It also appeared that several lots of the same article had previously been acquired by the same purchaser and that the defendant had made a practice of attaching warning labels. However, in this instance, the defendant was held liable since there was no specific evidence that the particular article had a warning label.

[68] See Farley v. Edward Tower Co., 271 Mass. 230, 171 N.E. 639 (1930), and Maize v. Atlantic Refining Co., 352 Pa. 51, 41 A.2d 850 (1945), as examples of cases showing the high standard of conduct for warnings that may be required and the dangers involved in advertising which may detract from the warning.

[69] See Tingey v. E. F. Houghton & Co., 30 Cal.2d 97, 179 P.2d 807 (1947), in which the court upheld a verdict of liability of the defendant manufacturer to users for failure to warn. The court stated at 103: "There is a particular need for a sufficient warning where, as here, there is a representation that the product is not dangerous.

[70] See *e.g.*, Ebers v. General Chemical Co., *supra* note 53; E. I. DuPont de Nemours & Co., v. Baridon, *supra* note 55; and McClanahan v. California Spray-Chemical Corp., *supra* note 57

express or implied warranty which will be discussed below. Furthermore, certain statements of assurance of safety may occasion liability in a tort action on the theory of deceit.[71] The courts have allowed recovery under theories of deceit even though an intent to deceive was not proved to exist.[72] The classification of the cases as deceit, negligence, or warranty is often extremely difficult because there is an overlapping of theories of liability.

Representative of cases in which it is difficult to ascertain the precise theory of liability is the case of *Baxter* v. *Ford Motor Co.*[73] There the manufacturer had distributed to automobile dealers catalogues and printed matter containing representations that the car windshields were made of non-shatterable glass. The plaintiff was injured when a pebble thrown by a passing car struck the windshield causing a piece of the windshield to strike the plaintiff's eye. The court, holding the defendant liable, stated that the plaintiff "had a right to rely upon the representations" even though there was no privity of contract, suggesting a theory of liability based upon misrepresentation. However, at the same time the court cited a number of cases holding suppliers of chattels liable in the absence of privity because of the "inherently dangerous" quality of the product.[74]

In *Wennerholm* v. *Stanford University School of Medicine,*[75] the California Supreme Court upheld, as sufficient to state a cause of action, an allegation of fraud by the plaintiff who suffered blindness as a result of taking drugs manufactured by the defendant even though the drug was taken in accordance with a physician's prescription. The allegation of fraud was that the defendant had by publication in newspapers, circulars, and elsewhere represented that the drug was harmless, that the defendant knew that the drug was inherently dangerous and liable to cause blindness, and that the plaintiff had relied on the representations. The court stated:

> The intent to deceive sufficiently appears . . . by the facts alleged, from which it may be inferred that the alleged false statements were made with the intention of inducing the public to purchase the drug.[76]

[71] Prosser, Torts §86 (2d ed. 1955).

[72] 1 Harper and James, Law of Torts c. VII (1956).

[73] 168 Wash. 456, 12 P.2d 409 (1932).

[74] In a substantially similar case, the Michigan court founded liability on the basis of warranty where plaintiff alleged deceit and fraud, negligence, and breach of warranty. Bahlman v. Hudson Motor Car Co., 290 Mich. 683, 288 N.W. 309 (1939).

[75] 20 Cal.2d 713, 128 P.2d 522 (1942).

[76] *Id.* at 716.

Cases are relatively rare, however, holding defendants liable to remote purchasers of chattels on theories of misrepresentation or deceit. The bases for liability of suppliers usually employed are either negligence or warranty,[77] with the misrepresentation playing an important role in showing the breach of the standard of conduct required or in establishing the warranty. Theories of misrepresentation or deceit are used, however, to establish liability to a purchaser when the product will not serve the purpose for which it was purchased. For example, in *Horrell* v. *Santa Fe Tank and Tower Company*[78] the supplier was held liable for damages on the basis of a representation that his atmospheric-type cooling tower would cool the volume of water necessary for the purchaser's refrigeration processes.[79] Liability of this type also holds warnings for suppliers to atomic energy industry because the unique technological problems involved may lead to representations of the suitability of a product which proves to be false. For example, an ordinary valve may be perfectly satisfactory for general industrial application, but because of susceptibility to corrosion it may be entirely unsatisfactory for use in conjunction with radioactive materials. Therefore, suppliers of standard products should exercise extreme caution in making representations concerning applications of their products in atomic energy operations.

It may be safely concluded that the duty to warn may be onerous for suppliers of articles which either employ radiation sources or are used in connection with nuclear processes. If the product is inherently dangerous, the cases seem to require a high standard of care in fulfilling the duty imposed. Moreover, we have also seen that the supplier may be held liable to third parties even if he has provided warnings to the purchaser. The extent of potential damage that may be caused by a defective component incorporated into a reactor is far greater than that encountered in more usual types of industrial pursuits, so suppliers to atomic industry should avoid unusual risks by exercising a very high degree of care in giving adequate warning to purchasers and so far as possible to third parties, thus assuring to the maximum possible degree that no accident will result from a failure to warn of the dangerous nature of the product.

[77] See Prosser, Torts c. 18 (2d ed. 1955); Restatement, Torts §525 (1934).

[78] 117 Cal. App.2d 114, 254 P.2d 893 (1953).

[79] See also Traylor Engineering & Manufacturing Co. v. National Container Corp., 45 Del. Rep. 143, 70 A.2d 9 (1949).

g. Effect of Qualifications of Purchaser

Suppliers of chattels may also be held negligent because of the probability that injuries will result from supplying chattels to incompetent persons. The rule, as explained by the Restatement, is as follows:

> One who supplies directly or through a third person a chattel for the use of another whom the supplier knows or from facts known to him should know to be likely because of his youth, inexperience or otherwise, to use it in a manner involving unreasonable risk of bodily harm to himself and others whom the supplier should expect to share in, or be in the vicinity of its use, is subject to liability for bodily harm caused thereby to them.[80]

This statement of the rule raises a number of problems for suppliers to atomic energy industry. It is generally realized that only highly trained scientific and technological personnel are equipped to handle the problems encountered in employing the fission process or radiation sources in research, medicine, or industry. Moreover, under the Atomic Energy Act of 1954 persons utilizing special nuclear materials (fissionable) or byproduct materials (radioactive) and operators of reactors must be licensed by the Atomic Energy Commission.[81] In respect to use of byproducts, licenses can be and are usually granted prior to the installation of the activity, but in connection with the utilization of special nuclear materials to produce electrical energy, the owners and their operators need not, and normally will not actually, receive their licenses until the installation is fully equipped and prepared for regular operation. However, the owner of a reactor must obtain a construction permit before building the facility.[82] To complicate the picture, the Atomic Energy Commission has promulgated regulations which establish general licenses for particular uses and quantities of radioactive byproduct materials. The existence of a general license, in effect, means that no individual license is required for certain activities although the participant may be required to comply with stated regulations.[83]

The supplier of radioisotopes or devices directly or indirectly associated with the fission process or the utilization of radiation sources is confronted with several questions. Should the supplier demand that his purchaser have a license? If a license is not essential or if general licensing exists, must he investigate the competence of the purchaser?

[80] Restatement, Torts §390 (1934).
[81] Atomic Energy Act of 1954, §§81, 101, and 109.
[82] *Id.* at §185.
[83] 10 Code Fed. Regs. Pt. 30.

Can he rely on the fact that a license has been issued to prove that he has not been negligent in supplying his product to the particular purchaser? If a construction permit has been issued for a reactor facility, must he investigate the degree of competence of the purchaser in view of the fact that the construction permit seems to require only a finding by the AEC that there is "reasonable assurance" that the facility will prove to be safe at a future date, namely at the time the reactor is ready for operation?[84] Where the license is issued to a corporation, must he investigate the competence of the persons who will actually use special nuclear or radioactive materials? Obviously, these questions relate to a standard of care which must usually be resolved in relations to the facts of specific cases, so no definitive answers are possible.

Possibly, an examination of the cases establishing liability for supplying dangerous products to children or incompetents may, although they are not too closely parallel, serve to indicate how some of these questions may be answered when litigated.

Generally the cases establishing liability for what may be described as a breach of duty in selection of a purchaser have involved sales to children of firearms,[85] fireworks,[86] or inflammable substances,[87] or the lending of motor vehicles to persons who were known by the lendor to be either reckless or inebriates.[88] Recently, a New York court upheld, as stating a good cause of action, an allegation that a wife was negligent in allowing her husband to drive her automobile when she knew that her husband had a dangerous heart condition. The plaintiff was injured when the defendant's car swerved to the wrong side of the road during a fatal heart attack suffered by the husband.[89] Manufacturers have also been held liable for negligence because of illegal sales of explosives or dangerous products to retailers.[90] For example, in *Milton Bradley Co.*

[84] 10 Code Fed. Regs. §50.35.

[85] See *e.g.*, Neff Lumber Co. v. First National Bank, 122 Ohio St. 302, 171 N.E. 327 (1930); Bernard v. Smith, 36 R.I. 377, 90 Atl. 657 (1914).

[86] See *e.g.*, Burbee v. McFarland, 114 Conn. 56, 157 Atl. 538 (1931); Bosserman v. Smith, 205 Mo. App. 657, 226 S.W. 608 (1920).

[87] See *e.g.*, Yachuk v. Oliver Blais Co., [1949] A.C. 386, 20 A.L.R. 2d 111 (1951); Grieving v. La Plante, 156 Kan. 196, 131 P.2d 898 (1942).

[88] See *e.g.*, Herrman v. Maley, 159 Miss. 538, 132 So. 541 (1931); Slaughter v. Holsomback, 166 Miss. 643, 147 So. 318, (1933); Rounds v. Phillips, 166 Md. 151, 170 Atl. 532 (1934); Golembe v. Blumberg, 262 App. Div. 759, 27 N.Y.S.2d 692 (1941); but *cf.* Estes v. Gibson, (Ky) 257 S.W.2d 604 (1953), finding no liability because the transaction was a gift.

[89] Schneider v. Van Wyckhouse, 54 N.Y.S.2d 446 (1945).

[90] See cases cited in Annotation, "Liability of manufacturer or wholesaler for injury caused by third person's use of explosives or other dangerous article sold to retailer in violation of law," 11 A.L.R.2d 1028 (1950).

of Georgia, Inc. v. *Cooper*,[91] the defendant wholesaler sold fireworks to a retailer in violation of a city ordinance. The son of the retailer took a torpedo toy, which explodes when thrown on the ground, from the store and threw it so as to explode near the plaintiff. The resulting explosion caused the plaintiff to lose the sight of his left eye. The Georgia Court of Appeals held that a cause of action had been stated and that the question of "proximate cause" should be determined by the jury. Moreover, sales in violation of statute are classified in many jurisdictions as negligence *per se* if the plaintiff is a member of the class, and the harm is of the type, designed to be protected by the legislation.[92]

We have discovered no cases which have imposed liability on a supplier for furnishing a dangerous product to an adult person even where there may have been knowledge that the adult person did not have sufficient technical skills to handle the product safely. However, it is possible that the courts may impose liability by analogy to the cases dealing with children if the supplier has knowledge of incompetence and the product is "inherently dangerous," such as radioactive materials. Probably liability would not be imposed in conjunction with sales of atomic energy products, not radioactive in themselves, nor would it be imposed if the seller has no knowledge of the incompetence. At the present time, it appears that the seller of atomic energy products has no duty to investigate the degree of skills possessed by his purchaser. However, if the sale is to a non-licensed person, where licensing is required, liability to the purchaser and others may be imposed because of violation of the statute, or the violation may create a presumption or constitute evidence of negligence.

Lack of knowledge or competence on the part of a purchaser may have some bearing upon the duty to warn. If purchasers of a product are not likely to have knowledge of inherent dangers or dangerous uses, the supplier may have to exercise a higher standard of care in providing warnings in order to avoid liability under negligence doctrines. Representative of cases indicating that a high degree of care may be required is *J. C. Lewis Motor Company, Inc.* v. *Williams*.[93] In that case the plaintiff claimed injury as a result of inhaling carbon monoxide fumes

[91] 79 Ga. App. 302, 53 S.E.2d 761 (1949).

[92] Prosser, Torts §34 at 161 (2d ed. 1955). Dean Prosser points out that in some states a violation of statute creates a presumption of negligence and in a few only evidence of negligence. Also violations of ordinances or regulations of administrative agencies may be treated only as evidence of negligence even in those states holding violations of statutes to be negligence *per se*.

[93] 85 Ga. App. 538, 69 S.E.2d 816 (1952).

emanating from a tractor purchased by her husband, but operated by her. The facts showed that the defendant supplier had failed to deliver a pipe which would have diverted the fumes away from the operator of the tractor. Furthermore, the plaintiff's husband knew of the omission since he contacted the supplier on several occasions, and the supplier promised to place an order for the missing pipe. The instructions supplied with the tractor contained no specific warning concerning the danger of carbon monoxide, but did state, that to avoid fumes, the pipe should be attached. The court held that the allegations were sufficient for the case to go to the jury for a determination of the questions of negligence of the supplier and possible contributory negligence on the part of the plaintiff. The plaintiff only had a fifth-grade education but the facts did not indicate the level of competence of her husband. It would seem that a knowledge of the danger of carbon monoxide would be almost universal among adults today; nonetheless, the court found that the jury should determine whether the supplier was negligent for failing to warn. The case illustrates the proposition that suppliers of radioactive materials and devices employing radiation must exercise extreme care in providing warnings, even though one might assume that any AEC licensee must know of the dangers involved.

h. Effect of Negligence by Others

Because of the complexities of our modern economic system, a number of problems arise in product liability cases concerning the effect of negligence that may be committed by others. Generally speaking, negligent acts committed by persons other than the defendant supplier in respect to the product may have one or both of two possible effects. First, a negligent act of another may insulate the supplier from liability, either because it proves that the supplier himself was not negligent, or that his negligence was not the "proximate cause" of the injury. Second, a negligent act of another may be the basis for shifting the economic loss suffered as a result of a judgment against the particular supplier for injuries sustained by the purchaser or third persons. The legal ramifications in respect to both of these possible effects are so complex, particularly because of the many possible factual variations, that we shall merely suggest the major considerations involved.

The possibility that negligence of another may serve to insulate a supplier from liability may be illustrated by a hypothetical atomic energy case. Suppose *X* markets a portable reactor power installation into which it incorporated a part negligently manufactured by *Y*, and the

defects cause a release of radioactive materials which results in bodily injury to *A*, the purchaser, who sues *X*. Can *X* avoid liability by showing that *Y* produced the part and that *X* used reasonable care in selecting *Y* as his supplier? A first consideration is the question whether *X* was separately negligent for his failure to inspect or in his manufacturing operations. In the *MacPherson* case,[94] the defendant had purchased the defective part from another but the Buick Motor Company was not relieved from liability since it was found to be negligent in its inspection.[95] Accordingly, it would appear that if the supplier has been negligent, he cannot successfully avoid liability to purchasers injured by the product he assembled. However, and to the contrary, in similar cases an assembler has avoided liability, apparently on the basis that the degree of care required of the assembler in inspecting the part is not as great as that imposed upon the manufacturer of the part.[96] Professor James suggests that these cases do not follow the modern rule imposing liability on the person who represents the product as his own even though it is actually manufactured by others.[97] To the extent that the cases deny liability where the product is represented by the seller as his own, they probably will afford little protection against liability of the seller in view of the more recent decisions. However, it would appear that they may have some validity where the part bears the trade-name of the actual manufacturer and the seller of the finished product is not equipped to make the same type of inspection as the manufacturer. For example, if, in our hypothetical portable reactor situation, the defective part was an electronic control mechanism for the reactor and if that mechanism bore the trade-name of *Y* after assembly of the reactor by *X*, it would seem that *X* may avoid liability if his selection of *Y's* product was reasonable and if he made reasonable inspections. The extent of the inspection required of *X*, of course, might be substantially less than that required of *Y* for it might not be readily possible to disassemble the device, and, furthermore, *X* may not be required to hold himself forth as an expert in electronic mechanisms. However, because of the dangerous qualities of reactors, the standard of care required of *X* would undoubtedly be higher than that encountered in respect to ordinary industrial products. In our survey of product liability cases, we have not

[94] *Supra* note 20.

[95] See also Willey v. Fyrogas Co., 363 Mo. 406, 251 S.W.2d 635 (1952); Sullivan v. Manhattan Market Co., 251 Mass. 395, 146 N.E. 673 (1925).

[96] Smith v. Peerless Glass Co., 259 N.Y. 292, 181 N.E. 576 (1932); Martin v. Studebaker Corp., 102 N.J.L. 612, 133 Atl. 384 (1926).

[97] James, *supra* note 18 at 192, 215. See cases cited therein at n. 142.

discovered any case defining the liability of the manufacturer where the defective part was a separate product assembled into the finished product with the original manufacturer's label attached. Therefore the possible effect of this fact upon liability remains conjectural.

It is clear, however, that the failure of any subsequent handler of the product to fulfill his duty to inspect will not prevent a prior handler who also had the duty to inspect from being held liable for his negligence. In *Willey* v. *Fyrogas Co.*,[98] the plaintiff's husband was killed in attempting to light a gas heater because a defective valve caused an explosion. The manufacturer of the valve, the manufacturer of the finished product, the wholesaler, and the retailer were all joined as defendants. The valve manufacturer and the manufacturer of the finished product both argued that they were not liable because of the custom in the trade for the retailer to make further tests at the time of installation. The valve manufacturer further argued that the manufacturer of the gas heater made tests that should eliminate his liability. The court stated:

> . . . The retailer's duty to test or his negligence in making tests certainly does not discharge the manufacturer's duty to also test and inspect and is not a defense to the manufacturer's negligence in constructing the article or in failing to properly test and inspect it. . . . The failure of the vendee to properly inspect and test is within the foreseeable risk of the manufacturer.[99]

The valve manufacturer, the gas-heater manufacturer, and the retailer were held jointly liable. The wholesaler was not held liable since he merely warehoused the heaters in their original crates until retail orders were received. Therefore, subsequent negligent acts by others in merchandising processes from the supplier of raw materials to the retailer will not immunize a prior handler or supplier from liability.

A more difficult question is whether negligence on the part of the purchaser or user of the product will permit the supplier to avoid liability for his negligence. In those states not following comparative negligence rules, it is generally recognized that contributory negligence and assumption of risk are defenses against liability even where negligence has been established on the part of the defendant.[100] It is impossible for us to

[98] 363 Mo. 406, 251 S.W.2d 635 (1952).

[99] *Id.* at 421. See also Foley v. Pittsburgh-Des Moines Co., 363 Pa. 1, 68 A.2d 517 (1949), and Moran v. Pittsburgh-Des Moines Steel Co., 166 F.2d 908 (1948), discussed *infra*.

[100] See Prosser, Torts c. 10 (2d ed. 1955).

consider the innumerable cases involving these defenses in negligence actions in this study, but it should be pointed out that in the product liability cases, Dean Prosser's statement that the courts are becoming more reluctant to find contributory negligence as a matter of law and that juries are "notoriously inclined" to enter verdicts for the plaintiff where there has been evidence of contributory negligence [101] appears accurate.[102] Representative of the possible obstacles to reliance on the defense of contributory negligence where radiation injuries are involved is the case of *O'Connell* v. *Westinghouse X-ray Co., Inc.*[103] There the plaintiff, an experienced surgeon, claimed negligence on the part of the manufacturer of an X-ray machine for failure to explain the proper method of using the machine and for failure to provide a guard. The plaintiff, who did not witness the demonstration of the machine, thereafter used it during operations and suffered severe burning leading to the loss of three fingers. He also offered evidence that the condition was progressively deteriorating and that further amputations would be necessary. The jury returned a verdict against the manufacturer for $100,000 which was sustained by the trial court.[104] On appeal, the Appellate Division found that the surgeon was contributorily negligent as a matter of law, stating:

> It may be doubted that the truth is that plaintiff, a surgeon who had some experience with X-ray works, was ignorant of the fact that the nearer the hand is placed to the source of the X-ray beam, the greater the intensity of the beam falling upon the hand. But that is plaintiff's own claim, and it cannot be disregarded. If the purpose of the testimony is to lay the basis for a legal contention that a surgeon who works on bones under a fluoroscopic machine is not charged in law with knowledge of the factors determining intensity of effect upon the body, and that the surgeon is entitled to rest upon the same degree of ignorance as a layman, then it must be held that even a layman who attempts to set a fracture under a fluoroscopic machine without knowledge that intensity varies with distance is chargeable with contributory negligence as a matter of law.

[101] *Id.* at 296.

[102] See *e.g.*, Pezzo v. Paterno, 277 App. Div. 496, 101 N.Y.S.2d 391 (1950), *rev.* 302 N.Y. 884, 100 N.E.2d 176 (1951), where the jury returned a verdict for the plaintiff, the Appellate Division of the Supreme Court reversed on the ground that there was contributory negligence as a matter of law, and the New York Court of Appeals reversed the Appellate Division stating that the submission of the issue of contributory negligence to the jury was proper.

[103] 16 N.Y.S.2d 54 (1939), *rev.* 261 App. Div. 8, 24 N.Y.S.2d 268 (1940), *rev.* 288 N.Y. 486, 41 N.E.2d 177 (1942).

[104] 16 N.Y.S.2d 54 (1939).

> The evidence in plaintiff's case not only fails to establish his freedom from negligence, but establishes affirmatively as a matter of law that he was heedless of his own safety.[105]

Despite the rather positive assertions of contributory negligence on the part of the surgeon by the Appellate Division, the Court of Appeals reversed, ordering a new trial.[106] The difficulties involved for suppliers of devices that create radiation hazards are obvious. Even where knowledge of the danger may be assumed for persons in the same general class as the plaintiff, the supplier cannot escape liability if the plaintiff can show the absence of knowledge on his part and hence contributory negligence cannot be established.

The product liability cases where the plaintiff is a third person and there is evidence of negligence by the purchaser or user are even less susceptible to strict legal analysis. The problem is usually presented to the jury in terms of "proximate cause," but often this concept embraces the issue of duty and the standard of conduct.[107] Again, in the product liability cases there is a marked tendency to find that the intervening negligence was foreseeable so that the supplier is not relieved from liability.

Consider the following hypothetical atomic energy fact situations:

1. *A* supplies a container for radioactive material which is defectively constructed so that even a slight impact will cause it to break. *B*, in transporting cobalt 60 in the container, negligently drives the truck into a viaduct. *C*, a bystander, suffers radiation injuries. Is *A* liable to *C*?

2. *X* supplies a reactor control mechanism which is defective. *Y*, the reactor operator, negligently permits an increase in power level and the control mechanism fails causing a release of radiation injuring *Z*. Is *X* liable to *Z*?

In both cases, it should be noted that the suppliers may be able to defend successfully against suits by *B* and *Y* if the court or jury find they are guilty of contributory negligence as a matter of law or fact. However, *A* and *C* may nonetheless recover from the suppliers for the intervening

[105] 24 N.Y.S.2d at 270-271 (1940). Another issue involved was the nature of the negligence of the manufacturer in respect to the guard. The court pointed out that the omission of the guard was intentional since the purchaser wanted to keep down the price of his gift to the hospital of the machine. This fact situation alone, absent other allegations of negligence, raises the difficult question of what the supplier must provide from the standpoint of safety of radiation devices even though the purchaser does not want to pay the additional costs.

[106] 288 N.Y. 486, 41 N.E.2d 177 (1942).

[107] See Prosser, Torts c. 9 (2d ed. 1955).

negligence may be considered foreseeable so that a jury determination that *A*'s and *X*'s negligence was the "proximate cause" will be sustained. An example of cases involving a similar fact situation is *Benton* v. *Sloss*.[108] In that case the defendant used-car dealer obtained a partial down payment for a car from a minor and permitted the minor to take possession. The minor's father refused to sign the sales contract and told the minor to return the car. After two unsuccessful attempts to return it, the minor took the plaintiffs for a ride, and he raced with another car. When a car coming from the opposite direction suddenly appeared above a rise in the road, the minor tried to use the brakes, but only the right brake worked. The car was thrown off the highway into a telephone pole, thereby injuring the plaintiffs. They recovered judgments in the trial court against both the minor and the used-car dealer. In sustaining the judgment against the used-car dealer the Supreme Court of California stated:

> . . . [The minor's] negligent driving was unquestionably a cause of plaintiffs' injuries. . . . [The dealer's] negligence was also a cause of those injuries, if it was a substantial factor in bringing them about. . . . In the light of the evidence [the jury] could reasonably conclude that because of the defective brakes [the minor] could not avoid the collision. . . .
>
> . . . The negligent conduct of [the minor] did not relieve [the dealer] from liability, for the likelihood of negligent operation of the vehicle was one of the hazards that [the dealer] could reasonably foresee.[109]

The conclusion to be drawn would seem to be that suppliers must accept the risk that the extent of the injuries resulting from their own negligence may be increased by subsequent negligent acts of the purchaser or user of the products. Intervening negligence is often found to be "foreseeable," and the determination of the issue is left to the juries under the nebulous concept of "proximate cause."

There remains for discussion the possibility that all or a part of the economic loss suffered as a result of a judgment against a product supplier may be shifted. The incidence of economic loss may be shifted by contractual arrangements or, absent express agreement, by the operation of certain legal factors. The former includes express agreements between the seller and the purchaser under which the purchaser of the product promises to reimburse the seller for any losses that he may suffer for damages based upon defects in the product. It would also include

[108] 38 Cal.2d 399, 240 P.2d 575 (1952).
[109] *Id.* at 405.

insurance. These pose no especially unique legal problems for atomic energy suppliers except that they may afford no real protection if the assets of the purchaser are insufficient to cover the liability or where the insurance coverage is limited in amount. However, atomic energy suppliers should explore these possibilities in conjunction with their sales. There is already some indication that "save harmless" clauses are becoming standard practice in the atomic energy field.

The possibility of shifting the economic loss suffered as a result of satisfying a judgment by seeking recovery of all or part of the moneys paid to the injured from other persons is more tenuous. If two or more suppliers of the same chattel, such as a part manufacturer, the assembler, the wholesaler, and the retailer, are held jointly liable for a breach of duty, such as the duty to inspect, in the same action, the plaintiff may seek satisfaction of his judgment from one or all. If the plaintiff collects the judgment from only one of the defendants, that defendant may seek contribution from the others who were held jointly liable. However, contribution is not generally available unless there is statutory authority.[110] A discussion of the applicability of the statutes authorizing contribution in various fact situations is beyond the scope of this study, but the supplier who suffers the economic loss involved in a judgment should investigate the potentialities of having others share the loss.

Indemnity may also be available as a possible means of shifting the entire loss where negligent acts of others occur either prior or subsequent to the negligence of the person held liable to an injured person. The law concerning indemnity, however, is highly confusing,[111] and for some inexplicable reason there is a paucity of cases dealing with attempts by suppliers to seek recoveries from others whose negligence may have caused the injury. The Restatement of the Law of Restitution contains the following:

> Where a person has supplied to another a chattel which because of the supplier's negligence or other fault is dangerously defective for the use for which it is supplied and both have become liable in tort to a third person injured by such use, the supplier is under a duty to indemnify the other for expenditures properly made in discharge of the claim of the third person, if the other used or disposed of the chattel in reliance upon

[110] See Davis, "Indemnity Between Negligent Tortfeasors: A Proposed Rationale," 37 Iowa L. Rev. 517 (1952).

[111] Bohlen, "Contribution and Indemnity Between Tortfeasors," 21 Cornell L.Q. 552 (1936), 22 Cornell L.Q. 469 (1937); Hodges, "Contribution and Indemnity Among Tortfeasors," 26 Tex. L. Rev. 150 (1947); Note, "Contribution and Indemnity Among Tortfeasors in Minnesota," 37 Minn. L. Rev. 470 (1953); Davis, *supra* note 110.

> the supplier's care and if, as between the two, such reliance was justifiable.[112]

Most of the cases cited by the Reporters for this proposition, however, have dealt with the right to indemnity of the purchaser-owner from the supplier.[113] Nonetheless, the principle involved should be equally applicable to indemnity by the retailer against the manufacturer, etc. In food product cases where under warranty doctrines a type of strict liability may be imposed against the retailer, indemnity has been allowed against the wholesaler and by the wholesaler against the packer.[114] In two recent cases, manufacturer-assemblers have been unsuccessful in recovering from their suppliers for defective parts or materials, apparently on the ground that reliance on the prior supplier was not justifiable. In *Heath* v. *Channel Lumber Co.*[115] the manufacturer of a ladder settled for $57,500 a claim for injuries sustained by a workman when the ladder broke. The manufacturer then sought indemnity for breach of warranty from the lumber supplier who supplied fir instead of hemlock as ordered by the manufacturer. The court refused indemnity on the ground that the plaintiff did not prove that the "efficient cause of the structural failure of the ladder was that one of its railings was fir and not hemlock without which circumstance the ladder would not have broken." [116] Similarly in *Maryland Casualty Co.* v. *Independent Metal Products Co.*[117] the plaintiff insurer, as subrogee of the manufacturer-assembler of the finished product, sought to recover the damages recovered by a third person on the theory that it was the defendant part supplier's negligence in manufacturing a tank for a truck trailer which caused the injury. The claim for indemnity was disallowed apparently because the insured Fruehauf Trailer Company actively supervised the supplier's work and because actual negligence could not be established although it seems that the injured person had no difficulty with this issue in the prior litigation.[118] Indemnity, therefore, appears to be only a

[112] Restatement, Restitution §93(1) (1937).

[113] See Seavey and Scott, Notes on Restatement of Restitution §93 (1937).

[114] See *e.g.*, McSpedon v. Kunz, 271 N.Y. 131, 2 N.E.2d 513 (1936); Hughes Provision Co. v. La Mear Poultry & Egg Co., 242 S.W.2d 285 (Mo. App. 1951). See also Annotation, "Recovery for loss of business resulting from resale of unwholesome food or beverages furnished by another." 17 A.L.R. 2d 1379 (1951).

[115] 25 N.J. Super. 6, 95 A.2d 425 (1953).

[116] 95 A.2d at 429.

[117] 99 F. Supp. 862 (1951), 203 F.2d 838 (1953).

[118] The difficulties in obtaining indemnity suggest that it may be advisable to have prior suppliers or subsequent vendees joined in the original action as defendants. In the Independent Metal Products Co. case, Fruehauf did tender the defense of the original action to the supplier, but he refused to accept. "Vouching in" practice should

remote possibility, but it exists and its possibilities should be explored by atomic energy suppliers in specific cases where there has been prior or subsequent negligence by other suppliers connected with the same chattel.

In summary, negligence by others may immunize product suppliers from liability, the most significant factor being, of course, contributory negligence on the part of the injured person. In addition, negligence by others, either prior or subsequent to the negligence of the product supplier, may offer the possibility of obtaining reimbursement of sums paid to satisfy claims of the injured. However, it appears that to date attempts to obtain reimbursement under indemnity theories have not been too effectual. For the product supplier to atomic energy industry, the most practicable approaches appear to be to obtain express agreements from purchasers or to purchase comprehensive insurance coverage.

i. Problems of Proof

In the atomic product liability field, as applied to atomic energy industry, some of the most unique problems are encountered in respect to the making of proof. As pointed out previously, the very nature of radiation injuries makes it difficult to prove causation in fact,[119] and there are the innumerable unique problems of proof connected with cumulative injuries, intervening causes, and peculiar injuries, such as genetic damage and shortened life span. All of these will appear in product liability cases and solutions similar to those evolved for other negligence situations will undoubtedly be evolved by the courts. In product liability cases involving negligence doctrines the plaintiff must show that an injury occurred because of the condition of the product, that the condition was unreasonably dangerous, and that the condition resulted from the defendant's negligence.[120] Each of these essential proof requirements may prove to be insurmountable obstacles to the plaintiff in atomic energy cases. In a highly scientific field it will frequently be extremely difficult for an injured person to prove that it was a defective product that caused a radiation injury. Possibly only the most exacting investigation would reveal the nature of a product defect that may have caused a reactor melt-down. Moreover, the accident may destroy the evidence of the defect. Even assuming that the injury may be traced to a defec-

be carefully scrutinized for its possible effects. For a recent case in which General Motors attempted unsuccessfully to have a retailer joined as defendant for its failure to inspect the brakes so that General Motors could avoid liability, see Birdsong et al. v. General Motors Corp., 99 F. Supp. 163 (1951).

[119] See Chapter III, *supra*.

[120] James, *supra* note 18 at 68-77.

tive product, the plaintiff may have difficulty in establishing the negligence of the supplier. Atomic science is undergoing almost daily change, and many theories are being subjected to complete reanalysis. Proof of reliance upon the best known existing methods may prevent the case from going to the jury because it may be impossible for the plaintiff to establish the precise nature of the standard of care which the defendant should have exercised in connection with the product.[121] If the product or the processes in which the product is used are complex, proof of negligent acts will be especially difficult. Moreover, proof of governmental inspection and certification, which may often be available for atomic energy installations and particularly in respect to reactors, may be offered as proof of the exercise of reasonable care, and hence freedom of negligence on the part of the supplier.[122] On the other hand, the doctrine of *res ipsa loquitur* may assist the plaintiff in establishing negligence on the part of a supplier. Although it is impossible in this study to explore fully the implications of the doctrine, a brief discussion of its use in a few cases will demonstrate its possibilities for assisting to establish negligence by suppliers of chattels.

In general discussions of *res ipsa loquitur* one of the stated requirements is that the defendant must have had exclusive control over the instrumentality causing the injury. Literal application of this requirement would prevent application of the doctrine in product liability cases involving suppliers once the product has passed into the hands of the purchaser or user. Although some courts have held that the doctrine was not applicable in such cases,[123] the modern and more commonly accepted view is that exclusive control by the defendant at the time of the accident is not essential. Thus, in *Gordon* v. *Aztec Brewing Co.*[124] *res ipsa loquitur* was applied against the bottler of the beverage in a case in which the explosion of the bottle caused damage to the plaintiff notwithstanding the fact that intermediate handlers had been in control of the product after it had left the possession of the bottler.[125] Moreover, the doctrine has been applied in product liability cases against multiple de-

[121] For an interesting analysis of the possible liability of Cutter Laboratories for the recent polio vaccine deaths indicating that negligence probably cannot be established, see Note, "The Cutter Polio Vaccine Incident: A Case Study of Manufacturers' Liability Without Fault in Tort and Warranty," 65 Yale L.J. 262 (1955).

[122] For a discussion of the possible effects of inspection and certification as a defense in the aircraft industry, see Hotchkiss, "Aircraft Manufacturers' Liability and the Civil Aeronautics Act of 1938," 16 Geo. Wash. L. Rev. 469 (1948).

[123] See *e.g.*, Kilgore v. Shepard Co., 52 R.I. 151, 158 Atl. 720 (1932).

[124] 33 Cal.2d 514, 203 P.2d 522 (1949).

[125] See also Escola v. Coca Cola Bottling Co., 24 Cal.2d 453, 150 P.2d 436 (1944).

fendants. In *Nichols* v. *Nold*[126] *res ipsa loquitur* was employed by the plaintiff who was injured by an exploding bottle to establish liability against the bottler, the distributor, and the retailer of a carbonated beverage. Furthermore, as in other negligence cases, the inference of negligence established by the doctrine is extremely difficult to refute. For example, in *Ortego* v. *Nehi Bottling Works*[127] the defendant offered considerable evidence tending to prove that because of the extreme precautions taken there was no negligence on its part. Nonetheless, the inference of negligence based upon application of *res ipsa loquitur* was deemed sufficient to sustain the verdict against the bottler. The Louisiana Supreme Court, in commenting on this evidence, stated:

> In fact [the defendants] are so strenuous in their arguments and the proof adduced to sustain the same that if it were not for the fact that the bottle in this case did actually explode without the touch of human hands, we would have no other recourse than to hold that the bottle did not in fact explode.[128]

In addition, *res ipsa loquitur* has been employed against suppliers of chattels even where the product has been in use for an extended period by the purchaser. In *Ryan* v. *Zweck-Wollenberg Company*[129] the plaintiff sought recovery from the retailer and the manufacturer of a refrigerator (Philco Corporation) for injuries suffered from electrical shock received when she placed one hand on the refrigerator and the other on a stove. The injuries were sustained in the spring of 1952, but the refrigerator had been purchased by the plaintiff's daughter in the spring of 1949. Moreover, in the interim the purchaser had moved the refrigerator from one community to another. Nonetheless, *res ipsa loquitur* was held to be applicable, reliance being placed on the fact that the defect was in a "sealed unit." The Wisconsin Supreme Court stated:

> Because of the fact that the refrigerator in the instant case had passed out of the possession of the defendant manufacturer approximately three years prior to the accident, Philco maintains that the principle of *res ipsa loquitur* cannot be invoked in behalf of the plaintiff to establish Philco's negligence inasmuch as the refrigerator was not within the exclusive control of Philco. If the refrigerator were a machine or appliance, such as an automobile or sewing machine, the moving parts of which are capable of being operated by the user, defendant's point would be well taken. In case of injury resulting from the use of such a machine the inference would be

[126] 174 Kan. 613, 258 P.2d 317 (1953).
[127] 199 La. 599, 6 S.2d 677 (1942).
[128] *Id.* at 607.
[129] 266 Wis. 630, 64 N.W.2d 226 (1954).

just as strong that the defect causing the injury occurred as the result of the operator's use as would the inference that the same was due to some defect in manufacture, and therefore the principle of *res ipsa loquitur* would not be applicable.

However, the operating mechanism of the refrigerator in question, consisting of the motor and compressor, was hermetically sealed within a metal inclosure and is commonly referred to as a "sealed unit." The evidence in the record shows that the sealed unit of the refrigerator causing plaintiff's injury was never opened or tampered with by anyone from the time the refrigerator was removed from its original shipping crate in which Philco had shipped the same, to the time of trial. There was nothing in connection with such sealed unit for the users of the refrigerator to operate. In the use of the refrigerator all that was done was to plug the electric cord of the refrigerator into one of the electric outlets forming part of the wiring system of the home. The testimony in the case definitely established that there was nothing in connection with the wiring of the refrigerator outside of the sealed unit which could have caused a short circuit. On the other hand, the evidence is undisputed that plaintiff did receive a severe electric shock as a result of a short circuit in the refrigerator. The inference, therefore, is almost inescapable that something inside of the sealed unit must have gone wrong to have caused such short circuit.[130]

The conclusion to be adduced by atomic energy suppliers from the application of *res ipsa loquitur* in product liability cases is perhaps abundantly obvious. It apparently will be difficult to avoid application of the doctrine, particularly where the product may be described as "inherently dangerous." If the doctrine is applied, the plaintiff's burden in establishing negligence by the supplier is diminished considerably. In fact, it may even be argued that the application of *res ipsa loquitur* amounts in its effect to the imposition of strict liability in the particular case. Therefore, *res ipsa loquitur* may serve as a method of removing the substantial difficulties confronting a plaintiff who suffers radiation damage in proving negligence by suppliers of chattels.

j. Summary

Throughout this discussion of liability of suppliers under general negligence doctrines two themes predominate so far as atomic energy

[130] *Id.* at 639-640. See also Peterson v. Minnesota Power & Light Co., 207 Minn. 387, 291 N.W. 705 (1940). But compare Jastrzembski v. General Motors Corp., 100 F. Supp. 465 (1951), in which the court thought several months use of a car prevented application of *res ipsa loquitur* to injuries caused by a defect in an automobile transmission because it was subjected to outside forces, namely use or abuse by the owner.

suppliers are concerned. First, general negligence doctrines are available as a basis for imposing liability, especially where the product can be described as "inherently" or "imminently" dangerous, which will often, if not normally, be the case where radiation injuries are involved. Second, the unusual scope of potential liability in a reactor disaster situation creates serious risks for the supplier since a single accident may destroy his business assets unless the potential economic losses can be avoided by insurance coverage, by other legal devices, or through indemnification under the recent amendments of the Atomic Energy Act, discussed below. Conversely, for those suffering injuries as a result of defects in atomic energy products, it will be difficult to prove negligence by suppliers because of the uncertain and constantly changing state of scientific knowledge and because it will often be difficult to prove in fact that radiation caused a particular injury.

3. Warranties

a. Express and Implied Warranties

Although warranty is generally considered today to be based on contract theory, it was originally based upon tort, and it still retains many tort elements.[181] For suppliers an important factor is that a breach of warranty results in the imposition of strict liability so that it is not necessary for the injured to prove negligence. Warranties may take one of two forms—either express or implied, and both are defined in most jurisdictions by legislative enactments of either the Uniform Sales Act or the Uniform Commercial Code.[182] The Uniform Sales Act defines an express warranty as follows:

> Any affirmation of fact or any promise by the seller relating to the goods is an express warranty if the natural tendency of such affirmation or promise is to induce the buyer to purchase the goods, and if the buyer purchases the goods relying thereon. No affirmation of the value of the goods, nor any statement purporting to be a statement of the seller's opinion only shall be construed as a warranty.[183]

The Uniform Commercial Code contains substantially the same definition.[184] What amounts to an express warranty in particular fact situa-

[181] 1 Williston, Sales §§195, 196 (Rev. ed. 1948).

[182] The Uniform Sales Act has been adopted in 36 jurisdictions and the Uniform Commercial Code is now operative in Pennsylvania. The Commercial Code has also been adopted, although not yet operative, in Massachusetts and Kentucky.

[183] Uniform Sales Act §12.

[184] Uniform Commercial Code §2-313.

tions has been the subject of considerable litigation.[135] In this study we cannot undertake a detailed analysis of the many problems involved in determining the existence of an express warranty. However, since express warranties may result in the imposition of strict liability, caution should be exercised by atomic energy suppliers during the negotiations for sales of products and in the drafting of sales agreements. In addition, atomic energy suppliers who wish to avoid liability on the basis of breach of express warranty should exercise care in the preparation of advertising circulars and literature. In some cases, the advertising representations have been characterized as warranties extending even to those not in privity with the advertiser.[136] For example, in *Bahlman* v. *Hudson Motor Car Co.*[137] the defendant had issued advertising matter representing that its car had a seamless roof. The plaintiff claimed reliance on this statement in purchasing the car from a dealer. He claimed damages for head lacerations received when the car overturned; the injury being caused by jagged edges along a welded seam in the roof. The court held the car manufacturer liable, even though it was conceded that the purchaser was negligent in operating the car, on the ground that the "defendant's representations amounted to express warranties of quality and construction." [138] Once express warranty was found, the court had no difficulty in dispensing with contributory negligence as a defense since warranty doctrines impose strict liability, the only question being whether the breach was the "proximate cause" of the injuries.[139]

In contrast with express warranties, over which the seller has a large degree of control, warranties are often implied even though the seller has apparently attempted to avoid all warranties in respect to his product. Once again it is impossible for us to consider the many ramifications of implied warranties,[140] but the statutory treatment is, of course, significant. The Uniform Sales Act provides:

> Subject to the provisions of this act and of any statute in that behalf, there is no implied warranty or condition as to

[135] See 1 Williston, Sales c. VIII (Rev. ed. 1948).

[136] See Rogers v. Toni Home Permanent Co., 167 Ohio St. 224, 147 N.E.2d 612 (1958).

[137] 290 Mich. 683, 288 N.W. 309 (1939).

[138] *Id.* at 690.

[139] See also Baxter v. Ford Motor Co., *supra* note 73, which may also be characterized as an express warranty case.

[140] See 1 Williston, Sales c. IX (Rev. ed. 1948); Amram and Goodman, "Some Problems in the Law of Implied Warranty," 3 Syracuse L. Rev. 259 (1952).

the quality or fitness for any particular purpose of goods supplied under a contract to sell or a sale, except as follows:

(1) Where the buyer, expressly or by implication, makes known to the seller the particular purpose for which the goods are required, and it appears that the buyer relies on the seller's skill or judgment (whether he be the grower or manufacturer or not), there is an implied warranty that the goods shall be reasonably fit for such purpose.

(2) Where the goods are bought by description from a seller who deals in goods of that description (whether he be the grower or manufacturer or not), there is an implied warranty that the goods shall be of merchantable quality.

(3) If the buyer has examined the goods, there is no implied warranty as regards defects which such examination ought to have revealed.

(4) In the case of a contract to sell or a sale of a specified article under its patent or other trade name, there is no implied warranty as to its fitness for any particular purpose.

(5) An implied warranty or condition as to the quality or fitness for a particular purpose may be annexed by the usage of trade.

(6) An express warranty or condition does not negative a warranty or condition implied under this act unless inconsistent therewith.[141]

The Uniform Commercial Code has broadened the implied warranty provisions slightly, but the same general types of implied warranties remain.[142] The possibility that implied warranties of fitness and merchantability under the statutes may expose atomic energy suppliers to strict liability is apparent. Furthermore, it can readily be understood from examination of the statutory language why the plaintiffs in product liability cases often plead both negligence and breach of warranty with the result that many cases are disposed of under warranty doctrines.[143]

The availability of implied warranty theories to establish liability of suppliers of chattels, however, is limited by a number of technical requirements. By far the most drastic limitation is the requirement of

[141] Uniform Sales Act §15.

[142] Uniform Commercial Code §§2-314, 2-315.

[143] A recent Georgia statute, Ga. Laws, 1957, Act 342, provides:

> The manufacturer of any personal property sold as new property, either directly or through wholesale or retail dealers, or any other person, shall warrant the following to the ultimate consumer, who, however, must exercise caution when purchasing to detect defects, and, provided there is no express covenant of warranty and no agreement to the contrary:
>
> 1. The article sold is merchantable and reasonably suited to the use intended.
>
> 2. The manufacturer knows of no latent defects undisclosed.

"privity of contract." Although we have seen that privity is no longer an essential element under negligence doctrines, implied warranty doctrine is not available to persons not parties to the contracts in a majority of jurisdictions.[144] Moreover, there are a number of potential pitfalls even for those in privity, such as the requirement of notice to the seller within a reasonable time after the breach, the possible selection of an inadequate remedy, and the necessity of showing reliance on the seller.[145]

However, in nearly one-third of the states the privity requirement has been abandoned in respect to food, drugs, and economic poisons.[146] Thus, there appears to be a development in the law of implied warranty corresponding to that in negligence law in that the privity requirement is being relaxed where the product is "imminently dangerous." A representative case is *Burr et al.* v. *Sherwin-Williams Co. of California.*[147] There the plaintiff sought recovery for damage to his cotton crop sustained from spraying the crop with a chemical, supplied by the defendant, which apparently contained 2-4-D, a weedkiller. The plaintiff alleged both negligence and breach of implied warranty. The trial court, after reading the provisions of the Sales Act, gave the following instruction to the jury:

> If you decide that any of the provisions of the code section . . . are applicable, and further decide that an implied warranty was made by the manufacturer, that warranty runs with the goods to the ultimate consumer, there being no requirement of privity of contract between the ultimate consumer and the manufacturer. And if you further find that the manufacturer breached such warranty, then it is liable for the damage caused by such breach, regardless of negligence.[148]

The California District Court of Appeals, after holding that the doctrine of *res ipsa loquitur* was applicable in respect to the cause of action based on negligence, concluded that the trial court's instruction was proper. Although the affirmation of the jury verdict was justified on grounds of negligence, the approval of the jury instruction on warranty indicates the willingness of the court to relax the requirements of privity when dealing with "imminently dangerous" articles.

[144] See James, *supra* note 18 at 192, 193-196, and cases cited therein.

[145] For an excellent discussion of these requirements in relation to product liability, see James, *supra* note 18 at 196-205. Also see 1 Williston, Sales c. IX (Rev. ed. 1948); Prosser, "The Implied Warranty of Merchantable Quality," 27 Minn. L. Rev. 117 (1943).

[146] Prosser, Torts §84, p. 507 (2d ed. 1955).

[147] (Cal. App.) 258 P.2d 58 (1953).

[148] 258 P.2d at 64.

The Supreme Court of Kansas also has allowed recovery under implied warranty doctrines in the absence of privity. In *Graham* v. *Bottenfield's Inc.*[149] the plaintiff was injured by a hair preparation which was purchased by the defendant distributor corporation from the manufacturer and was sold in the original container to a beautician who applied it to the plaintiff's hair. The plaintiff sought recovery for breach of an implied warranty of fitness. The defendant distributor defended on the grounds of no privity of contract and on the ground that it had no duty to test the product. The court, in holding that plaintiff could recover for breach of the implied warranty, discussed the food cases and stated:

> If the reasons . . . for recognizing the exceptions to the general rule of the common law are to be followed and adhered to we are forced to agree there is merit in appellee's position that there is just as much reason for holding public policy, which it is to be noted is the basic foundation for the imposition of liability under the doctrine of implied warranty . . . , requires, that a manufacturer, jobber or distributor who sells [hair preparations] . . . impliedly warrants that preparation as suited and fit for use . . . as there is for holding that food manufactured and sold for domestic consumption is impliedly warranted as wholesome and fit for that purpose or that glass bottles when sold and/or delivered in connection with the sale of liquid beverages are impliedly warranted to be in a safe and nonexplosive condition. Therefore, on the basis of the reasoning of such decisions and what is there said and held, consistency requires and we feel constrained to hold the scope of the exception to the common law rule of *caveat emptor* . . . should be extended to include sales of the product here in question.[150]

Despite the extensions of the implied warranty doctrine to cover those not in privity in the food, drug, economic poisons, and cosmetic cases, the courts have been reluctant to allow the use of implied warranty in connection with other products. For example, in *Wood* v. *General Electric Co.*[151] where the plaintiff sought to recover damages for a fire

[149] 176 Kan. 68, 269 P.2d 413 (1954).

[150] *Id.* at 74. See also DiVello v. Gardner Machine Co., 102 N.E.2d 289, 293 (Com Pleas Ohio, 1951): ". . .[T]his court is of the opinion that the sale of the grinding wheel carried with it an implied warranty of merchantability and fit for the usages designed and that such warranty extended to the workman of the vendee who was injured in its ordinary use because of a latent defect and in the absence of contributory negligence such workman could recover on the basis of a breach of warranty against the party who sold the wheel to his employer."

[151] 159 Ohio St. 273, 112 N.E.2d 8(1953).

caused by a defect in an electric blanket manufactured by the defendant on both theories of negligence and breach of implied warranty, the Supreme Court of Ohio held that the implied warranty doctrine was not available, stating:

> Although a subpurchaser of an inherently dangerous article may recover from its manufacturer for negligence, in making and furnishing of the article, causing harm to the subpurchaser or his property from a latent defect therein, no action may be maintained against such manufacturer by such subpurchaser for such harm, based upon implied warranty of fitness of the article so purchased. . . . Here, there was no such privity and hence no implied warranty upon the part of General Electric and no valid issue on that subject.[152]

Nonetheless, the parallel history of recovery for negligence seems to indicate further extensions of implied warranty doctrines in the product liability field. For those atomic energy products that fall into the category of food, drugs, or economic poisons, such as radioactive materials that are to be used upon humans for medical tests or therapy, implied warranty will be available to those injured by a defect in the product. Other atomic energy products will escape strict liability on implied warranty theories until there are further extensions of existing rules of law. However, the high degree of danger involved in certain atomic energy products and the difficulties for the injured in proving negligence may provide the type of case in which courts initially may allow recovery for breach of implied warranty.

b. Effect of Disclaimers

Since liability under warranty doctrine arises either as a result of express contract provisions or is implied by law as a part of the contract of sale, it is generally recognized that by mutual consent the parties may exclude all warranties, both express and implied.[153] However, in some cases, such agreements have been denied effect on grounds of public policy. This is especially true in the food cases.[154] Moreover, the courts have been reluctant to find an exclusion of warranties unless the language of the sales agreement is absolutely clear.[155] Finally, the courts may

[152] *Id.* at 279.

[153] Both the Uniform Sales Act §71 and the Uniform Commercial Code §2-316 provide that agreements may be made to exclude all express or implied warranties.

[154] See *e.g.*, Linn v. Radio Center Delicatessen, Inc., 169 Misc. 879, 9 N.Y.S.2d 110 (1939).

[155] See Note, 23 Minn. L. Rev. 784 (1939), and cases cited therein; James, "Assumption of Risk," 61 Yale L.J. 141, 162 *et seq.* (1952); James, *supra* note 18 at 192, 210-211.

find a disclaimer of warranties to be ineffective because the purchaser did not have proper notice of its existence, either because it was on the package, on an invoice, in small print, etc.[156] Nonetheless, if care is exercised, atomic energy product manufacturers may make effective use of disclaimers to limit liability under warranty theories.

In addition to disclaiming warranties, the supplier may also, by mutual consent, disclaim any liability on his part under negligence doctrines if public policy does not render the contract provision void. For example, in *Charles Lachman Co., Inc.* v. *Hercules Powder Co., Inc.*[157] the plaintiff sought recovery under negligence doctrines for damages caused to its carpets by use of a chemical manufactured by the defendant. The contract provided, in part: "Seller makes no warranty of any kind, express or implied, except that the materials sold hereunder shall be of Seller's standard quality, and Buyer assumes all risk and liability whatsoever resulting from the use of such materials, whether used singly or in combination with other substances." The court held that the contract provisions were sufficiently broad to preclude recovery under negligence theories,[158] stating:

> The general rule is that one party to a transaction may ordinarily contract to limit or eliminate his liability for negligence in performing his obligations. There is no rule of public policy which makes such provisions ineffective, particularly when the obligee is under no disadvantage by reason of confidential relationship, disability, inexperience or the necessities of the situation. In the present case the parties were both corporations engaged in large scale manufacturing. The plaintiff was under no compulsion to buy from the defendant and, if it desired to buy from it, had the choice of accepting the defendant's terms or going elsewhere.[159]

The court's statement indicates that there may be limitations on contracting away liability for negligence where one party is in a disadvantageous bargaining position. Such has often been found to be the case where public utilities, common carriers, innkeepers, and public warehousemen have attempted to limit liability.[160] However, for many

[156] Note, *supra* note 155 at 795; 1 Corbin, Contracts §33 (1950).

[157] 79 F. Supp. 206 (1948).

[158] See also Shafer v. Reo Motors, Inc., 205 F.2d 685 (1953), where the Lachman case is quoted with approval in holding a truck manufacturer not liable for negligence where the contract provided, in part, that "this Warranty being expressly in lieu of all other Warranties expressed or implied and of all other obligations or liabilities on our part, and we neither assume or authorize any other person to assume for us any liability in connection with the sale of our vehicles."

[159] *Supra* note 157 at 207.

[160] See Prosser, Torts §55, pp. 305-307 (2d ed. 1955), and cases cited therein.

atomic energy suppliers there appears to be no public policy that would render agreements to limit liability void.

However, disclaimers of warranty or liability for negligence will afford only limited protection to atomic energy suppliers in those instances in which a defect in the product leads to a major reactor mishap. The agreement between the supplier and his purchaser will have no effect on liability for negligence to persons not in privity. Even the broadest type of disclaimers of warranties and of liability for negligence will protect the supplier only from claims of injury to the purchaser and his property. They cannot be relied upon as a solution to the problem of the potential large-scale damages for which atomic energy suppliers may be held liable. They may, however, considerably reduce economic losses in those cases where the negligence caused minimal injuries to those not bound by the disclaimer. For example, if a defective control rod causes a reactor melt-down and if all radiation is contained within the building, the liability of the supplier who has the protection of disclaimers will be limited to satisfying the claims of persons irradiated within the building. It will not include the reactor loss. Therefore, the usefulness of disclaimers in the atomic energy industry should not be minimized, provided purchasers will accept the products on the specified terms and conditions.

4. Strict Liability

a. Common Law

It may be argued, and, we believe, quite effectively, that the extension of negligence concepts, the liberal use of *res ipsa loquitur,* the greater willingness to submit cases to juries, and the extension of implied warranty doctrines have carried us very close to the application of strict liability rules in the product liability field. However, with one possible exception, the courts have not as yet applied such rules against the product supplier, and the cases still are analyzed in terms of negligence, misrepresentation, or breach of warranty, even though a number of legal writers appear to urge the imposition of strict liability.[161] The one possible exception is the case of *Chapman Chemical Co.* v. *Taylor*[162] in which 2-4-D weedkiller sprayed from an airplane by a farmer drifted three-quarters of a mile and settled on the plaintiff's cotton crop. The defendant was the manufacturer. Testimony indicated that neither the

[161] See *e.g.,* James, *supra* note 18 at 192, 215; Ehrenzweig, Negligence Without Fault (1951).

[162] 215 Ark. 630, 222 S.W.2d 820 (1949).

manufacturer nor the user knew that 2-4-D had a propensity for floating much larger distances than experienced with other agricultural chemicals. Although the case may be analyzed in terms of negligence, the Arkansas Supreme Court, in holding the manufacturer liable, suggested that strict liability rules applied to the manufacturer by stating:

> We do not think the Chemical Company excused itself from liability by the mere showing that it was unaware of the peculiar carrying quality of the dust it was selling. Ordinary care required that it should know in view of the dangerous nature of the product it was selling, and it was charged with the knowledge which tests would have revealed. The case is therefore one in which the rule of strict liability should be applied.[163]

If other courts apply strict liability rules when dangerous products are involved, many atomic energy suppliers will be faced with potential liabilities that might not exist if only negligence concepts were applied. On the other hand, strict liability rules would assist injured persons in overcoming the difficulties of proving negligence in the highly technical atomic energy field. These difficulties may lead the courts to broaden the application of strict liability in atomic energy cases so that eventually liability in conjunction with any dangerous product may well be established under strict liability doctrines.[164]

b. Under Statutes

Statutes may also be the basis of imposing strict liability in the product liability field or of imposing what amounts to strict liability by the use of presumptions. For example, in many states violation of the pure food and drug laws gives rise to a civil action for damages, and it is not necessary to allege and prove specific negligence or knowledge on the part of the maker or seller.[165] Under such circumstances the basis of liability may be characterized as strict. Also, violation of statutory restrictions is treated as negligence *per se* by some courts while others treat it as creating a presumption of negligence which must be rebutted by the defendant. Only a small minority of courts treat violations of statutes as mere evidence of negligence.[166] Thus, in most jurisdictions

[163] *Id.* at 644. In Gotreaux v. Gary, 94 S.2d 293 (La. 1957), the Supreme Court of Louisiana held the user of 2-4-D liable for damages caused by the drifting of the weedkiller, applying a strict liability doctrine. The manufacturer was not a party to the litigation, however.

[164] See Chapter IV for a discussion of the applicability of strict liability to atomic energy pursuits.

[165] See generally, Prosser, Torts §61, p. 345 (2d ed. 1955).

[166] *Id.* at §34.

statutory violations afford the plaintiff considerable assistance in proving negligence with the result that a type of strict liability may be said to exist in fact. Atomic energy suppliers, therefore, must carefully avoid violations of statutory standards that may be prescribed by the Congress or the state legislatures. Violation of regulations of administrative agencies in most states are apparently treated only as evidence of negligence,[167] but in the atomic energy field the hazards are so unique that perhaps violations of rules of the Atomic Energy Commission or state health agencies may be held to be negligence *per se*. Once again, the atomic energy supplier must exercise utmost care to avoid violations of regulations. The Atomic Energy Act of 1954 gives the Atomic Energy Commission broad rule-making powers to protect the public health and safety [168] and many of the regulations promulgated by the Commission will apply to the activities of atomic energy suppliers.

5. Contractual Indemnification

Because of the magnitude of potential liability of atomic energy product suppliers, there are indications that the suppliers are requiring purchasers to execute sales contracts containing agreements to indemnify and hold the suppliers harmless from any possible liabilities. Such agreements, of course, will afford protection to the supplier only to the extent that the purchaser is able to bear the economic burden, either through insurance or otherwise. If the purchaser is unable to pay the claims of the injured, the supplier must respond in damages to the injured parties. If the federal government has agreed to indemnify the purchaser, the supplier is probably as adequately protected from economic loss as he can expect to be. Furthermore, under the recent governmental indemnity amendments to the Atomic Energy Act, the use of "save harmless" clauses will provide even greater protection to atomic energy suppliers. Therefore, atomic energy suppliers should examine thoroughly the possibilities of indemnity clauses in their sales contracts as a method of shifting the economic loss incurred through a nuclear accident, with the admonition, of course, that indemnity agreements will not insulate the supplier from loss if the purchaser is unable to pay.

6. Conclusion

We have sketched at length the several legal theories under which suppliers of atomic energy products may be held liable for injuries to third

[167] *Ibid.*

[168] Atomic Energy Act of 1954, §161(b).

persons. We feel that it is abundantly clear that, even without further expansions of strict liability doctrines, there are several available legal avenues for imposing liability on atomic energy suppliers. In our society there is a definite trend toward the establishment of enterprise liability in conjunction with the sale of products in our economy. Undoubtedly the major compelling reason for this trend is the fact that the supplier is more likely, than is the injured person, to be able to suffer the economic losses or to take appropriate steps to minimize them. In respect to atomic energy products we can expect a continuation of the trend because of the unusual dangers involved. Therefore, atomic energy suppliers should adopt two courses of action: (1) initiate all necessary and reasonable procedures to assure that their products are incapable of becoming the cause of radiation injuries and (2) take all expedient legal steps either to avoid the imposition of liability or to shift possible economic losses by taking advantage of insurance and other contractual arrangements.

B. Liability of Building Contractors

Persons who design or construct fixtures and buildings expose themselves to liability for injuries to third persons at least during the construction period and possibly thereafter. In respect to atomic energy, the problems of liability during construction of an atomic energy facility are no different than those encountered in respect to any other building activity. Hence they will not be discussed herein. However, we are concerned with liability problems arising after the building contractor of an atomic energy facility has completed performance of his contract. Perhaps these problems can best be brought into focus through the use of hypothetical fact situations. Suppose *X*, a building contractor, builds a reactor building designed by *A* and supposed to be leakproof in case of a reactor mishap. If a reactor accident occurs and radioactive gases leak into the environment causing injuries to third persons, is *X* liable if he followed *A*'s design? Would *X* be liable if he knew that *A*'s design was improper? Would *X* be liable if during construction he made minor variations in the design? Would *X* be liable if the owner accepted knowing of the changes by *X*? Would *X* be liable to third persons if he warned the owner that the design was faulty or that the construction should be inspected periodically? It will be noted that these questions are substantially the same as those we have already considered in the product liability field. The major difference here is that we are dealing with a product which is likely to be large and stationary so that it is treated as real property rather than personalty.

The general rule in the United States appears to be that building contractors are not liable to third parties who may be injured as a result of the contractor's negligence after completion and acceptance of the construction by the owner.[169] Among the various reasons expounded by the courts for the rule are (1) lack of contractual privity between the parties, (2) the owner's intervening negligence as the proximate cause of the injury, (3) lack of foreseeability of injury by the contractor, (4) lack of control by the contractor over the design, and (5) lack of control after completion of the work which prevents the contractor from correcting the defects.[170] It will be noted that most of these reasons no longer have any application in the product liability field although they were once employed to restrict the liability of manufacturers of chattels.

As in the case of the rule of non-liability for defects in chattels supplied by a party not in privity, exceptions have in recent years been made to the general rule in the case of contractors. Thus, where the completed work is turned over to the owner in a condition so negligently defective as to be imminently dangerous to third persons, recovery has been allowed.[171] In *Hale* v. *Depaoli*[172] the builder of a house was held liable for injuries sustained by the daughter of a tenant, when a railing which had been installed eighteen years previously gave way and the child was injured in a fall. An examination of the railing showed that nails too weak for safety had been used. The opinion referred to the doctrine of *MacPherson* v. *Buick Motor Company*[173] as supporting authority, despite the fact that that case concerned only a defective chattel. The court stated that the general rule was one of non-liability, and then proceeded to establish a significant exception, stating first, that when an article is such as to place life and limb in peril when negligently made, it then becomes a "thing of danger," and is subject to a rule of liability under the MacPherson doctrine; and, second, that when the article is of an abnormally dangerous and noxious nature, the rule against liability must give way, even in cases of defects in construction

[169] For an extensive collection of the cases, see Annotation, "Negligence of building or construction contractor as ground of liability upon his part for injury or damage to third person occurring after completion and acceptance of the work," 13 A.L.R.2d 191 (1950).

[170] *Ibid.*

[171] Holmes v. T. M. Strider & Co., 186 Miss. 380, 189 So. 518 (1939), defective guard rail on bridge; Holland Furnace Company v. Nauracaj, 105 Ind. App. 574, 14 N.E.2d 339 (1938), negligent installation of furnace; Davey v. Turner, 55 Ga. App. 786, 191 S.E. 382 (1937), defective gas heater was installed and products of combustion escaping from a hose killed petitioner's daughter.

[172] 33 Cal.2d 228, 201 P.2d 1 (1948).

[173] *Supra* note 20.

or design of structures on land. This has, indeed, great significance for atomic energy industry, because it may herald a blanket application of the rule of liability to third parties against the builders of atomic installations.

While it is commonplace to find general statements in nearly all of the opinions to the effect that the rule is still one of non-liability to third parties, even aside from the widening exceptions, some cases have boldly obliterated all distinctions between chattels and realty and have adopted identical rules of liability both for contractors and suppliers of chattels.

Two recent decisions are likely to figure prominently in cases dealing with the failure of nuclear energy structures and the liability of their constructors or designers. In 1944 a cyclindrical tank, designed, constructed, and installed by the Pittsburgh-Des Moines Steel Company for the purpose of storing liquefied gas, exploded. Many persons were killed or injured and much property damage ensued. Over a hundred claims were filed against the defendant. Two test cases were tried, one in the federal and the other in the Pennsylvania state court. In each case the appellate courts expressly extended the doctrine of manufacturers liability to third parties to cases involving structures.

The federal decision, *Moran* v. *Pittsburgh-Des Moines Steel Company*,[174] was the first one rendered. The plaintiff's decedent, Moran, was an employee of the East Ohio Company, an operating public utility engaged in selling natural gas for both industrial and consumer use in the City of Cleveland. To meet the problem of storing the gas so as to be able to meet the consumer demand, which fluctuated according to the seasons of the year, a plan was worked out whereby the gas was liquefied by subjecting it to temperatures 260° below zero F. The condensation in volume attained by liquefying the gas was so great that 600 cubic feet of natural gas became one cubic foot of liquid gas. The gas remained liquid as long as the temperature was kept at the extremely low level. To contain the liquid gas and to keep it at the low temperature required, steel tanks were placed within outer tanks with cork insulation between them, somewhat like the principle of a thermos bottle. The defendants built three of these tanks and experience with them proved satisfactory. Increased demand for gas led East Ohio to seek further storage space. The defendants contracted to build a new tank with twice the storage space of those first installed. The new tank was cylindrical in design (rather than spherical as the earlier tanks had been) and was completed and installed in May 1943. Thirteen months later it exploded.

[174] 166 F.2d 908 (1948).

The plaintiff presented two alternative theories of recovery. One called for application of the doctrine of strict liability under Ohio law.[175] However, because the structure was not under the control of the defendant at the time of the explosion, the court held that the doctrine of strict liability was not applicable. The second theory was negligence, and the negligence alleged was that the defendants had installed a tank of improper design, made of inferior materials. Conflicting evidence on these subjects was adduced at the trial. The trial court refused to let the case go to the jury and entered an involuntary non-suit. In reversing this action of the trial court, Judge Goodrich, of the Circuit Court of Appeals, stated:

> The second theory of responsibility which the plaintiff urges against the defendants is that the defendants were negligent in the plans for the structure and materials used therein. Before we outline the plaintiff's allegations with regard to negligence there is a legal question to be met. Assume, for the moment, that the plaintiff has alleged and shown negligence on the part of the defendants in planning and erecting the structure. Does their responsibility extend to harm suffered by one in the position of the plaintiff after the structure has been turned over to the purchaser, East Ohio? . . .
>
> The old rule was that the manufacturer of a chattel was not responsible for injuries to others than his immediate vendee. Exceptions grew up to the rule and the whole matter received clarification by the New York Court of Appeals, through Judge Cardozo, in what is now the leading case of Mac Pherson v. Buick Motor Co. This decision puts responsibility for an injury to one operating the car on one who negligently manufactures a part of an automobile, and it is fair to call the decision a landmark in tort law. An examination of the Ohio authorities shows clearly, we think, that the principles upon which MacPherson v. Buick Motor Co. was decided are part of the law of Ohio. They are, likewise, generally, though not universally, accepted in modern law and are adopted in the Restatement of Torts.[176]

Recognizing that the doctrine of *MacPherson* v. *Buick Motor Company* in itself was not enough to sustain the position of the plaintiff, the court went on to explain the development of that doctrine in Ohio:

> We need to find that those courts have taken, or would take, one step more and possibly two. The first step is the manu-

[175] Although the case was tried in the Pennsylvania district the *lex loci delicti* was applicable.

[176] *Id.* at 914-915.

> facturer's or supplier's responsibility, not merely to the ultimate consumer of the article, but to a person in the vicinity of its use who is injured by the manufacturer's lack of due care. This extension of the MacPherson v. Buick Motor Co. doctrine is indicated in the Restatement and is clearly indicated to be the Ohio law in the decision of White Sewing Machine Co. v. Feisel. . . . We have no difficulty, therefore, in finding that the Ohio law imposes liability on a manufacturer, not alone to the ultimate consumer, but to one who might reasonably have been expected to be in the vicinity of the chattel's use.[177]

The second step to which the court alluded was whether or not the doctrine was applicable to cases concerning realty. On this subject Judge Goodrich continued with the statement that:

> We have no doubt that an Ohio court confronted with the question would, in accordance with the development of the law shown in its previous decisions, extend the liability of the manufacturer to negligence involved in building a structure even though that structure was affixed on another's land.[178]

Thus the MacPherson doctrine was extended to impose liability for injuries to third parties other than the purchasers or ultimate users injured as a result of negligence in the construction of a structure usually denominated as realty under property law rules.

The companion case, *Foley* v. *Pittsburgh-Des Moines Steel Co.*,[179] reached the same result by applying the same legal theories. There the trial court had permitted the case to go to the jury on the negligence issue, but when the jury returned a verdict for the plaintiff, the court granted the defendant's motion for judgment notwithstanding the verdict. The Pennsylvania Supreme Court reversed on the same principles as those applied by the federal court. In so doing the court stated that there was no logical basis for a distinction between chattels and realty "and it would obviously be absurd to hold that a manufacturer would be liable if negligent in building a small, readily movable tank which would undoubtedly be a chattel, but not in building an enormously large and correspondingly more potentially dangerous a one that legalistically was classified as realty." [180]

The older rule of non-liability for injuries caused by structures seems to be uniformly followed in England. In a fairly recent case a builder

[177] *Id.* at 915-916.
[178] *Id.* at 916
[179] 363 Pa. 1 (1949).
[180] *Id.* at 34-35.

was held under no duty, either to a future purchaser or to persons who come to live in the house, to take care that it is well constructed and safe. In *Bottomley* v. *Bannister* [181] a boiler had been installed which was heated by a gas burner. No flue was provided to carry the gas outside, and the occupants, husband and wife, were killed by the poisonous gas. The court found negligence, but since the case involved the installation of a structure on realty, the court held the chattel cases inapplicable and recovery was denied. *Donoghue* v. *Stevenson,*[182] the English equivalent of the MacPherson case, raised certain doubts as to the validity of the non-liability rule in the case of building contractors, but a later case, *Otto* v. *Bolton and Norris,*[183] expressly differentiated between chattel suppliers and builders and held the old rule still to be in effect. Certain qualifications were made, however, in the *Otto* case, which although mere dicta may forecast a weakening of the rule of non-liability even in Britain. The court speculated on the result if the rule of liability as stated in the *Stevenson* case should be applied to a case of negligent construction of realty if the defect was not discoverable by the purchaser on a careful inspection. It was the opinion of the court that the *Stevenson* case opened the door to possible liability to third parties when no inspection by the occupant was to be expected or possible. This reasoning could expose the designers and builders of atomic energy installations in England to liability to third parties, if the defect in the construction or design is so hidden that reasonable inspection would not disclose it.

The similarity between the explosion of pressurized gas in steel tanks and the effect of loss of control of nuclear reactors is too clear to escape the notice of the courts in the United States if the issue of liability of a builder of atomic energy installations should ever arise. Even some of the language used in the opinion of the *Moran* case is suggestive of the likely results if a "burn up" of a nuclear reactor should occur. The court noted that the plant was a novel experiment and a "poignant episode in the development of the kind of bold and ingenious engineering for which Americans have become famous," [184] a comment which is particularly apropos in respect to nuclear reactors. Although technically the *Moran* and *Foley* cases could be limited in their future application, the logic of the cases is compelling and can be viewed as the culmination of the slow process of equalization between the cases of suppliers of chattels and those involving builders of structures on land.

[181] (1932) 1 K. B. 458.
[182] (1932) A. C. 562.
[183] (1936) 2 K. B. 46.
[184] Moran v. Pittsburgh-Des Moines Steel Co., 166 F.2d 908 at 911 (1948).

Therefore, these decisions may well represent the law to be applied to atomic energy enterprise with respect to the liability of designers and builders of nuclear installations. If this should be the future development of the law, designers and contractors for real property structures will be held liable under doctrines comparable to those now applied to suppliers of chattels with similar results.

C. Protection Afforded Supplier Under the Indemnification Provisions of the Atomic Energy Act

In 1957 the Atomic Energy Act was amended to place a limitation upon the total public liability of atomic energy entrepreneurs and to provide for governmental indemnification.[185] These provisions, which were discussed in detail in Chapter III, are specifically designed to provide protection for suppliers of chattels, designers, and building contractors whose negligence may possibly result in a radiation accident. The significant provision is the definition of "person indemnified," which reads:

> The term "person indemnified" means the person with whom an indemity agreement is excuted and any other person who may be liable for public liability.

In its report, the Joint Committee on Atomic Energy indicated the applicability of the indemnification provisions to suppliers of chattels by stating:

> The definition "person indemnified" means more than just the person with whom the indemnity agreement is executed. In the case of license this agreement will be executed with the licensee. Where the Commission and a contractor decide to take advantage of the provisions of this act, an indemnity agreement will be executed with the prime contractor. The phrase "person indemnified" also covers any other persons who may be liable. For a licensee for a reactor, this would mean in addition to the licensee that the indemnification extends to such persons as the subcontractors of the licensee, including those responsible for the design and construction of the reactor and the supplying of parts. However, it is not meant to be limited solely to those who may be found liable due to their contractual relationship with the licensee. In the hearings, the question of protecting the public was raised where some unusual incident, such as negligence in maintaining an airplane motor, should cause an airplane to crash into a reactor and thereby cause damage to the public. Under this bill the public is protected and the airplane company can also

[185] Public Law 85-256, Act of Sept. 2, 1957.

> take advantage of the indemnification and other proceedings. The proposed AEC limitation to those in privity with the licensee was reconsidered by the Commission, and the Commission decided to accept the premise of the original bills which would make the person indemnified any person who might be found liable, regardless of the contractual relation.[186]

The sweeping nature of the indemnification and limitation of liability provisions removes the major hazards of potential liability from suppliers of goods and services for atomic energy industry in that financial protection is required for reactor installations. However, in respect to certain licenses, namely those for domestic distribution of special nuclear material, source material, and byproduct material, the Commission does not have to require financial protection. If the financial protection is not required, an indemnification agreement by the Atomic Energy Commission is also not required. Therefore, suppliers of goods and services may not be protected under the federal legislation in respect to some radiation injuries. However, financial protection will probably always be imposed by the Commission as a condition of a license wherever the hazard is substantial. If the hazard is not unusual, the suppliers should be able to obtain satisfactory private insurance coverage or indemnification agreements from their customers. It should be noted, however, that the existence of federal indemnification may have the effect of broadening present liability concepts in the law and these concepts may be carried over eventually into other product liability cases not involving atomic energy activities.

Although the indemnification provisions of the Atomic Energy Act cover the major areas of liability which are of deep concern to atomic energy suppliers, three limitations in the effectiveness of the indemnification provisions warrant attention. First, the definition of "public liability" does not include liability for damage to property "at the site and used in connection with the activity where the nuclear incident occurs." Since reactor installations are very costly, product suppliers will be faced with the potentialities of liability in tremendous sums if the purchaser can recover for property damage under theories of negligence, warranty, or strict liability. Therefore, suppliers should continue to obtain indemnity agreements from their purchasers wherever possible. The second limitation arises out of the definition of "nuclear incident" which is limited to "any occurrence within the United States." If a supplier furnishes his products to purchasers for use in other

[186] H. Rep. 435, 85th Cong., 1st Sess. 17 (1957).

countries or upon the high seas, and injuries occur outside the United States for which the supplier may be held liable, the provisions of the Atomic Energy Act will afford no relief.[187] Therefore, if atomic energy suppliers are engaged in sales of products to be used outside the United States, potential liability must be examined with reference to the laws of the foreign nations and the law of the high seas. A third limitation on the effectiveness of the indemnification provisions may arise whenever the scope of the financial protection required and obtainable through private insurance is less than the scope of possible public liability. Under the Atomic Energy Act the indemnification provisions do not operate unless the public liability is "in excess of the level of financial protection required of the licensee." [188] Therefore, if the private insurance arrangements of the licensee have a shorter limitations period or if they do not provide coverage for certain types of injury, the supplier who may be liable under theories of strict liability, negligence, or warranty still faces the possibility of substantial liability.

Although these limitations on the protection afforded by the indemnification provisions may affect some suppliers in certain phases of their activities, generally the Atomic Energy Act of 1954, as amended, has created a favorable climate for suppliers to atomic energy industry. Unless some such indemnification were available, atomic energy suppliers would be forced to accept highly unusual monetary risks and entrance into the supply industry would be discouraged. As further studies are made in connection with foreign sales and activities, it is entirely possible that other governments will provide similar protection for atomic energy product manufacturers or an expansion of the indemnification provisions may be enacted by Congress. The Atomic Energy Commission and the Joint Committee are continually studying the problems and any severe legal restraints on the development of peacetime uses of atomic energy will undoubtedly be corrected.

[187] Legislation providing indemnity protection for the proposed nuclear-powered merchant shop, the U.S. Savannah, has been approved by the Senate Committee on Interstate and Foreign Commerce, and has been transmitted to the Joint Committee on Atomic Energy for further study. S. 3106, 85th Cong., 2d Sess. (1958). Suppliers are expressly indemnified if the amendments recommended by the Maritime Commission are included in the proposed legislation. See BNA Atomic Industry Reporter 54:17 (1958).

[188] Section 170c, 42 U.S.C.A. §2210(c).

PART II

WORKMEN'S COMPENSATION AND RADIATION INJURIES

WORKMEN'S COMPENSATION AND RADIATION INJURIES*

I. INTRODUCTION

Because of the extensive harmful potential of the materials and techniques involved in utilizing atomic energy and radioactive materials, radiation injuries to employees must be avoided wherever possible. To this end, atomic industry may be required to follow a number of unique personnel procedures not encountered in other industries. For example, consideration must be given to revision of the work week if radiation exposures become too hazardous for normal periods of time. Employers must also ascertain the significance of the age and sex of employees in relation to potential radiation exposures. It is generally believed that, due to rapid rate of development, persons under eighteen should not be employed in work requiring exposure to ionizing radiation. Moreover, the idea has been advanced, although it has not received any great degree of acceptance, that persons over forty-five may be able to tolerate doses of radiation double those considered safe for younger adults. Still again, pregnant women should not be exposed because prenatal sensitivity to radiation is high. These and other related factors obviously must be evaluated by employers in the assignment of work and personnel.

Once employees have been assigned to jobs associated with radiation, suitable monitoring apparatus is essential. Any employee apt to be working in locations where he will be exposed to radiation should be issued a personal monitoring device, such as a film badge or a pocket dosimeter, to measure the radiation received by him. Special problems arise in connection with the handling of radioactive equipment and materials. Remote control devices have been developed which permit handling of objects by means of tongs, mechanical hands, etc., while the operator remains behind suitable shielding. Specialized tools and methods have been devised to permit radioactive liquids to be handled; pipetting, filtering, precipitation, and the like can thus be carried out

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with minimum hazards to the operator. Employers must provide the necessary equipment and facilities to avoid or to minimize radiation exposure.

From the point of view of protecting employees from radiation hazards the waste disposal problem is also highly significant. Not only must wastes be disposed of at no risk to the surrounding area, but also methods for accomplishing this must be devised with a view to protecting employees while handling the wastes or while working in the vicinity of disposal sites or along the routes selected for transportation of wastes. All areas involved in the disposal process will require regular monitoring to assure that the level of radiation is not such as to imperil employees. Wastes accumulating in work areas must be stored in suitably shielded containers.

An overriding consideration in this field is that of supervision and training. Employees will require constant supervision to make certain that they understand and will take the necessary precautions. Specific persons must be assigned the responsibility for radiation protection measures, including checking the efficiency of protective devices as well as detecting, with the use of the monitoring apparatus, the possible presence of contamination.

Since the effects of radioactivity on the human body are cumulative, at least when irradiations of a certain intensity occur and possibly also regardless of the minuteness of the amounts received, it will become necessary to maintain permanent records for the workers concerned, so that their exposures may be adequately and accurately followed throughout the course of their various employments. Just as radiation hazards must be given a long-term evaluation, so too will long-term personnel records become an integral part of operations in the atomic industry. Complete medical supervision, covering not only the period of employment but also the prior medical history, will permit detection of conditions rendering a person unsuitable for work in a radioactive environment. Such evidences may be provided by examinations of skin, bone, gonad, blood, and lung conditions, and complete records should be kept as a matter of personnel routine.

Although the first line of defense for atomic industry will be the avoidance of radiation injuries by utilization of adequate radiation safety measures, we must recognize that despite these efforts some such injuries will be inflicted. For industrial accidents, in general, workmen's compensation has been evolved as the method of supplying economic protection to employees. The existing workmen's compensation statutes

warrant re-examination to determine their adequacy in dealing with the new hazards created by the advent of industrial application of atomic energy. In identifying and discussing the problems likely to be raised by specific provisions of the workmen's compensation laws in relation to atomic energy injuries, it will be helpful to review briefly the several types of statutes providing relief for injuries which might occur in atomic industry. It is, of course, to be expected that the bulk of existing legislative provisions in this field can be adapted to radiation injuries without undue stress and will serve substantially the same policy ends as effectively as under present conditions. Atomic industry will doubtlessly have its share of typical industrial accidents whose nature and circumstances will not present any unusual difficulties. The fact remains, however, that the potential industrial applications of nuclear energy may precipitate situations of unusually complicated and unexpected character and of sufficient frequency to warrant concern over the adequacy of certain aspects of present day compensation legislation. The following review has the purpose of presenting a selective illustration of areas of workmen's compensation law that may require amendment so that we may not be totally unprepared for the proper disposition of industrial radiation injury cases.

II. SCOPE OF COVERAGE UNDER EXISTING LAWS

Workmen's compensation legislation, now enacted in every state, imposes, in effect, strict liability for certain injuries arising out of the employment relationship. Under workmen's compensation the losses are distributed throughout the industry by a liability insurance system with the theory being that the consumer should eventually bear the financial burden for injuries to employees. As we have already seen in connection with common law tort liability rules, the peculiarities of atomic energy and radiation injuries raise several new legal problems. An examination of selective workmen's compensation acts from the standpoint of atomic energy and radiation injuries also, as we shall see, uncovers new problems that must be resolved in the atomic age.

Since our discussion will be limited mainly to the possibilities of recovery for radiation injuries under existing compensation statutes, it may be helpful to define the several types of radiation injuries with which we are concerned primarily. For purposes of convenience, four types of radiation injuries warrant attention. First, there is the "immediate radiation injury" which is occasioned by a harmful exposure to radiation, fixed in time, and which results in radiation sickness or

death, coterminously or shortly after exposure. Second, there is the "delayed radiation injury" for which the cause (the harmful exposure) can be fixed in time but in which the effect develops over a period of time, or, conversely, the effect may be fixed in time but the harmful exposure occurs over an extended period. Third, there is the "cumulative radiation injury" where the cause occurs over an extended period and the effect also gradually develops. Fourth, there are the "distinctive radiation injuries" which have unusual effects, not normally encountered in other industrial pursuits, such as shortened life span, temporary or permanent sterility, probable or possible genetic damage, or increased susceptibility to disease, and which may occur as a result of any of the three other types of injury.

Under most workmen's compensation acts the statutory language covers two broad types of injuries; namely (1) "injuries by accident" "arising out of and in the course of employment" and (2) "occupational diseases." To be compensable, any injury suffered by an employee subject to the act must come within the definitions established for these two general categories of injuries by the statutes. Therefore, in respect to radiation injuries, we will first examine the extent to which current statutory provisions provide coverage. Secondly, problems arising out of successive injuries and successive exposures culminating in occupational diseases will be explored. Thereafter, the statutory provisions relating to the bases of compensation awards will be examined to ascertain their adequacy when applied to radiation injuries.

A. General Accidental Injury Coverage

1. Injury by Accident

Nearly all compensation statutes require that an injury be "accidental" to be compensable. "Accidental injury" or "injury by accident" is not defined in the statutes, with the result that judicial construction of these terms has been essential. In construing these terms the courts have universally required an element of unexpectedness, and most courts have added the further requirement that an accidental injury must be reasonably traceable to a definite time, place, and occasion or cause. In respect to "immediate radiation injuries," where both the cause and effect can be ascertained immediately, there appears to be no doubt that the statutory language is sufficiently broad to provide coverage. However, in applying traditional court tests difficulties are encountered in respect to the "delayed radiation injuries." In specific non-radiation

cases, the courts have reached divergent results in attempting to apply definitions of "accidental" to similar injuries. The common but troublesome issue is the question of whether the injury must have resulted from an unexpected and traceable external cause, or, in the alternative, whether it is sufficient that the injury was sudden and unusual though the immediate cause was not an external and unexpected event. The resolution of this question, is of course, crucial if the radiation injury is not compensable as an occupational disease.

In respect to "delayed radiation injuries," the cases of routine exposure, either to the elements or to conditions peculiar to the employee's environment while at work, provide some analogies. Many courts have distinguished between abrupt results on the one hand and subtle physiological disturbances on the other. For example, prolonged exposure to either heat or cold, resulting in heat prostration or frostbite respectively, has been held by most courts to give rise to an accidental and compensable injury,[1] though some courts stress the need for the existence of unusual conditions as contrasted with the usual exposure of the general public. A minority of courts have, however, refused relief on the ground that in certain jobs there is nothing unusual in being exposed to heat or cold whether in greater or lesser degree in relation to the normal exposure of the public, and thus the injury is held not to be a sudden and unexpected accident, and no compensation is allowed.[2] In atomic industry comparable cases may take the form of acute radiation sickness caused not by sudden excessive irradiation, but by the effect of cumulative exposures normal for the kind of employment. If the degree of usual exposure in the particular employment test should be imposed when dealing with immediately discernible radiation injuries, compensation may be unavailable. Such a result, however, may be seriously questioned, and it is doubtful that even courts following the minority rule would apply the same test in radiation cases.

In contrast to cases of immediate, tangible injury, cases involving routine exposures to the elements or to artificial conditions causing a latent disease or the formation of degenerative conditions in the organs or tissues, have found the courts much more reluctant to find an "accident."

[1] See citations classified by state in 1 Larson, The Law of Workmen's Compensation §38.40, n. 20 (1952).

[2] Beadle v. Bethlehem Steel Co., 172 Md. 541, 193 Atl. 240 (1937) (heat stroke suffered by employees whose duties were to remove heavy pieces of metal from furnace with temperature of 1300 degrees); Savage v. City of Pontiac, 214 Mich. 626, 183 N.W. 798 (1921) (freezing suffered by fireman whose wet clothes froze on him and whose neck was covered by ice).

When an employee incurs a disease from exposure to heat, cold, dampness, fumes, or dust, and the disease is not covered as an occupational disease under the statute, a majority of courts deny compensation for lack of accidental character of the injury.[3] The rule is tempered sometimes by the implication that if the exposure is of unusual occurrence for persons engaged in the victim's type of work, the disease can be held accidental.

A typical case illustrating the chief objection to the recognition as accidental of slowly developing injuries from exposure to the weather or to noxious substances, and indicating that the difficulty springs solely from the traditional definition of "accident," is *Deyo* v. *Village of Piermont.*[4] In that case a policeman's arthritis was aggravated from standing for hours in wet and freezing weather to direct traffic. The court denied compensation, saying: ". . . [W]e do not think the interpretation of what constitutes an 'accident' should be extended to fringe cases such as this, where there is no single incident which would be regarded as an accident by the common man. There must be some element of suddenness—something catastrophic—and some incident immediately noticeable." [5]

A minority of courts hold compensable, as accidental, slowly developing injuries that result from greater exposure than that to which the general public is submitted even if the exposure is a matter of routine in the victim's type of employment. The fact that the exposure is peculiar to the employment is often a corroborative factor in favor of compensability for courts following this approach.[6]

Any "delayed radiation injury" not compensable as an occupational

[3] Powell v. Taylor, 177 Pa. Super. 647, 112 A. 2d 415 (1955) (carpenter employed for over 3 years during which he used dusty and mouldy lumber which required brushing and scraping before use, breathed and inhaled this material and became totally disabled and afflicted with moniliasis. Medical expert was unable to state whether a single contact with fungus spores or exposure over a period of time had caused the disease. Held: compensation denied since neither an accident was shown nor a scheduled occupational disease); Davis v. Sunshine Mining Co., 73 Idaho 94, 245 P. 2d 822 (1952) (miner's tuberculosis from neither unusual conditions nor fortuitous event); Hasbrouck v. Goodyear Tire and Rubber Co. (Ohio, Ct. Com. Pleas) 99 N.E. 2d 329 (1951) (victim overcome by fumes while mixing vat of alcohol and benzol; recovery denied for lack of suddenness and unforeseeability and thus of accidental nature of injury); see also citations by state in 1 Larson, *supra* note 1 at §38.50, n. 21.

[4] 283 App. Div. 67, 126 N.Y.S. 2d 523 (1953).

[5] *Id.* at 69 and 525.

[6] Black v. Creston Auto Co., 225 Iowa 671, 281 N.W. 189 (1938) (lead poisoning from inhaling poisonous fumes over a period of time); Webb v. New Mexico Pub. Co., 47 N.M. 279, 141 P. 2d 333 (1943) (dermatitis from 6 months' use of irritating soap); see also citations by state in 1 Larson, *supra* note 1 at §38.50, n. 21.

disease would presumably receive similar judicial treatment whenever the injury was in the form of an aggravation of a latent disease or a slowly developing deterioration of tissue or organs. The fact that radiation-caused ailments may include disorders heretofore beyond scientific expectation and of a kind which may not be included within restrictive lists of occupational diseases suggests a reappraisal of policies of the law in this area for atomic energy industry.

"Cumulative radiation injuries," not covered as occupational diseases under the statutes, raise similar problems of coverage under existing legislation. The chief obstacle under many American statutes to compensability of gradual injuries of a clearly occupational nature consists in the difficulty experienced in determining the exact time of their occurrence. This is essential for the purpose of satisfying the requirement of proving an "injury by accident," which has been generally interpreted as calling for *an* accident and not including cases of slow and often imperceptible deteriorations. When the element of suddenness is totally absent for the reason that neither is the cause of an injury an untoward and unexpected event nor is the result a clear-cut collapse (for example, in a case of heat prostration), compensability has been granted and denied alternately in the same state.

These cases are often difficult to distinguish from the accidental diseases discussed above. They include situations in which protracted exposures result in gradual physical deteriorations or diseases but where both the cause and effect are gradual and span a considerable period of time. Some courts have granted compensation in these cases by assimilating gradual injuries to the traditional conception of "injury by accident," saying that each exposure produced a new trauma and constituted a small accident the repetition of which finally led to a compensable injury.[7] But some of the same courts have denied compensation in other similar cases because of absence of an accident sufficiently definite in time.[8]

Most of the radiation injuries caused by repeated exposures are, of course, of a nature that would qualify for compensation under statutes providing coverage for all occupational diseases, and the problem raised by gradual injuries in the atomic industry can perhaps be solved best by the amendment of compensation statutes where necessary to effect com-

[7] *E.g.*, Pan American Airways v. Willard, 99 F. Supp. 257 (1951) (skin disease from exposure to tropical sun); Batesville White Lime Co. v. Bell, 212 Ark. 23, 205 S.W. 2d 31 (1947) (inhalation of excessive dust for 23 years causing heart injury).

[8] Compare cases listed by jurisdictions in 1 Larson, *supra* note 1, at §39.10, notes 16 and 17.

prehensive occupational disease coverage. Otherwise unexpected gradual radiation injuries would be likely to remain uncompensated and thus produce an incongruity difficult to defend when we realize that constant though minimal and supposedly safe exposures to radioactivity are apt to be routine for employees in atomic industry.

2. "Arising out of and in the Course of Employment"

Another all but universal coverage provision in American compensation statutes is the requirement that the industrial injury must be one "arising out of and in the course of employment." Forty-one states and the Longshoremen's and Harbor Workers' Act [9] use this test. Utah has modified the formula to read "arising out of *or* in the course of the employment." [10] The statutes of North Dakota, Pennsylvania, Texas, and Washington, and the United States Employees' Compensation Act do not contain the "arising out of" portion of the formula.[11] West Virginia requires an injury "resulting from" instead of "arising out of" employment.[12] Wyoming has rejected the entire traditional approach and requires that the injury be "incurred in the employment." [13] Wisconsin has replaced the "course of employment" phrase with the requirement that the employee be injured "while performing service growing out of and incidental to his employment," [14] and the United States Employee's Compensation Act covers injuries "sustained while in the performance of duty." [15]

"Arising out of and in the course of employment" is normally said to indicate two separate tests which must be met before an injury may be held compensable. An injury is said to arise out of the employment when a causal connection between the conditions of work and the resulting harm is apparent to the rational mind. While restrictive interpretations of this phrase in earlier years interposed additional obstacles to compensability (such as the doctrine that an added peril resulting from the conduct of the worker himself excluded the requisite causal connection and the view that a hazard common to all mankind did not

[9] 33 U.S.C.A. §§901-950.

[10] Utah Code Ann. §35-1-45 (1953).

[11] N.D. Rev. Code §65-0102(8) (1943) ("arising in the course of employment"); Pa. Stat. Ann. tit. 77, §411 (1952); Tex. Civ. Stat. Ann. art. 8309, §1 (1956); Wash. Rev. Code §51.08.100 (1951) (resulting from "a sudden and tangible happening, of a traumatic nature").

[12] W.Va. Code Ann. c. 23, §4-1 (1955).

[13] Wyo. Comp. Stat. Ann. §72-106 (1945).

[14] Wis. Stat. Ann. §102.03 (1)(c) (1957).

[15] 5 U.S.C.A. §751.

satisfy the "arising out of" test), the trend of recent decisions is to the effect that it is enough if the employment was a contributing cause. Generally whether the employment is a sufficient contributing factor becomes a simple question of proof not subject to the ordinary tests used to determine the presence of proximate cause in tort cases. Insofar as it relates to the problems confronting atomic energy industry, this phase of the law will be considered when we deal with the modes of establishing a causal relation between the work and the injury or disease.

The part of the coverage formula which may work a hardship in certain radiation cases is the requirement that an injury arise "in the course of employment." This phrase implies that to be compensable, an accident must overtake an employee during working hours, or at a place where he is reasonably expected to be while carrying on an activity incidental to his job. Generally the courts have held that manifestation of the injury as well as origin must occur during the course of employment. This approach is likely to be unsatisfactory in atomic industry for the reason that the effects of an overexposure may make themselves felt hours after the workman leaves his place of employment.

There are at least two judicial decisions which, when considered in relation to comparable radiation injury situations, illustrate the awkward solutions which the present coverage formula may inspire. In *American Motorists Insurance Co.* v. *Steel*[16] an employee whose job required the drilling of holes in metal suffered a severe injury when sharp shavings, which had lodged in his eyebrows, fell into his eye. The accident took place about fifteen minutes after the end of working hours while the workman was on his way home. Because the harmful result did not occur "during the course of employment," the injury was held non-compensable. Again in *Gill* v. *Belmar Construction Company*[17] the workman had negligently left a dynamite cap in his pocket and was badly injured when it exploded the next morning while he was dressing in his hotel room. The time and place of the accident not coinciding with the employment, compensation was denied.

It is not difficult to imagine situations in atomic industry in which delayed-action injuries will occur. Indeed, without resorting to imagination, it is already possible to advance hypotheses based on actual events as reported in the press. For example, a worker on a construction project in Connecticut innocently carried away in his trousers pocket a capsule of cobalt 60 which was being used on the job for radiography of

[16] (Tex. App.) 229 S.W. 2d 386 (1950).
[17] 226 App. Div. 616, 236 N.Y. Supp. 379 (1929).

welds. The workman was interested in using the long string from which the small, one and three-eights inch cylinder of deadly cobalt was hanging, and he was unaware of the radioactive nature of the contents. After a general alarm had been given and a thorough search started, the cobalt was found in the glove compartment of the worker's car. Final information on the physical effect of this episode is lacking, but the construction worker is suing for $200,000 damages. If he and perhaps some of his companions in his car suffered radiation injuries, the rule of the above two cases would probably exclude compensability.

3. Summary

Existing statutory provisions relating to accidental injuries appear to cover adequately "immediate radiation injuries." However, in respect to "delayed radiation injuries" or "cumulative radiation injuries," statutory language requiring an "accident" probably cannot be relied upon, except in a minority of courts, as a basis for awarding compensation. Whenever the cause of an injury occurs over a prolonged period of time or whenever the injury develops at a remote time, the courts have often denied compensation because no "accident" can be established. Where both cause and effect span lengthy time periods, even the more liberal courts have found considerable difficulty in awarding compensation. Therefore, for many radiation injuries, the general statutory provisions relating to accidental injuries do not provide satisfactory coverage if it is deemed desirable that radiation injuries be afforded the same treatment as other types of industrial injuries. However, satisfactory compensation for radiation injuries may be available under occupational disease coverage provisions of the workmen's compensation acts.

B. Occupational Disease Coverage

Although they may occur occasionally, radiation "accidents" in all probability will not constitute the major source of atomic energy injuries. Of greater concern are the "cumulative radiation injuries" caused by chronic exposure, such as cataract, cancer, leukemia, leucopenia, bone necrosis, sterility, genetic mutations, shortened life span, epilation, or injury to any of the various organs within the body. While all these injuries can be caused by a single large dose of radiation, as in the case of an accident, most of them can also be caused by repeated exposures to low amounts of radioactivity.

Because of the manner in which these injuries develop, they resemble those injuries which have typically been classified as occupational dis-

eases under workmen's compensation statutes. Occupational diseases, which ordinarily develop gradually, generally lack the character of unexpectedness typical of industrial accidents. They are recognized as a hazard inherent in continued exposure under the peculiar conditions of the specific employment. The statutes which provide compensation for occupational diseases, either by defining "injury by accident" to include such diseases or by separate specific coverage, must be examined in each state to determine their effectiveness as a means of providing compensation for "delayed" or "cumulative" radiation injuries for which compensation would not be awarded under the "accidental" injury provisions.

Some of the statutes literally provide compensation for "all occupational diseases" and leave it to industrial commissions or the courts to decide which diseases fit within the terminology. Others provide full coverage by including within the scope of "injury" all known or even unknown diseases which result from employment.[18] A variation of this type of legislation is found in statutes which include a list of diseases for which compensation is provided, this device being known as "the schedule type of coverage." The lists may be exclusive or non-exclusive. Full coverage is achieved by those statutes which adopt a definite list of diseases and then add a general clause which usually reads: "any and all occupational diseases" or "all other occupational diseases." [19]

A number of states, not having full coverage for occupational diseases, have adopted statutes providing coverage, specifically and apparently exclusively, for some radiation diseases.[20] The statutes of six states that provide for occupational disease coverage by use of a schedule do not cover radiation-induced diseases expressly, and it is doubtful

[18] Alaska, Arkansas, California, Connecticut, Delaware, District of Columbia, Florida, Hawaii, Illinois, Indiana, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Nebraska, New Jersey, North Dakota, Oregon, South Carolina, Virginia (alternative coverage), Washington, West Virginia, Wisconsin. Under federal legislation civil employees as well as workers falling under the Longshoremen's Act are similarly covered.

[19] New York, Ohio, Nevada, Rhode Island, and Utah.

[20] Arizona (ulceration of skin or destruction of tissue due to roentgen rays or radium emanations), Colorado (poisoning or disease caused by exposure to radioactive materials, substances, or machines, or fissionable materials), Georgia, Kansas, Louisiana, Oklahoma, Texas, Vermont (diseased condition caused by exposure to X-rays or radioactive substances), Idaho (radium poisoning or disability due to radioactive properties of substances or to roentgen rays), New Mexico (all diseases directly traceable to fissionable materials or radioactive materials), North Carolina (radium poisoning or injury by X-rays), South Dakota (ulceration of skin or destruction of tissue due to prolonged exposure to roentgen rays or radium emanations).

whether they can be construed to include such disorders.[21] Two states provide no coverage for occupational diseases.[22]

1. General Coverage

In respect to those statutes providing full coverage by the use of the language "all occupational diseases," it is obvious that anything that can be classified as an occupational disease will be compensable. This, of course, leaves open the question of what constitutes an "occupational disease," so as to come within the meaning of the statute. An occupational disease is generally defined as a disease which is peculiar to a particular industrial process, trade, or occupation and which does not arise from any single occurrence in the employment, but develops gradually.[23]

The problem of defining an occupational disease is one of attempting to draw a distinction between those diseases to which the human race as a whole is constantly subjected, and those diseases which are distinctively connected with the conditions under which the employee works.[24] Consequently, most of the definitions place emphasis upon the causal relationship of the particular disease to the employment.

The occupational disease statute of the state of Illinois defines occupational disease as follows:

> In this act the term "Occupational Disease" means a disease arising out of and in the course of the employment. Ordinary diseases of life to which the general public is exposed outside

[21] Alabama (specified dust diseases such as pneumoconiosis including silicosis, anthraco-tuberculosis, aluminosis, etc.), Iowa (16 specific diseases), Maine (15 specified diseases), Montana (a separate statute provides for payment of $60.00 a month from state funds for workers totally disabled from silicosis if they are residents of the state of 10 years standing), New Hampshire (silicosis and other pulmonary diseases, anthrax, lead poisoning, dermatitis venenata, and diseases caused by inhalation of poisonous gas and fumes), Tennessee (full coverage permissible).

[22] Mississippi and Wyoming.

[23] ". . . an occupational disease is one which is due wholly to causes and conditions which are normal and constantly present and characteristic of the particular occupation; that is, those things which science and industry have not yet learned how to eliminate." Cell v. Yale and Towne Manufacturing Co., 281 Mich. 564, 568, 275 N.W.250 (1937), quoting from Seattle Can Co. v. Dept. of Labor & Industry, 147 Wash. 303, 309, 265 Pac. 739 (1928).

[24] Many of the cases which are used to define occupational disease are cases in which the distinction between an occupational disease and an injury by accident was drawn so as to label the particular injury uncompensable. This occurred in the situation where there was no occupational disease law, and if the particular injury of the employee was labeled as an occupational disease, it could not be compensated as an "injury by accident." Thus in reading cases, it is important to keep in mind the purpose for which the distinction or definition of occupational disease is being made.

> of the employment shall not be compensable, except where the said disease follows as an incident of an occupational disease as defined in this section.
>
> A disease shall be deemed to arise out of the employment, only if there is apparent to the rational mind upon consideration of all the circumstances, a direct causal connection between the conditions under which the work is performed and the occupational disease, and which can be seen to have followed as a natural incident of the work as a result of the exposure occasioned by the nature of the employment and which can be fairly traced to the employment as the proximate cause, and which does not come from a hazard to which workmen would have been equally exposed outside of the employment. The disease must be incidental to the character of the business and not independent of the relation of employer and employee. The disease need not to have been foreseen or expected but after its contraction it must appear to have had its origin in a risk connected with the employment and to have flowed from that source as a rational consequence.[25]

Some state statutes are briefer. For example, the Nebraska statute reads:

> The term "occupational disease" shall mean only a disease which is due to causes and conditions which are characteristic of and peculiar to a particular trade, occupation, process, or employment, and shall exclude all ordinary diseases of life to which the general public are exposed.[26]

An even briefer statute defining "occupational disease" in terms of causal connection is that of the state of Connecticut:

> The words "occupational disease" shall mean a disease peculiar to the occupation in which the employee was engaged and due to causes in excess of the ordinary hazards of employment as such.[27]

In addition, some statutes provide coverage for occupational diseases without providing any definition of what is meant thereby. In these states it has been left to the courts to decide the limitations of the statutory language. The New York court, in *Harman* v. *Republic Aviation Corp.*, was required to define what was meant by the scheduled item "any and all occupational diseases." Expressing itself in terms of causal connection, the court said:

> An ailment does not become an occupational disease simply because it is contracted on the employer's premises. It must be

[25] Ill. Rev. Stat. c. 48, §172.36(d) (1955).
[26] Neb. Rev. Stat. §48-151(3) (1943).
[27] Conn. Gen. Stat. §7416 (1949).

> one which is commonly regarded as natural to, inhering in, and incident and concomitant of, the work in question. There must be a recognizable link between the disease and some distinctive feature of the claimant's job, common to all jobs of that sort. As this court observed in *Matter of Goldberg* v. *954 Marcy Corp.* (276 N.Y. 313, 318-319), an occupational disease is one "which results from the nature of the employment, and by nature is meant * * * conditions to which all employees of a class are subject, and which produce the disease as a natural incident of a particular occupation, and attach to that occupation a hazard which distinguishes it from the usual run of occupations and is in excess of the hazard attending employment in general." [28]

In contrast to the foregoing statutory and judicial definitions of occupational disease emphasizing an "affirmative" showing of the causal relationship between the disease and the job, the state of South Carolina has taken a negative approach. Its statute provides:

> The words *"occupational disease"* mean a disease arising out of and in the course of employment, which is due to hazards in excess of those ordinarily incident to employment and is peculiar to the occupation in which the employee is engaged. A disease shall be deemed an occupational disease only if caused by a hazard recognized as peculiar to a particular trade, process, occupation or employment as a direct result of continuous exposure to the normal working conditions thereof.
>
> No disease shall be deemed an occupational disease when:
>
> (1) It does not result directly and naturally from exposure in this State to the hazards peculiar to the particular employment;
>
> (2) It results from exposure to outside climatic conditions;
>
> (3) It is a contagious disease resulting from exposure to fellow employees or from a hazard to which the workman would have been equally exposed outside of his employment;
>
> (4) It is one of the ordinary diseases of life to which the general public is equally exposed, unless such disease follows as a complication and a natural incident of an occupational disease or unless there is a constant exposure peculiar to the occupation itself which makes such disease a hazard inherent in such occupation;
>
> (5) It is any disease of the cardiac, pulmonary or circulatory system not resulting directly from abnormal external gaseous pressure exerted upon the body or the natural entrance into the body through the skin or natural orifices thereof of foreign organic or inorganic matter under circumstances pe-

[28] 298 N.Y. 285, 288, 82 N.E. 2d 785 (1948).

culiar to the employment and the processes utilized therein or
(6) It is any chronic disease of the skeletal joints.[29]

The basic question is: Do statutes, which theoretically provide full coverage of occupational diseases, adequately cover radiation injuries? As we have seen, the crucial element is the showing of causal connection between a particular disease and the job. We must, then, determine the extent to which causal connection between radiation injuries and the occupations in which they are incurred can be proved. Consider, for example, the diseases of cancer and leukemia. These are diseases to which the general public is exposed, quite apart from employment. They are also diseases which are caused by exposure to radiation. While it has been shown that radiation does cause cancer, the mechanics of this causation have not yet been thoroughly understood. It is impossible, then, for even a medical expert to point to a particular case of cancer and assert with confidence that it was caused by exposure to radiation. The same is true of leukemia. While a higher than normal incidence rate of leukemia can be shown to occur among persons exposed frequently to radiation, such as radiologists, it is still impossible to point to any specific case of leukemia and conclude that it was caused by exposure to radiation. Thus, though we know that exposure to radiation can cause these diseases, it is impossible at present to testify that the occurrence of any of them in any individual employee is traceable to radiation exposure.

It may in fact be easier on the basis of statistics for an employer to disprove causation in radiation cases than for an employee to prove it. For example, to satisfy the causation requirement under the Illinois statute, it is necessary that the disease be one which can be "fairly traced to the employment as the proximate cause, and one which does not come from the hazards to which workmen would have been equally exposed outside of the employment." In respect to the first requirement, would it be sufficient to offer testimony to the effect that, because there is a higher leukemia incidence rate among workers who deal with radiation, the occurrence of a particular case was incident to the employment? To answer affirmatively to this question, would, in effect, make the employer an insurer against the risk of his employees coming down with this particular disease. This would result from the fact that even though the incidence rates themselves show that causes other than radiation produce a majority of the cases, the employer probably will be un-

[29] S.C. Code §72-251 (1952).

able to prove that any particular case of leukemia or cancer was caused by circumstances external to the employment.

The second statutory requirement, that the disease be one which does not come from a "hazard to which workmen would have been equally exposed outside of the employment," presents another troublesome problem of fact. The question is whether the cause of cancer or leukemia can be said to be due to the same "hazard," whether that "hazard" is inside or outside of the employment. From available evidence, it definitely appears that radiation can cause cancer or leukemia. However, the sources of radiation are not confined to those artificially produced in atomic energy plants alone. Everyone is subjected to the radiation that comes from outer space and to the natural radiation caused by the deterioration of the composition of the earth's surface. The amount of such radiation to which a person is subjected varies according to the location. Decomposition of the materials of the earth's surface in some areas is higher than in others, and a person receives more natural radiation from outer space when he is in the higher altitudes. It is very questionable therefore whether cancer or leukemia could be said to be due to a radiation "hazard" to which the workman would not have been equally exposed outside of the employment. The Atomic Energy Commission has pointed out that the average dosage of radiation within its plants is no greater than people generally receive from natural radiation. As more is learned about the nature of these diseases and their causes, it may be disclosed that natural radiation is too low to be a significant factor. It could be true that cancer is caused by subjection to radiation on an "exponential" basis and follows inevitably after exposure to a certain amount of radiation, or that possibly it is caused by a "chance" passage of radiation at any time. At the present time, however, adequate information concerning the significance of natural radiation simply is unavailable. Moreover, X-ray radiation to which people subject themselves voluntarily for medical or other purposes, also must be considered. Such exposure could qualify as a "hazard to which workmen have been equally exposed outside of the employment." Therefore, the problem of proving the causal connection essential to classifying a radiation injury as an occupational disease may prove insuperable.

A recent Illinois case, *City of Chicago* v. *Industrial Commission et al.*,[80] indicates the nature of the proof that probably will be required to show the causal connection in radiation cases where compensation is sought under the occupational disease provisions of the statute. In that

[80] 403 Ill. 105, 85 N.E. 2d 665 (1949).

case, an employee of the city's sewer department died from Weil's disease, a disease commonly transmitted from contact with the excreta of diseased rats. The presence of rats near or around the sewers where the decedent had worked was made to appear in the evidence. In affirming the denial of an award by the Industrial Commission, the court said:

> The evidence in the case at bar clearly falls short of establishing such a causal connection. In its aspect most favorable to plaintiff in error it shows merely that the disease from which the death resulted is commonly transmitted from contact with the droppings of infected rats, and that rats exist in the sewers where decedent worked. There is no evidence that any such rats were diseased or that the decedent came into contact with any rat droppings. A mere possibility of contamination in the course of employment is not sufficient to support an award of compensation. . . . In the case at bar the presence of spirochetes at decedent's place of employment can be inferred only by speculation. This cannot serve as proof of a direct causal connection.[31]

Thus the court required a showing of actual contact with the disease, or the cause of the employee's disease, at the place of employment. The fact that there were rats at the decedent's place of employment and that these rats could have carried the disease was not sufficient. It was necessary to show that there were diseased rats at the place of employment. The court distinguished this case from an earlier one, *Arquin* v. *Industrial Commission*,[32] where the disease had been treated as an injury by accident. In that case, the court held that there was a causal connection where an intern treating meningitis cases in a contagious ward had died from meningitis. The evidence showed that the employee had been in actual contact with the disease in the course of his employment.

Although no court demands absolute certainty in establishing the occupational origin of a disease, the problems of causation are bound to be very serious in atomic energy compensation cases especially because the diseases caused by radioactivity are the same as those originating from other causes. In other types of cases the courts have permitted reasonable inferences drawn from medical testimony of probabilities to justify the finding that certain diseases are occupational in nature. For example, in *Travelers Ins. Co.* v. *Donovan*,[33] the claimant, an employee of the Red Cross, was assigned to duty in Kyoto, Japan, where he contracted tuberculosis. The evidence showed that the incidence rate of

[31] *Id.* at 107-108.
[32] 349 Ill. 220, 181 N.E. 613 (1932).
[33] 125 F. Supp. 261 (1954).

tuberculosis at Kyoto in 1951 was 1040 per 100,000 population, and 1090 per 100,000 population in 1952. This compared with an incidence rate of 220.9 per 100,000 in 1951 and 215.7 per 100,000 for 1952 in the District of Columbia, the employee's residence in the United States. An award made on this basis was affirmed. The court remarked that it was reasonable to conclude that the disease was contracted not only in the course of the employment but also out of the employment, because there was an aggravated risk as a result of work in an area with a high incidence rate of tuberculosis. The chances were five times those in the District of Columbia. Further, the court stated that, although in an action for damages governed by common-law principles the causal relation between the employment and the disease could not be deemed to have been established, different principles govern under workmen's compensation laws.

In *Zaepfel* v. *E. I. DuPont de Nemours & Co.*[84] the deceased had been employed as a chemist by four successive employers. He had worked for DuPont from 1936 to 1943, for a second employer from 1944 to 1946, for a third from 1947 to 1948, and for a fourth for two months in 1948. He stopped work in 1948 because of illness, and in 1949, at the age of thirty-nine, he died of aplastic anemia, a disease which impairs the function of the marrow in producing blood. A claim was filed against all the employers, and it was alleged that exposure to chemicals during deceased's employment caused the disease. The compensation board found that the total disability was the result of poisoning from benzol and benzine derivatives contracted while in the employment of DuPont and causing an occupational disease. An award was made against DuPont only, for no causal relation was found between the disease and the employment with the other three defendants. An autopsy disclosed no trace of chemicals left from other employments. The medical testimony was conflicting as to the cause of the anemia. But in view of the general paucity of experience with aplastic anemia as an industrial disease, the court expressed a willingness to accept less than positive proof of causation. A physician's testimony to the effect that ". . . the picture could well have begun at the time he was employed handling the benzine ring products at DuPont" was held sufficient to support the board's award. As to the use of the word "could," the court remarked that it is highly probative, and that indeed such evidence is preferable to a glib manifestation of certainty in these cases. Asked whether other employments had anything to do with the disease, the

[84] 284 App. Div. 693, 134 N.Y.S. 2d 377 (1954).

medical expert refused to exclude them but maintained that the disorder was attributable to constant exposure to chemicals during the period of employment. He could not, however, give details as to how other employments could have contributed to or aggravated the disease. In justifying the decision of the board, the court pointed out: "Neither the spirit, purpose nor the language of the Workmen's Compensation Law requires that, to become entitled to compensation his widow must establish the precise exposure which caused his death to an absolute certainty." [85] It is interesting to observe that if any trace of other chemicals had been found in the deceased's body, other employers would probably also have been held liable.

On the question of causal relationship, therefore, it is possible for a court to take the view that a showing of exposure to radiation during the course of employment and a showing of subsequent development of a disease, which can be caused by radioactivity, satisfy the requirements of proof of the occupational character of the disease. This approach, however, will tend to make the employer in atomic industry an insurer against certain diseases such as cancer. On the other hand, if a greater burden of proof must be sustained by the employee to establish the causal connection, it is doubtful whether many of the cumulative radiation injuries will be found compensable as occupational diseases because of the lack of sufficient scientific and medical evidence. It is to be hoped that further discoveries of the specific nature of atomic energy injuries will diminish the area of conjecture. For example, if it can be shown by statistical evidence that it takes a cumulative dose of ninety roentgens to cause a certain type of cancer, such as cancer of the breast, then unless the employee could show that he was exposed to this much radiation during the course of his employment, he would have difficulty in proving a causal connection. In the absence of such conclusive scientific data, however, it seems preferable to err on the side of providing compensation for atomic injuries. If the existing statutory or judicial rules relating to proof of causal connection appear to create an insuperable burden for possible victims of radiation injuries, appropriate revision of the statutes appears desirable.

2. Schedule Type of Coverage

As previously mentioned, some statutes, instead of providing coverage for "all occupational diseases," purport to compensate for only a prescribed, exclusive "list" of such diseases. There are several policy rea-

[85] *Id.* at 696.

sons underlying the adoption of the schedule type of legislation. Primarily, it is an attempt to limit the employer's liability, so that industry will not be burdened with the cost of compensation for those diseases to which the human race as a whole is subject. Another important consideration is that of "definiteness," which serves the worthy purpose of reducing the amount of time and money employed in litigation over the question of whether the disease involved in the case is or is not a compensable occupational disease.

An examination of the various statutory lists of the occupational disease laws reveals a considerable variation concerning both the items included and the language employed. As indicated previously, in some states no item of the schedule relates to radiation injuries. In other states the schedules do incorporate items that have some relevancy to atomic injuries and these will be examined with a view toward determining their adequacy.

a. Examples of Older Legislation

North Carolina. The North Carolina statute enacted in 1935 reads:

> The following diseases and conditions only shall be deemed to be occupational diseases within the meaning of this article: . . . (15) radium poisoning or injuries by X-rays.[36]

Unless a particular disease appears on this list, it is not compensable. Twenty-six different items are listed as occupational diseases in the North Carolina statute and only item 15 pertains to radiation injuries.

Since today the use of X-rays in industrial processes probably exceeds the use of other radioactive materials or equipment, "injury by X-rays" probably will, numerically speaking, cover the greatest share of actual radiation injuries. However, as the use of newer atomic energy devices becomes more prevalent, the inadequacies of the North Carolina statute will become more apparent.

The statute also covers what is termed "radium poisoning." The use of the generic term "poisoning" raises the question of whether the "poisoning" referred to is that of a toxic nature, or one due to radioactive properties of the material mentioned in connection with it—in this case, radium. The dictionary definition of a poison is "any agent which, introduced into an organism, may chemically produce an injurious or deadly effect." [37] Adopting this definition, the term radium

[36] N.C. Gen. Stat. §97-53 (1950).
[37] Webster's New Collegiate Dictionary.

poisoning would make compensable only those diseases wherein some toxic consequences were produced chemically from the ingestion of radium compounds, thus excluding injuries caused by external or internal radiation. However, most of the statutes which adopted the words "radium poisoning" did so after the injuries suffered by the radium dial painters in New Jersey were publicized. Thus, it would appear that this language was directed toward covering that sort of injury. Since the injury was not due to the toxic nature of the radium material, but due to its radioactive properties, it is quite likely that the legislature meant to provide compensation for any harm caused the body by ingestion of radium. However, this is a disputable point. Some of the statutes have avoided this difficulty through the use of the word "disability" instead of the word "poisoning." Regardless of the scope of the term "poisoning," the language of the statute is obviously limited to injuries involving use of radium compounds only, and the language could be construed to exclude compensation for occupational diseases due to contact with other radioactive substances.

Accordingly there are several types of radiation injuries not covered by the North Carolina statute. One class not covered is that caused by the particle accelerators which produce high energy radiation, such as the cosmotron, the betatron, the cyclotron, the synchrotron, and the Van de Graaff machine. The development of cataracts due to chronic exposure to neutrons suffered by the scientists who experimented with the cyclotron at the University of California illustrates the possibility of such machines producing injuries which under a properly drafted statute could be classified as occupational diseases. Similarly, the statute does not cover injuries caused by types of radiation other than X-rays, such as alpha, beta, and gamma radiation.

Another type of radiation injury not made compensable under the language of the North Carolina statute is that which might be caused by the nuclear reactor or atomic pile. The nuclear reactor and the chemical separation plant needed to process the fuel elements are sources of tremendous amounts of radiation. Since it is anticipated that nuclear reactors will be used extensively in research, in the production of electricity, and otherwise, it would seem that a considerable number of injuries might be anticipated from these sources. The North Carolina statute makes no reference to injuries from such sources either specifically or by reference to "fissionable" material.

Texas. The state of Texas provides another variation in the statutory language concerning the atomic energy injuries considered com-

pensable as occupational diseases. The Texas occupational disease law reads in part as follows:

> Wherever the terms "injury" or "personal injury" are used in the Workmen's Compensation Law of this state, such terms shall be construed to mean damage or harm to the physical structure of the body and such diseases or infection as naturally result therefrom. Unless from the context the meaning is clearly to the contrary, such terms shall also be construed to mean and include occupational diseases, as hereinafter defined. The following diseases only shall be deemed to be occupational diseases: (a) Poisoning by: (separate and distinct items are listed including, for example, arsenic, chlorine, cyanide, hydrochloric acid, lead, nitric acid, phosphorus, sulphuric acid, and zinc) . . . (h) Diseased condition caused by exposure to x-rays or radioactive substances . . . .[38]

Under this language it is readily apparent that the coverage is much broader than that afforded under the North Carolina legislation. Although the Texas occupational disease law was enacted in 1947, indicating that the legislature should have been aware of the possibility of injuries through the new uses of atomic energy, a number of problems may be raised concerning the adequacy of the language. For example, do the words "diseased condition" apply only to a degenerative physical condition so that atomic injuries such as cancer and leukemia are covered but sterility is not? In resolving this question, it should be kept in mind that some of the early cases of injury from radioactive materials involved scientists who had experienced dermatitis and cancer. Also, the nature of the injuries received by the radium dial painters was such that the injury or disease grew progressively worse as time passed. In view of the fairly recent date of the Texas legislation, it is likely that the term "diseased condition" would be broadly construed to include all atomic energy injuries otherwise compensable under the statute. Moreover, the tendency on the part of the courts to give a liberal interpretation to the language of the workmen's compensation and occupational disease statutes could induce a court to take this broader view.

A number of questions may be raised concerning the meaning of "exposure to x-rays or radioactive substances." It may be argued that the language covers only exposures to external sources of radiation. Because the radiation injury which is compensable, *i.e.*, the "diseased condition," is accompanied by the phrase which links exposure to X-rays

[38] Tex. Civ. Stat. Ann. art. 8306, §20 (1956). The provisions of the Virginia statutes are comparable in that they cover "Radium disability or disability due to exposure to radioactive substances and X-Ray. . . ." Va. Laws 1958, H.B. 552, adding Va. Code §65-43.

and exposure to radioactive substances conjunctively and because exposure to X-rays can only be by external exposure, it may be that only external exposure to radioactive substances was contemplated. Moreover, because those instances of poisoning intended to be compensable are grouped together under another subheading, the failure to include certain radioactive materials which also have toxic effects may be interpreted to mean that, if such materials should result in toxic damage, the poisoning would not be compensable. Therefore, the scope of coverage for injuries resulting from ingestion of radioactive materials, either because of their emission of radiation or because of their toxic effect, remains conjectural.

More important is the question as to whether or not the fuel which "burns" in a nuclear reactor, or the nuclear reactor itself, can be termed a "radioactive substance." A radioactive element such as radium, or an artificially produced radioisotope like cobalt 60, is designated as radioactive because it is undergoing internal decay and in the process is giving off radiations of one kind or another. But what about neutron bombardment from a nuclear reactor? It is questionable whether the nuclear reactor itself could be thought of as a radioactive substance, because, for one thing, the reactor needs more than simply "a substance," *i.e.*, the uranium metal, in order to operate. Highly refined moderators, control rods, and cooling devices are essential to the operation of a reactor. Conceding that the uranium or plutonium is radioactive, and that the nuclear reactor would give off some radiation from "substances," this would be insignificant compared with the radiation resulting from neutron beam exposure. The functioning of the nuclear reactor does not depend upon the radioactivity of uranium 235, but upon its fissionable quality. Therefore, it would be more correct to speak of radiations given off from a nuclear reactor as being due to "fissionable substances" rather than to radioactive substances. On this basis, the statutory language "radioactive substances" seemingly would not include exposure to neutron radiation from a nuclear reactor. Similarly, the Texas statute apparently provides no coverage for those injuries which may be due to exposure to radiation produced by any of the high energy machines, such as the cyclotron.

Arizona. Another example of a statute supplying coverage for occupational diseases by setting forth a schedule of compensable diseases is that of the state of Arizona. This statute which was adopted in 1943 reads:

> For the purposes of this Act only the diseases enumerated in this section shall be deemed to be occupational diseases: . . .

(12) ulceration of the skin or destruction of tissue due to the prolonged exposure to roentgen rays or radium emanations.[39]

The injuries covered under this statute are limited to only those caused by prolonged exposure to either X-rays or radium emanations.[40] This limitation means the exclusion of many potential radiation injuries previously discussed in respect to other statutes. The different concept introduced by the Arizona statute is that of "radium emanations." There are two possible meanings of this term. The one which seems most plausible is that radium emanations are the rays given off by a source of radioactivity consisting only of radium. In other words, the emphasis is on the material, radium, and not on the qualities of the radiations. The other possible interpretation would include in the term all rays given off from any radioactive material, not only those from radium. The question is: Were the words "radium emanations" intended to mean the "type of rays" given off by any radioactive material or just those from radium? Would gamma and beta rays given off from cobalt 60 come within this language as well as gamma and beta rays given off by radium? An affirmative answer would appear to be an unwarrantable construction of the language. When the language was adopted in 1943, not much was known about the possibility of using other forms of radioactivity. The fact that other radioactive substances could be produced, which would give off the same types of rays as are given off by radium, was not general knowledge. Therefore, the coverage of occupational diseases provided for by this act is probably limited to those injuries caused by exposure to either X-rays or radium.

Another limitation is imposed by the statement of the nature of the injury for which recovery will be permitted. The act lists as compensable items, "ulceration of the skin and destruction of tissue." Since an ulcer is described as anything that festers and corrupts like an open sore, "ulceration of the skin" should cover an injury, such as cancer, that could occur to the skin through exposure to radioactivity. Whether heavy scar tissue would be included is questionable. There is also a question concerning the language "destruction of tissue." Is this broad enough to cover an injury that occurs to the cells, to internal organs such as the spleen or liver, or to the bone marrow? Tissue is defined biologically as an aggregate of cells, with its intercellular substance, constituting one of the structural materials of a plant or animal: for example, epithelium tissue, nerve tissue, muscular tissue, and connective tissue.

[39] Ariz. Rev. Stat. §23-1102 (1956).

[40] "Roentgen rays" are X-rays.

Thus, since tissue encompasses any of the structural materials of the body, it probably is broad enough to cover injury to any of the organs of the body and to the bone. It would not include damage to individual cells, as in the blood, but since blood deficiencies and excesses are usually a consequence of damage to blood producing organs, adequate coverage may also be provided by the definition. Though some of the atomic energy injuries, such as cancer, are not really a destruction of tissue but rather a malignant growth of tissue, they probably would be covered if the statute is given a liberal interpretation.

In summary, the Arizona statute covers only injuries caused by exposure to either X-rays or radium. It does not cover injuries from other sources of radioactivity now available in the form of radioisotopes, nor is there coverage for injuries due to such instrumentalities as the nuclear reactor. Except for the X-ray machine, no coverage is provided for injury which can be traced to radiation given off by any of the high energy machines.

Idaho. The schedule set out by the Idaho statute to provide compensation for radiation injuries reads as follows:

> Compensation as provided in this chapter shall be payable for disability or death of an employee resulting from the following occupational diseases: . . . (6) radium poisoning by or disability due to radioactive properties of substances or to Roentgen ray (X-ray) in any occupation involving direct contact therewith, handling thereof, or exposure thereto.[41]

This language, although adopted in 1939, would appear to cover most of the possibilities of injury by radium, X-rays, or radioactive materials, because it speaks of both poisoning and disability. However, toxic injuries are not included because the "poisoning" or disability must be due to the radioactive properties of substances, not their chemical properties. Thus radium poisoning is made to refer expressly to the radioactive injury caused. There is nothing in the language which would cover the neutron radiation given off from a nuclear reactor, because such injuries would not be "due to radioactive properties of substances," but to their fissionable qualities. Nor is there any coverage provided for injuries due to high-energy machines.

This statute, by using the words "in any occupation involving direct contact therewith, handling thereof, or exposure thereto," makes compensability also depend upon employment in such an occupation. Would this statute provide compensation for the office worker who happened

[41] Idaho Code §72-1204 (1949).

to be in an area close to a radioactive substance? Would his occupation be deemed to involve "exposure" to the radioactive material? His exposure would simply result from his having performed his duties in a radioactive area. If the statute is interpreted to provide compensation only for those occupations where, as a part of one's duties, there is direct contact with, handling of, or exposure to radioactive materials, it is conceivable that many radiation injuries will be excluded.

b. Recent Legislation

New Mexico. Some of the states which have utilized the schedule type of compensation law have attempted recently to modify their statutes to provide more complete coverage for radiation injuries. The New Mexico law, as amended in 1957, serves as an example:

> For the purpose of this act only the diseases enumerated in this section shall be deemed to be occupational diseases: . . . (27) ulceration of the skin or destruction of tissue due to prolonged exposure to roentgen rays or radium emanations . . . (32) diseases contracted by virtue of work connected with and directly traceable to fissionable materials or radioactive materials and not specifically listed herein.[42]

Since we have discussed statutory language similar to that used in item 27 of this statute, we will not dwell upon the scope of its coverage, except to say that it is apparently limited to injuries caused by exposure to radiation either in the form of X-rays or that emitted by radium. The new provision in item 32 includes any diseases which can be traced directly to "fissionable" materials. Undoubtedly the legislature had in mind the desirability of adding injuries resulting from the new uses of atomic energy. Any injury due to an explosion, such as the setting off of an atom bomb, or even the inadvertent reaching of the critical mass of fissionable material, probably would be pin-pointed in time and would doubtless be covered under the workmen's compensation law as an "injury by accident," as distinguished from an occupational disease. Therefore, it seems that the legislature intended to make compensable occupational diseases caused by the operation of a nuclear reactor.

What is the meaning of "fissionable"? Does it include any element which can undergo the fission process, in the sense of being split into two or more fragments, or does it apply only to those elements able

[42] N.M. Stat. §59-10-45; N.M. Laws 1957, c. 246, §10.

to sustain a chain reaction? A statement from Glasstone indicates that the word is used by scientists in the former sense:

> Until 1947, fission had not been observed in any element of atomic number less than 90, but in that year successful fission of bismuth, lead, thallium, mercury, gold, platinum and tantalum was achieved in the Radiation Laboratory, Berkeley, by means of alpha particles, deuterons or neutrons of very high energy. . . .[43]

If this broad meaning is given to the word "fissionable," then the statute would cover diseases caused by many of the elements. However, it would seem more likely that the legislature intended to adopt the interpretation of that word as it is used in the Atomic Energy Act of 1946. They probably meant to include within the term "fissionable materials" only those materials capable of sustaining a chain reaction, such as thorium, plutonium, or uranium 235. Another question raised by the language of item 32 is: Would an injury caused by fissionable material be compensable when caused by radioactivity or toxicity, rather than by the fissionable quality? For example, when plutonium is ingested, it has a very deleterious effect upon the body, both of a toxic and of a radioactive nature. The language is probably broad enough to include such injuries. It should be noted, however, that injuries arising in connection with thermonuclear (or fusion) processes may not be covered.

Colorado. On March 28, 1951, the state of Colorado added item number 22 to its list of compensable occupational diseases:

> The following diseases only shall be deemed to be occupational diseases, and compensation as provided in this act shall be payable for disability or death of employee resulting from such diseases and from no others: . . . (22) poisoning or disease caused by exposure to radioactive materials, substances, or machines, or fissionable materials.[44]

The words "poisoning or disease" are comprehensive enough to cover the possibility of injury by exposure to an external source of radiation. Also covered are injuries by ingestion of the material, causing either toxic or radiation damage or both. The descriptive wording of the sources of injury intended to be covered, *i.e.*, "radioactive materials, substances, or machines, or fissionable materials," is quite comprehensive. This language should be adequate to cover any disease or injury caused by exposure to any of the radioactive or fissionable materials

[43] Glasstone, Sourcebook on Atomic Energy 349 (1950).
[44] Colo. Rev. Stat. §81-18-9 (1953).

with which we are now acquainted. On the whole, this statute represents one of the better attempts to describe comprehensively the instrumentalities which may produce radiation injuries.

Conclusion. In nearly every state having schedule type coverage for occupational diseases, the existing statutory language is either nonexistent or unduly restrictive in coverage of atomic injuries that may be classified as occupational. In view of the fact that many delayed and cumulative radiation injuries will often not be compensable as "injuries by accident," amendatory legislation broadening the coverage for radiation injuries as occupational diseases is indicated, following the example of Colorado.

c. The Requirement of Causal Connection in Schedule Type Statutes

The showing of causal connection between the injury or disease and the employment is a requirement which appears to be highly regulated in some of the statutes providing for a schedule of occupational diseases. An example is the statute of New Mexico which reads:

> The occupational diseases hereinafter defined are deemed to arise out of the employment only if:
>
> A. There is a direct connection between the conditions under which the work is performed and the occupational disease; and
>
> B. The occupational disease can be seen to have followed as a natural incident of the work and as a result of the exposure occasioned by the nature of the employment; and
>
> C. The occupational disease can be traced to the employment as the cause; and
>
> D. The occupational disease does not come from a hazard to which the employee would have been equally exposed outside of the employment; and
>
> E. The disease is incidental to the character of the business and not independent of the relation of employer and employee, (the disease need not have been foreseen or expected, but, after its contraction, it must appear to have had its origin in a risk connected with the employment, and to have flowed from that source as a natural consequence). . . .[45]

Under this law an employee with a radiation injury may have extreme difficulty proving causation even though the injury appears on the schedule. The same considerations discussed previously in connection with the proof of causal connection under statutes providing coverage

[45] N.M. Stat. Ann. §59-10-44.

of all occupational diseases apply in the case of statutes employing schedule type coverage.

3. Voluntary Coverage

Finally, some of the states have provisions whereby the employer may elect coverage of "all occupational diseases" in lieu of the schedule. The Tennessee statute provides:

> Any employer may, in lieu of the schedule of occupational diseases enumerated in section 50-1101, reject the same and elect by written declaration filed with the division of workmen's compensation, department of labor, on a form provided by it, to be bound in accordance with the Workmen's Compensation Law by the provisions of this section and section 50-1104 relating to full coverage of all occupational diseases. Thereupon the employer shall be liable for all occupational diseases arising out of and in the course of the employment pursuant to all the provisions of the Workmen's Compensation Law.[46]

This provision has already been acted upon by the contractors of the Atomic Energy Commission operating the Oak Ridge installations, thereby affording compensation for radiation injuries not covered by the compulsory coverage provisions of Tennessee law. In those states where there may be some reluctance to expand the occupational disease statutory provisions to include all types of atomic radiation injuries, it would be desirable to at least permit expanded voluntary coverage, and it is to be hoped that atomic energy entrepreneurs would take advantage of the opportunities thereby afforded for satisfactory compensation of such injuries.

C. Successive Injuries and Second Injury Funds

Among the problems besetting modern workmen's compensation legislation is the case of two physical disabilities overtaking one man at different times and while in the employ of different employers. The combined effect of the injuries may be catastrophic although each accident by itself would give rise only to partial or total but only temporary disability. The typical example is the case of a man who loses the sight of one eye at one job and his other eye later at another job, thus becoming permanently and totally disabled. The vexing question in such instances is whether the last employer should bear the cost of compensa-

[46] Tenn. Code Ann. §50-1103 (1955).

tion for the whole final result or whether a system of apportionment of the loss among several employers ought to be used. The consequence of failing to provide a sharing of the cost may be the resort to discriminatory practices against previously injured workers, who present too great a financial risk, by refusing employment because of a prior minor injury.

Three general approaches to this problem are followed in American compensation statutes. The so-called "full responsibility" rule practically ignores the difficulty and places liability for the entire result on the employer in whose employment a worker became disabled. At the other extreme under some apportionment statutes the last employer is held liable only for the amount of the injury suffered in the second mishap, and the cumulative effect of the accidents is ignored.

Most states, including several having apportionment statutes, the District of Columbia, Hawaii, Puerto Rico, and the Longshoreman's Act, have sought to achieve equitable compensation for employees and fair relief for employers by instituting so-called second injury funds, under which usually an employer is held liable for the portion of disability arising out of the injury which occurred in his employment, while the fund contributes the difference between that amount and the total amount to which the combined effects of the two injuries entitle the worker.[47] These funds are financed in different ways. Usually they are supported by charges imposed upon employers or their insurance carriers in cases of death of employees without dependents. Some states provide funds by assessments against carriers based on total premiums collected or on compensation payments. A small number of states support the funds by special appropriations from the legislature.

In appraising the adaptability of existing second injury fund provisions to injuries suffered in private atomic industry, it should be noted that some of the second injury fund provisions apply only when the first injury consists of a listed injury, such as loss of use of an eye, leg, arm, or other member of the body, which causes a permanent partial disability, and the second injury produces the cumulative result of permanent total disability through loss or loss of use of another member. In other states, however, the second injury fund provisions are not limited in their application to listed injuries compensable under the fixed schedule of benefits. But even where the statutes are not limited, some courts have stressed that the prime objective of the statutes is maintaining the unimpaired competitive position of workmen in the

[47] The only states which do not provide for a second injury fund are Florida, Georgia, Louisiana, Nevada, New Mexico, and Virginia.

labor market and have denied the applicability of second injury fund provisions where the prior injury had no effect on the subsequent employment or where the "second injury" caused a prior non-disabling injury to become disabling. If the second injury fund provisions are not applicable, the last employer is held liable for the whole injury since the nearly universal principle is that an employer takes an employee as he finds him, and if an injury causes a disability aggravated by a previous latent condition, the entire disability is compensable without weighing the relative contributions of the two injuries.[48]

Illustrative of the cases imposing liability on the last employer for the entire extent of the ultimate injury is the case of *Scott* v. *Alaska Industrial Board*.[49] There the worker had been employed in mines since 1906 with the exception of several years in construction work. Prior to his disability he had worked in plaintiff's mine for thirty months. His prior injury was silicosis which, however, had not yet manifested itself at the time plaintiff hired him and therefore could not have placed him at a disadvantage when seeking new employment. The new injury was pneumonia, which, superimposed on silicosis, caused permanent total disability. The employer was held not to be entitled to recover from the second injury fund the portion of compensation covering effects in excess of the disability caused by pneumonia only. The court was clear that recovery could be had under the statute only when the prior disability or injury was "obviously manifested" so that the employer may have been deterred from hiring the worker. In addition, where the second accident or disease merely precipitates and renders disabling a prior non-disabling condition, it was the opinion of the court that the second injury fund legislation was inapplicable.

Radiation injuries are known to cause gradual deterioration of human tissues, and often the date of disability is postponed indefinitely. Certainly they are not of the type that will normally cause the immediate loss or loss of use of a member of the body except when amputations are necessary. Moreover, the possible cumulative effects of irradiation are not yet easily assessable. It is impossible for employers to appraise the financial risk involved in employing personnel with prolonged experience in atomic energy work, and yet skilled and experienced men offer the highest technical value. We must add to this the fact that the nature of atomic industry is such that irradiation of personnel often

[48] Only three states have special statutes on aggravation of disease: California Labor Code §4663; Kentucky Rev. Stat. §342.005(1); North Dakota Rev. Code §65-0102(8).

[49] 91 F. Supp. 201 (1950).

cannot be totally eliminated, but only reduced to levels believed to be safe. Consequently, a person applying for work in other than his original place of employment in atomic industry may be suspect to a prospective employer by reason of his experience in the field. If he has by chance been involved in minor radiation accidents, but has never been disabled even temporarily, it may nevertheless be unsound business practice for the employer to consider him for employment even in those states that do not place full responsibility on the last employer. Such hesitation is made more understandable when we realize that the state of present day knowledge of the biological effects of radiation is far from perfect, and thus atomic industry is deprived of a basic yardstick for calculating the gravity of the risk and the duration of possible complications and their financial import in terms of workmen's compensation liability. Nevertheless, if the lack of adequate second injury fund provisions, as applied to atomic energy injuries, tends to restrict the potentialities of employment of employees suffering prior radiation injuries, liberalization of the applicability of the second injury funds seems warranted.

D. Apportionment of Liability in Occupational Disease Cases

The problem of occupational diseases incubating for years before they cause a disability, with the victim engaged in several employments in the meantime, is similar in nature to the difficulties which inspired the creation of second injury funds. Its significance in relation to private atomic energy industry is apparent, for radiation diseases frequently and, indeed, normally develop slowly, a fact which is demonstrated by the medical histories of persons exposed to excessive amounts of radioactivity. Such cases threaten to be among the most troublesome from the compensation point of view.

Under present American statutes most courts impose liability on the employer or insurance carrier who assumed the risk as of the time when the disease caused the disability, so long as the employment at that time was of a kind contributing to the disease, regardless of the fact that the condition was caused in part through employment by more than the last employer. As an example, *Willingham* v. *Bryan Rock & Sand Co.* may be cited.[50] In that case the deceased worker died of silicosis. He had previously been twenty years in the employment of the person against whom the claim for compensation was filed. Following his first employment, he was hired by a second employer for five months, and it was

[50] 240 N.C. 281, 82 S.E. 2d 68 (1954).

during this employment that he became totally disabled from the disease. The second employer was joined as a defendant in the pending compensation case against the first employer and was held solely liable.

Though the last employer is held liable to the employee for the total effect of a gradually maturing disability, several statutes nevertheless provide for procedures whereby an apportionment of liabilities may be had among previous employers whose employments contributed to the disease.[51] The contribution to which each of several employers is subjected normally depends on the length of time spent in each employer's service, although Minnesota has adopted a system under which the compensation board can take into account the safety standards maintained by each employer in computing the share of contribution of each employer. This system ought to appeal greatly to framers of compensation legislation for the atomic industry because of the incentive it provides to maintain the highest safety standards.

California has adopted an apportionment scheme by judicial decision.[52] Under it a worker may recover fully from any insurance carrier who has assumed the risk at anytime during the long period of incubation of the disease, and the carrier may recover contributions from other carriers who insured the worker at some time during the several employments.

The administrative difficulties of the apportionment rule in cases in which the period of incubation may last for years or even decades, as it may in radiation diseases, and the virtual impossibility of showing the proper causal relationship between injuries and employments in which exposures to radioactivity occurred years prior to the disability, may render the apportionment system as applied today rather unsatisfactory when the attempt is made to enforce it in radiation injury cases. But, on the other hand, the adoption of the rule imposing liability only on the last employer who may have employed a workman for a relatively brief period of time may be unfair. Statutory provisions to create devices similar to those used in connection with second injury funds and intended to cover cases of slowly maturing occupational radiation-induced diseases are deserving of consideration for they may reduce the problems of providing adequate compensation for employees of atomic industry.

[51] *E.g.*, Mich. Stat. Ann. §17.228; Minn. Stat. Ann. §176.66(5); N.Y. Work. Comp. Law §44.

[52] Colonial Insurance Co. v. Industrial Accident Commission, 29 Cal. 2d 79, 172 P. 2d 884 (1946).

E. Disability and Loss of Earning Capacity

1. General Principles

Workmen's compensation and occupational disease statutes are subject to a limitation which permits compensation only for those injuries resulting in total or partial disability. Unless an injury falls within the definition of "disability," it is not considered compensable regardless of its seriousness. This restriction springs from the very basic policies underlying the adoption of the workmen's compensation and occupational disease acts.

Among the reasons for the adoption of workmen's compensation legislation was the fact that the cost of common law litigation often defeated its purpose. In many cases it consumed a good share of the proceeds of the final recovery of the workman. The time consumed in such litigation, moreover, made it difficult for the employee to pay his medical bills or support his family pending the outcome. Furthermore, the application of common law defenses to an action based upon negligence of the employer made recovery highly speculative. Confronted with the ever increasing number of injuries due to expanding industrialization, the legislatures concluded that the cost of support and medical care resulting from these injuries should be borne by the industry which created them. Workmen's compensation and occupational disease laws were thus intended to make industrial employers "pay their way" and to reduce litigation to a minimum.

Notwithstanding these factors underlying the adoption of all workmen's compensation and occupational disease legislation, there has been confusion regarding the basis for making awards for injuries. Some legislatures have been concerned with making awards for injuries which left employees in an impaired physical condition. Other legislatures have been more concerned with whether the employee was subsequently able to maintain his prior earning power, regardless of the injury he had received.[53]

In a tort action for personal injury, an "injury" to the person must be shown. Under compensation statutes a showing of "disability" is required to support an award. "Damages" in tort law and "compensa-

[53] Although death benefits comprise a substantial category of workmen's compensation claims and occupational disease claims, no discussion will be devoted to them here because there is apparently no significant difference between death caused by atomic energy and death caused by any other source, regardless of whether compensation is claimed under a workmen's compensation statute or under an occupational disease statute.

tion" under the statutes are different concepts. Therefore the extent to which atomic energy injuries will constitute compensable disabilities, taking into consideration the definitions used by the legislatures and the interpretations of the statutory wording by the courts, warrants examination. Generally speaking, a personal injury, while normally sufficient grounds for tort liability in another setting, may not be enough to entitle the injured person to compensation.

In deciding what constitutes either a total or partial disability, it should be recognized that there are two determinants: (1) actual physical disability which is determined by the reduction in ability of the claimant to use his body after the injury, *e.g.*, the inability to see because of cataract or to move because of muscular damage; and (2) loss of earning power which is determined by the extent to which claimant's injury subtracts from his attractiveness in the labor pool. These factors are corollary to the policy considerations which prompted the adoption of the workmen's compensation and occupational disease acts.

In most instances, both physical disability and inability to earn the same wages occur simultaneously. But this is not necessarily the case. At one extreme, it is conceivable that a workman can be made an almost totally handicapped person, such as a quadruple amputee, but yet, by perseverance and ingenuity, he may be able to earn a livelihood. Common sense would suggest that a man who has lost his arms and legs has suffered a serious decrease in his earning capacity. It would seem that the harm he has suffered physically should entitle him to compensation on the ground that his capacity to earn has been destroyed so far as his competitive position with his fellow workers is concerned. To deny him compensation because he develops a new means of earning a living would be to penalize a person who is more industrious and imaginative than the average. On the other hand, it is likely that a worker who has suffered an injury which only slightly impairs his physical activity may not be able to find employment, and therefore has suffered a severe diminution of his wage-earning capacity. This latter situation may very well be the case when occupational disease is involved, especially is this likely to be true in radiation overexposure cases. Since such radiation exposures have a cumulative effect, another atomic energy employer may refuse to hire a man who has been previously overexposed, for only a little additional exposure, even though small in amount, may produce disability. The last employer may have to bear the compensation payments because, as was noted in the preceding section, under most of the occupational disease laws the last employer is responsible for the entire compensation.

For classification purposes a four-fold subdivision of compensable disabilities has been established. These are temporary total, temporary partial, permanent total, and permanent partial disability. Ordinarily, there is little controversy regarding the loss of earning power under the categories of temporary partial or temporary total disability. The actual wage loss of the disabled employee can be determined directly from the amount of time and wages the employee has lost. Permanent partial and permanent total disabilities raise more complex questions in both accidental injury and occupational disease areas. In these instances, it becomes necesary to determine the employee's earning capacity after the condition created by the injury has stabilized.

The first problem in dealing with atomic energy injuries is to determine how they will be classified as disabilities. Then, it must be determined whether the disability is to be measured under the statutes on the basis of physical condition or loss of earning power, or both, in order to appraise the suitability of the solutions in respect to radiation injuries.

2. Application of General Principles to Atomic Injuries

a. Temporary Disabilities and Atomic Injuries from Accidents

Typical of the atomic energy injuries, which seem most likely to fall into the category of temporary disabilities, either partial or total, are the aftereffects, other than death, of a large single accidental overexposure to radiation. Radiation illness, due to a large overexposure to radiation, goes through four phases within a period of months, after which the immediately apparent effects either disappear or are latent. During this period, the employee may be totally incapacitated. In determining the amount of compensation for temporary disabilities, the problem becomes one of ascertaining the extent of the "disability" (unless this particular injury has a prescribed compensation listed in a statutory schedule).[54] "Disability" as used in a particular statute might mean either or both of the factors hitherto named, *i.e.*, physical incapacity or loss of earning capacity. However, in the temporary disability situation, the emphasis will be on loss of current wages. No forecast as to the employee's loss of earning capacity in the future is

[54] Typically, workmen's compensation statutes provide a specified weekly benefit for temporary disabilities requiring loss of earnings and prescribe a maximum total compensation. For example, see N.Y. Workmen's Comp. Law §15. It would be possible to prescribe a fixed number of weekly benefits for a specific injury, however.

necessary as would be true in the case of a permanent disability. In the case of acute overexposure to radiation, the effects are likely to be severe enough to warrant the assumption that the claimant will not be able to earn anything for the period of the disability. If the particular injury does not cause any loss of wages, compensation probably will not be awarded because of the emphasis in temporary disability cases on actual wage loss.

b. Permanent Disabilities and Atomic Injuries from Accidents

The atomic energy injuries which seem more likely to fall into the categories of permanent partial or total disabilities are those of sterility, genetic damage, leukemia, leukopenia, cancer, and shortened life span. The "distinctive radiation injuries," such as sterility, genetic damage, or shortened life span, may not fall within what is generally considered a "disability," although the damage is permanent. This results from the fact that these injuries may not result in wage loss or physical deterioration which affects the overall earning capacity. If the particular requirements of the statute as to a loss of earning capacity are not met, then regardless of whether the statute otherwise includes such an injury within its scope, no recovery will be allowed.

In respect to those radiation injuries, such as cancer, which may be classified as permanent partial disabilities, most states determine benefits on the basis of decreased earning capacity, disregarding actual wage loss. This will create some problems in relation to radiation injuries unless they are covered by a schedule which provides a definite amount of compensation. For example, certain seemingly permanent atomic energy injuries, such as cancer, leukemia, leukopenia, and bone necrosis, while definitely constituting physical impairment of the body, may not result in decreased earning power in the immediate period after they are contracted. That these injuries should qualify as physical disabilities affecting earning power can be illustrated by the likelihood that if a person had cancer, even though medical treatment temporarily arrested its development, his chances of future employment would be lessened. Since another employer would not be likely to hire him, the cancer would cause an actual decrease in the employee's earning potential thus warranting compensation.

The experience in Illinois demonstrates the typical judicial construction given to statutes which determine disability in terms of loss of earning capacity. Prior to 1955 the Illinois statute read:

> If, after the accidental injury has been sustained, the employee as a result thereof becomes partially incapacitated from pursu-

> ing his usual and customary line of employment, he shall, except in cases covered by the specific schedule set forth in paragraph (e) of this section, receive compensation . . . equal to fifty per centum of the difference between the average amount which he earned before the accident and the average amount which he is earning or is able to earn in some suitable employment or business after the accident.[55]

The purpose of the statute was stated in *Ridge Coal Mining Co.* v. *Industrial Commission:*

> The purpose of the act is to as nearly as possible give the injured employee fifty per cent of the difference between what his earnings would have been had he not been injured and what he is earning or is able to earn subsequent to the injury.[56]

In that case an employer sought to terminate compensation payments on the theory that the employee subsequently was earning higher wages. The employer did not introduce any evidence of the employee's physical condition. The court held that:

> Since the plaintiff in error has contented itself with presenting testimony only concerning the wages of the defendant in error, and has offered no other evidence concerning the condition of the defendant in error, its evidence is not sufficient to justify a holding that the disability of the defendant in error has ended.[57]

Thus the court interpreted the statute to mean that the employee's physical condition must be ascertained, regardless of his earnings, before an award will be terminated.

In a decision rendered by the same court the following year upon a petition to reduce an award on the ground that in a new position the employee had been able to work more days and thus earn more money than he would have earned had he continued in his former occupation, the court said: "Compensation is not based on physical or mental disability, except as it affects earning capacity, nor on opportunity to work, but is based on previous earnings and earning capacity and is measured by the loss of such earning capacity due to the accident." [58] In a very recent case, however, involving an attempt by an employee to base his

[55] Ill. Rev. Stat. c. 48, §145(d) (1949). The statute now provides for compensation equal to a minimum of 65% of the wage difference. Ill. Rev. Stat. c. 48, §138.8(d) (1955).

[56] 314 Ill. 509, 512, 145 N.E. 643 (1924).

[57] *Id.* at 517.

[58] Consolidated Coal Co. of St. Louis v. Industrial Commission et al., 314 Ill. 526, 528, 145 N.E. 675 (1924).

claim for compensation upon the fact that his wages were now less than formerly, if overtime pay were excluded, the same court stated: "The object of this provision is to compensate the injured employee for his reduced earning capacity and, if any injury does not reduce his earning capacity, he is not entitled to compensation." [59] From these cases, it can readily be seen that the earning capacity test cannot be easily applied in instances where there was no actual wage loss although some physical impairment could be demonstrated. For "distinctive radiation injuries," such as shortened life span and sterility, providing compensation under the loss of earning capacity test will be even more difficult unless statutes are amended to cover such cases in schedules or otherwise.

Wisconsin has a provision in its statute which may have the effect of permitting coverage of most atomic energy injuries. The Wisconsin statute establishes a schedule of specific disabilities and relative disabilities and makes allowance for disfigurement. It also states:

> For permanent partial disability not covered by the provisions of sections 102.52 to 102.56 [schedule, application of schedule, and disfigurement] the aggregate number of weeks of indemnity shall bear such relation to the number of weeks of indemnity set out . . . as the nature of the injury bears to one causing permanent total disability and shall be payable at the rate of 70 per cent of the average weekly earnings. . . .[60]

By this language, an injury is made compensable on the basis of how much the injury tends to impair, percentage-wise, bodily function. Interpreting this language, the court has stated that the legislature intended to put this kind of permanent partial incapacity on the same plane with scheduled injuries. The effect of this is to make an injury compensable much in the same manner as is true in the case of the regular scheduled injuries. In a recent case the court stated:

> The general scheme of the statutes following the development of schedule and relative injuries, all of which constituted a permanent partial disability, indicates that the legislature was concerned with bringing nonschedule and nonrelative disabilities into conformity with schedule and relative disabilities. . . . Such a construction leaves no disparity between schedule and relative injuries on the one hand, and nonschedule injuries causing permanent partial disability on the other. This also conforms to the practical necessities. During the healing period it is possible to establish a wage loss because that is a past event. But since an award for permanent disability is to

[59] Sroka v. Industrial Commission et al., 412 Ill. 126, 128, 105 N.E. 2d 716 (1952).
[60] Wis. Stat. Ann. §102.44(3) (1957).

> be made for all time at the end of this period it must be based upon some sort of prediction as to impairment of earning capacity. It appears to us that the legislature has specifically chosen in the case of nonschedule permanent partial disabilities the method of comparing the severity of the injuries causing such a disability with those causing permanent total disability.[61]

The case involved a salesman who had injured a vertebral disc while lifting a refrigerator during a demonstration for a prospective customer. Following an operation to alleviate his condition, he again resumed his occupation as a salesman at higher wages than before the injury. In this situation, the employee continued in the same work as prior to the injury, and he earned more money, yet he was classified as permanently partially disabled to the extent of twelve and a half per cent, due to the loss of some motion in the spine. It would seem that the award was really made because of the physical disability with its resulting effect on the competitive earning capacity of the employee. Since the court construed the statute to mean that the legislature intended to put nonschedule injuries on the same plane with schedule injuries, it appears that the award was made without reference to whether any diminished earning capacity is foreseeable. This treatment would permit compensation for atomic energy injuries because the commission could simply consider the particular injury the employee had suffered and could decide that it amounted to some percentage of total disability. The employee would then be compensated on this basis without having to overcome the obstacle of showing his earning capacity had been specifically decreased. The effect is similar to that of listing atomic energy injuries in the schedule. Even this type of statutory provision, however, may be difficult to apply in respect to such injuries as shortened life span and sterility. Moreover, as applied to atomic energy injuries, insurance companies may have difficulty in preparing contracts that are actuarily sound.

Generally, the post injury earnings used as the basis for computing decreased earning capacity are those the injured employee is able to earn in "any" kind of employment. However, a few states use earning capacity "in the same employment" as the basis for computing the difference between prior and subsequent earnings. The advantages of the latter approach to an employee are apparent. It would be quite possible for a highly skilled craftsman to receive injuries that compel

[61] Northern States Power Co. v. Industrial Commission, 252 Wis. 70, 75-76, 30 N.W. 2d 217 (1947).

him to discontinue his particular craft. However, if he is able to obtain employment as a common laborer, he might be able to earn some wages for the period which elapses before he has to file his claim. If wages earned in "any" employment were the criterion, the commission would be obliged to use his potential earning capacity as a common laborer in determining the disability award. In respect to atomic energy workers, the advantage of special training might be lost if an overexposure is suffered which prevents continuing in the same job. The loss of the value of this special training might go uncompensated if the employee were able to earn equivalent wages under a statute which used "any employment" as a basis of comparing a loss in earning capacity.

Michigan defines disability by reference to the same employment. The statute states:

> The word "disability" means the state of being disabled from earning full wages at the work in which the employee was last subject to the conditions resulting in disability. . . .[62]

In a case which arose under this statute an employee who had been employed as a motor tester suffered an arm injury which rendered his arm useless. Subsequent to his injury, he was employed as a motor inspector at a slightly higher rate of pay. The court held that though the occupations of the employee prior and subsequent to his injury were closely *related,* they were not identical and the statute explicitly provides that ability to work at the *same* employment is the statutory test. The court stated:

> Again, we must hold that this raises an equitable question barred from consideration as the law now stands, and we cannot hold that it was error for the board to award him compensation on the ground that from the time of the accident he was wholly incapacitated from earning any wages in the employment in which he was engaged at the time of the accident.[63]

Therefore, under Michigan law, an employee suffering an atomic energy injury preventing continuation in the same work would qualify as disabled.

While the preceding discussion concerning the Michigan treatment of compensability is limited to a consideration of whether the injury is within the statutory definition of a compensable disability in the first

[62] Mich. Stat. Ann. §17.220(a) (1950).

[63] Geis v. Packard Motor Car Co., 214 Mich. 646, 651, 183 N.W. 916 (1921).

instance, subsequent earnings of the employee are taken into consideration under that part of the Michigan statute which provides:

> The weekly loss of wages referred to in this act shall consist of such percentage of the average weekly earnings of the injured employee computed according to the provisions of this section as shall fairly represent the proportionate extent of the impairment of his earning capacity in the employment in which he was working at the time of the injury, the same to be fixed as of the time of the injury, but to be determined in view of the nature and extent of the injury: *Provided*, The compensation payable, when added to his wage earning capacity after the injury in the same or other employment, shall not exceed his average weekly earnings at the time of such injury.[64]

Interpreting this proviso, the Michigan court in *Markey* v. *S. S. Peter and Paul's Parish* [65] held that where the employee was regularly earning more money in a new and permanent employment subsequent to the injury, the proviso became operative, and the employer was entitled to an award stopping compensation.

At first glance it would seem that under this type of legislation if the employee subsequently earns equivalent or better wages, he will be denied compensation. However, in Michigan, once the employee is classified as having a compensable disability because he can no longer earn full wages at his old employment, he becomes entitled to compensation. From this point on, in order to stop payments, it is necessary for the employer to show that the employee is again holding a job which yields equal or higher wages. If such employment should cease, the employee does not have to show any actual change of physical condition to have the compensation restored. The policy underlying this approach is to encourage rehabilitation of the injured employee. This system would seem highly suitable to meet the needs of employers and employees in private atomic industry where, undeniably, injuries may have a marked impact on one's earning capacity in the indefinite future though no serious diminution of earning ability may result in the immediate or intermediate future, and, yet, on the employer's side, it may be considered fair not to burden an enterprise on account of damages which have not yet materialized. Of course, an extension of the limitations period for recovery may be necessitated to render these remedies meaningful when applied to radiation injuries.

[64] Mich. Stat. Ann. §17.161 (1950).
[65] 281 Mich. 292, 274 N.W. 797 (1937).

Another provision in many of the statutes which may provide compensation for some of the atomic energy injuries is that which deals with "disfigurement." Under these provisions, compensation is usually allowed, with a maximum limit, in case of any disfigurement to the face, head, neck, or hands, when such disfigurement interferes with the employee's future earning capacity. Such a provision may be used to cover such disfigurements as resulted from the accident which occurred during the Eniwetok experiments. In that case some of the personnel employed during the experiment picked up some "hot" equipment, seriously exposing their hands to radiation. The hands were scarred. If a statute provided compensation for disfigurement to the hands, then such an item would be compensable if it interfered with the individual's earning capacity. Another item which might be included within the term "disfigurement," is that of epilation, or loss of hair. This would depend upon whether the loss of hair is permanent and whether or not it could come within the definition of disfigurement. Where a loss of hair could be shown to result in decreased earning capacity, it might be compensable. Generally, the statutes do not define disfigurement, but instead leave it to the discretion of the commission in each case. The only general limitation is that the disfigurement must be such that it may affect the future earning capacity of the employee or influence a subsequent employer in deciding whether or not to hire the claimant.

c. Occupational Diseases and Atomic Injuries

The question as to the meaning of "disability" also arises in connection with radiation injuries that may be classified as occupational diseases, and problems similar to those discussed in connection with accidental radiation injuries are encountered. Generally speaking, in occupational disease legislation the emphasis is also placed upon diminished earning capacity.

In Michigan, disability is defined in terms of being unable to earn full wages in the same occupation, but the compensation therefore is measured by loss of earning capacity. The statute reads:

> The word "disability" means the state of being disabled from earning full wages at the work in which the employee was last subjected to the conditions resulting in disability. . . .[66]
>
> If an employee is disabled or dies and his disability or death is caused by a disease and the disease is due to the nature of

[66] Mich. Stat. Ann. §17.220(a) (1950).

> the employment in which such employee was engaged and was contracted therein, he . . . shall be entitled to compensation . . . for his disablement . . . all as provided in part 2 of this act, except as hereinafter stated in this part: *Provided, however,* That if it shall be determined that such employee is able to earn wages in another occupation, which shall be neither unhealthful nor injurious and such wages do not equal his full wages prior to the date of his disablement, the compensation payable shall be a percentage of full compensation proportionate to the reduction in his earning capacity.[67]

Thus, when the employee is unable to earn full wages at the work in which he was last subjected to the hazards of the disease, he will be considered disabled. However, the compensation he receives will depend directly upon the loss of earning capacity he has suffered.

Under the Wisconsin statute, compensation for occupational diseases is handled the same as for injuries by accident. "Injury" is defined as mental or physical harm to an employee caused by accident or disease.[68] Therefore, the compensation provisions which are applicable in the case of disability resulting from an injury by accident would also apply to the case of an occupational disease. The Wisconsin approach, as discussed in the preceding section dealing with injury by accident, is that of basing disability payments upon the percentage of the actual incapacity as related to permanent total disability. The employee is not disqualified from compensation simply because it can be shown that at the time of filing the claim he is able to earn more money than he did at the time of the injury.

In the occupational disease area, some states limit compensability to those occupational diseases as a result of which the individual is totally incapacitated, as distinguished from partial incapacity. A reason for so distinguishing between partial and total incapacity probably lies in the fear that, if partial incapacity were also made compensable, the employer would be subjected to many claims for compensation based upon minor difficulties. For example, the Idaho statute provides:

> Except as hereinafter otherwise provided in this chapter, "disablement" means the event of an employee's becoming actually and totally incapacitated, because of an occupational disease, from performing his work in the last occupation in which injuriously exposed to the hazards of such disease; and "disability" means the state of being so incapacitated.[69]

[67] Mich. Stat. Ann. §17.222 (1950).
[68] Wis. Stat. Ann. §102.01(2) (1957).
[69] Idaho Code §72-1205 (1949).

Thus in Idaho the employee who is only partially disabled from an occupational disease would not be able to recover compensation for his disability.

3. Summary

Under both the injury by accident and the occupational disease statutory provisions, there is a requirement that for the injury or disease to be compensable, there must be a "disability." The general approach taken is that a showing of decreased earning capacity satisfies the requirement of a disability. Most of the states also employ schedules which set out specific injuries and the amount of compensation which will be awarded for them. Under the schedule system, it is usually immaterial whether or not any decrease in the earning capacity can be shown. Thus if an item appears on the schedule, it may be compensable whereas otherwise it is not. It should be noted, however, that most of the injuries caused by radiation do not fall within the present coverage of the schedules unless amputation may be involved. In the occupational disease area emphasis is placed upon whether or not the disease only partially disables the employee. Some states require that the employee be totally disabled from performing his last occupation for his disability to be compensable. The extent to which the atomic energy injuries will be prejudiced by statutory language requiring a disability will depend upon the extent that the atomic energy injuries result in disabilities not affecting earnings, or not wholly incapacitating the employee. As of this time, not enough is known of the atomic energy injuries to be able to say positively just what their effect will be. From general considerations of the nature of these injuries, and from the extensive use of monitoring systems, it would seem that many cases of overexposure may be caught in the early stages and result in a job shift of one kind or another. Also some of the atomic energy injuries, such as sterility, will not result in any decreased earning capacity. Therefore, it seems that the disability requirement may exclude some of the atomic energy injuries from compensability.

III. MEDICAL BENEFITS

A. Hospitalization and Treatment Costs

In addition to financial assistance to injured workers, workmen's compensation statutes in the United States provide for hospital and medical care in varying degrees. Roughly one-half of the statutes

grant unlimited benefits as to both amount and period of time, while the remainder limit benefits to certain maximum amounts and periods of time.

In some states full benefits are authorized directly by statute,[70] and in other states, although the statutes set maximum costs or periods of time, equivalent unlimited benefits may result because the workmen's compensation boards are given authority to extend medical aid up to such amounts and for such times as they may consider necessary.[71]

In many of the statutes prescribing medical care that is limited in terms of time or costs, or both, the maximum rates are such that it seems obvious that this legislation was conceived and enacted without consideration being given to the unique needs of private atomic industry.[72] Although many of these statutes were enacted years ago when the legislatures could not have taken into account the problems likely to arise from the utilization of the atom, several states have only recently increased their rates to levels that are still very modest notwithstanding the fact that the legislatures presumably were aware of the forthcoming advent of private atomic industry.

When we consider the imperfect state of present day knowledge concerning biological effects of radioactivity, and the further fact that such knowledge as we now possess indicates that radiation injuries and diseases frequently develop gradually and, even after resulting in disability, may extend over long periods of time, it seems unquestion-

[70] California, Connecticut, District of Columbia, Hawaii, Idaho (for occupational diseases only for a reasonable length of time), Illinois (up to six months only in case of silicosis or asbestosis), Massachusetts, Minnesota, Nebraska, New York, North Dakota, Puerto Rico, Washington, Wisconsin, United States Longshoremen's Act, and United States Civil Employees Act.

[71] Arkansas, Delaware, Florida, Indiana, Maine, Maryland, Michigan, Missouri, New Hampshire, New Jersey, New Mexico, North Carolina, Ohio, Oregon, Pennsylvania, Rhode Island, and South Carolina.

[72] Alabama (maximum period 90 days; maximum amount $1000), Alaska (maximum period 4 years), Colorado (maximum period 6 months; maximum amount $1000), Georgia (maximum period 10 weeks extendable once; maximum amount $1125; board may permit additional $375), Iowa (maximum amount $1500; commission may permit additional services up to $1000), Kansas (maximum period 120 days; in case of occupational disease commission may authorize additional 90 days; maximum amount $2500), Kentucky (maximum amount $2500), Louisiana (maximum amount $2500), Montana (maximum period 18 months; maximum amount $2500 which may be increased by $1000), Nevada (maximum period 6 months, may be extended additional year; maximum amount in case of silicosis $1250), South Dakota (maximum period 20 weeks; maximum amount $1000); Tennessee (maximum period 1 year; maximum amount $1500), Texas (maximum period 180 days), Vermont (maximum amount $2500), Virginia (maximum period 1 year), West Virginia (maximum amount $1600; additional $800 may be authorized).

able that they may result in extraordinarily high medical and hospitalization costs to be borne by afflicted employees. The inadequacy of the arbitrary limits on medical benefits set by many statutes seems obvious when applied to accidents and diseases caused by overexposure or by the cumulative effects of normal exposure to radioactivity.

There is another consideration indicating that full coverage for medical benefits would be advisable in connection with radiation injuries. If experts in atomic medicine can be obtained to assist state boards in radiation compensation cases, and if unlimited medical aid is extended, publicly supervised treatment of such injuries and diseases will in the course of time make available to the states a backlog of experience which can be used to advantage in regulating atomic industry with respect to health and safety problems. This may well result in increased efficiency in the prevention and cure of the major effects of overexposure to radioactivity and in consequent savings to private atomic industry and to society generally.

B. Rehabilitation Provisions

Statutory provisions for the rehabilitation of disabled workmen are relative newcomers to American workmen's compensation statutes. Already more than twenty states as well as the federal compensation acts provide varying degrees of assistance to injured employees for training purposes aimed at returning them to useful lives in the same or other employments which they can fill despite their disabilities. Artificial limbs and other appliances are included within the medical benefits available under practically all compensation statutes.

Many argue that this feature of workmen's compensation acts results in eventual savings to employers and insurance carriers who can thereby avoid the expense of supporting permanently and totally disabled workers. In addition, under the Vocational Rehabilitation Act, as amended in 1943,[73] a cost-free state-federal program of vocational rehabilitation is open to patients unable to pay.

The states are becoming increasingly aware of the advantages of rehabilitation provisions and many already provide allowances for maintenance and travel while in training. One of the greater obstacles to the full development of this legislative device to offer more meaningful compensation to men handicapped by industrial injuries is the continued presence on the statute books of provisions limiting medical

[73] 57 Stat. 374.

benefits to certain plainly inadequate maximum amounts and periods of time.

Viewing the workability of present legislation on rehabilitation as it concerns private atomic industry, it seems indisputable that the more complete programs currently available will be highly useful. It is entirely possible that the sum total of irradiation of certain workmen in atomic industry may, as the result of repeated accidents or accumulation of low level exposure, render them unfit to pursue further work in exposed areas, for additional exposure might tip the scales so as to precipitate serious disabilities. And yet these men may still be physically and mentally healthy enough to fill positions not involving exposure to radioactivity. When we consider that technicians and even rank and file personnel in atomic industry must at present and in the foreseeable future be possessed of skills which are acquired only through long periods of training and application, it is readily understood that the sudden destruction of their professional capabilities stemming from the necessity of relinquishing their old pursuits may entail severe displacements in their economic life. Adequate provisions for the rehabilitation of such highly qualified personnel may well be deemed a method of effectuating more fully the underlying policies of workmen's compensation legislation.

IV. LIMITATIONS PERIODS ON NOTICE OF INJURY AND FILING OF CLAIMS

A. General Principles in Relation to Radiation Injuries

Among the restrictions, which may add difficulty to the compensability of injuries or diseases caused by the unique qualities of atomic energy, are the requirements of giving notice to the employer and filing of a claim for compensation within a specific time limit. Generally, depending on statutory variations, the injured or diseased employee must give his employer notice of such injury or disease within a specified short period of time, or as soon as practicable. Also, the injured employee must file his claim for compensation within a definite fixed period ranging between three or six months and two years.

The objective of requiring notice to the employer is to enable him to protect himself both by seeing that the injured employee gets adequate medical treatment, so as to minimize damages, and by determining the cause of the injury. This latter point serves the dual purpose of providing the employer a better opportunity to defend himself and of giv-

ing him knowledge of any dangerous condition within the plant which might be corrected before other employees are injured. For example, an unduly delayed notice of an alleged occupational disease might prevent the employer from making a reliable investigation. This would prejudice the employer, for he would be unable to gather the facts with which to defend the claim.

Time limitations upon giving notice and filing claims may prove especially troublesome because of the peculiar nature of atomic injuries. In an article dealing with the latent biological effects of radiation, Dr. G. Failla of Columbia University wrote:

> Radiologists in the early days, when the question of protection was not under study, got their hands particularly exposed to large doses of radiation. They did not see much change at first, but gradually skin changes started to appear. Warts began to develop, and sometimes open sores started to develop. It did not incapacitate them, but perhaps ten or fifteen years later cancer developed in those regions which had shown a considerable change in the appearance of the skin. Thus, you see the latent period can be even twenty-five years. As a matter of fact, there is a case on record in which cancer developed forty years after treatment. This patient was treated in the early days for an abdominal tumor. It probably was not a tumor because she lived forty years after the treatment. In those days X-rays were not very penetrating and the treatment could not possibly have cured the tumor.
>
> It is the latent period which makes the problem of protection extremely complicated, because the worst effects may not appear until twenty-five or thirty years later. To predict the dose today that would produce effects, or rather would not produce effects, twenty-five years later is quite a problem. It would be hopeless if we did not have the experience of many radiologists who have been overexposed to radiation. We have been able to watch them for long periods of time and see what has happened to them, and thus we may arrive at our permissible limits.
>
> Cataracts are another result of overexposure. They do occur from exposure to X-rays, and it also seems that neutrons produce cataracts more readily than X-rays. As you probably read in the papers, individuals who have worked with cyclotrons and had considerable local exposure to neutrons have developed cataracts of various degrees. Some are rather badly affected and some rather slightly. It takes, roughly, three years following the exposure for cataracts to appear. The latent period can be shortened if the dose is very large, but

> the height of the reaction really occurs at about the same time.[74]

In the atomic energy field, for such latent radiation injuries as cancer, leukemia, leukopenia, anemia, cataracts, genetic damage, or sterility, compensability may be barred, depending upon the nature of the applicable statute of limitations. Consideration must therefore be given the various types of limitations expressed in the statutes regarding notice and filing of claim.

B. Notice and Claims for Accidental Injuries

The problem arising under statutes granting compensation for accidental injuries is two-fold. Some states commence the running of the period from the time of the "accident" which caused the disabling condition. Other states date the claim period from the time of the "injury."

Under the former type of statute, notice must be given to the employer within so many days after the "accident," namely the harmful exposure in the case of radiation injuries, and the claim must be filed with the commission within a number of months or two years at the most after the same date. Under the "injury" type of statute the courts are almost unanimous in holding that notice and claim periods begin to run from the time a compensable injury becomes apparent.[75]

An example of the "accident" type of statute is the Kentucky one which reads:

> No proceeding under this chapter for compensation for an injury or death shall be maintained unless a notice of the accident shall have been given to the employer as soon as practicable after the happening thereof and unless a claim for compensation with respect to such injury shall have been made within one year after the date of the accident, or, in case of

[74] Failla, "Biological Effects of Radiation," AEC, TID—388, March 12, 1951, pp. 65-66.

[75] Compare the following: Under "injury" type statutes: Acme Body Works v. Industrial Commission, 204 Wis. 493, 234 N.W. 756 (1931) (cataract developed 6 years after accident compensable), English v. Industrial Commission, 73 Ariz. 86, 237 P. 2d 815 (1951) (injury from inhalation of gas fumes 5 years after leaving employment; claimant entitled to a hearing). Under "accident" type legislation: Lewis v. Carnegie-Illinois Steel Corp., 159 Pa. Super. 226, 48 A. 2d 120 (1946) (cataract developed 5 years after accident; claim barred), Whitted v. Palmer-Bee Co., 228 N.C. 447, 46 S.E. 2d 109 (1948) (cataract developed 18 months after steel chip hit claimant's eye; claim barred), Central Locomotive & Car Works v. Ind. Comm., 290 Ill. 436, 125 N.E. 369 (1919) (blindness 3 years after accident; claim barred).

death, within one year after such death, whether or not a claim has been made by the employee himself for compensation.[76]

Any recovery for latent accidental injuries caused by nuclear radiation may well be barred under such a statute. Or at most, in the absence of square precedents on the point, it may be an open question whether the later development of an injury due to exposure to radioactivity can be compensated in cases in which a workman was never aware of any harmful effect until he became disabled. This happens to be the present state of authority in Kentucky where it is clear that if a worker has suffered a minor compensable accident he is absolutely barred later from recovery for the worsening of his condition after the running of the period of limitations. Thus, in *Fiorella* v. *Clark* [77] the claimant knew immediately after a fall of about five feet from a grease rack that he had suffered minor compensable injuries and received payment from his employer in compromise of his claim. More than one year later it became apparent that the worker had suffered severe spinal injuries. The statute was held to bar this claim, the court saying: "The word 'accident' as used in our Statute does not mean the resulting injury, but means the occurrence itself, the happening of which causes the injury." [78] In the more recent case of *Goode* v. *Fleischmann Distilling Corp.*,[79] the court, in reaching a result similar to that of the *Fiorella* case, expressly left open the question whether, in the case of a latent injury of a kind which was never preceded by a harmful event noticed by the claimant, the statutory period would be tolled until it became reasonably apparent that a compensable injury had been sustained.

The policy argument concerning the choice of the date of the accident as the time from which the period should begin to run, rather than the time when the employee should become aware or actually becomes aware of the fact that he has an industrial injury, probably lies in the fact that the risk of permitting questionable claims to be compensated would be much greater under the latter situation. In the case of latent injuries, intervening factors beyond the employer's knowledge might

[76] Ky. Rev. Stat. §342.185 (1956).

[77] 298 Ky. 817, 184 S.W. 2d 208 (1944).

[78] *Id.* at 824. See also Rutledge v. Sandlin, 181 Kan. 369, 310 P. 2d 950 (1957), where workman suffered a severe blow which several months later required surgical removal of a malignant tumor. In denying compensation, the court held that the statutory period started running with the day of the blow rather than with the day of the discovery of the injury.

[79] 275 S.W. 2d 903 (Ky. 1955).

subsequently cause the injury. Further, with the passage of time it becomes increasingly difficult for the employer to defend.

In other "injury by accident" states, the period for giving notice and filing claim commences as of the time of the injury. Thus, where an injury is latent, compensability is not barred because the injury develops some time later.[80] The Mississippi statute, which starts the period from the date of the injury, reads as follows:

> No claim for compensation shall be maintained unless, within thirty days after the occurrence of the injury actual notice was received by the employer or by an officer, manager or designated representative of an employer. . . . Regardless of whether notice was received, if no payment of compensation (other than medical treatment or burial expense) is made, and no application for benefits is filed with the commission within two years from the date of the injury or death, the right to compensation therefor shall be barred.[81]

Since the emphasis here is not upon the date of the accident but upon the occurrence of the injury, latent atomic energy injuries should not be denied compensability.

There is a further problem created where the employee does not realize the occupational connection of his injury within the statutory period following the manifestation of the injury. Does the period commence running as of the time the employee knows that his injury has an occupational connection, or when as a reasonable man he should have known of the occupational connection? For example, the statute of Missouri reads:

> No proceedings for compensation under this chapter shall be maintained unless a claim therefor be filed with the commission within one year after the injury or death, or in case payments have been made on account of the injury or death, within one year from the date of the last payment.[82]

The court, in interpreting this statute, which then had a six months limitation, said: "It seems to be a well-settled rule in respect to latent injuries that the six months' limitation for filing claims for compensation commences to run from the time it becomes reasonably apparent, and discoverable, that the employee has sustained a compensable in-

[80] This, of course, is subject to some other limitations within the statutes. For example, the claim must be filed within 5 years after leaving the employment.

[81] Miss. Code Ann. §6998-18 (1952).

[82] Mo. Rev. Stat. §287.430 (1949).

jury."[83] Under this interpretation of the "injury" type of statute, the period begins to run from the date the employee reasonably should know of his injury. This is important in the radiation injury field since the cause of some injuries may be difficult to determine.

Some states have attempted by statute to meet the problem of latent injuries. In Louisiana compensation claims generally must be filed within one year after the "accident"; however, in the case of latent injuries that statute is extended to two years. The Louisiana statute reads:

> In case of personal injury . . . all claims for payments shall be forever barred unless within one year after the accident or death the parties have agreed upon the payments to be made under this chapter or unless within one year after the accident proceedings have been begun as provided in Parts III and IV of this Chapter. Where such payments have been made in any case, the limitation shall not take effect until the expiration of one year from the time of making the last payment. Also, where the injury does not result at the time of, or develop immediately after the accident, the limitation shall not take effect until the expiration of one year from the time the injury develops, but in all such cases the claim for payment shall be forever barred unless the proceedings have been begun within two years from the date of the accident.[84]

The Louisiana court, in applying the above statute, has held that a suit for a latent injury is maintainable only if it is commenced within one year from the time the injury manifests itself, and within two years of the date of the accident.[85] The limitation to two years, of course, would be inadequate for some radiation injuries, but the statutory approach might be employed for a further relaxation of the notice requirements in respect to latent radiation injuries.

Massachusetts has a provision for ameliorating the harsh effects of the running of the period for the giving of notice and the filing of claim. The law reads in part:

> Failure to make a claim within the time fixed by Section 41 shall not bar proceedings under this chapter, if it is found that it was occasioned by the mistake or other reasonable cause, or if it is found that the insurer was not prejudiced by the delay. . . .[86]

[83] Cleveland v. Laclede Christy Clay Products Company, (Mo. App.) 129 S.W. 2d 12, 16 (1939).

[84] La. Rev. Stat. tit. 23, §1209 (1950).

[85] Hannafin v. Pelican Cracker Factory, Inc., (La. App.) 185 So. 479 (1939).

[86] Mass. Laws Ann. c. 152, §49 (1957).

The effect of this provision is to allow an even more liberal period of time in which to file a claim, if the statutory excuses can be shown. The statutory excuses give the court a wide area of discretion and, in one case, were the basis for holding that seven years' delay in filing a claim was not prejudicial as a matter of law.[87] It has also been held that delay in filing a claim until the employee learned from his doctor that his injury was probably caused by his work was for reasonable cause.[88] On the other hand, the court has held that where delay is due to mistake, the claim must be filed within a reasonable time after the mistake is discovered. The court said that since the statute is silent, a reasonable time will be assumed, and all circumstances should be considered.[89]

New York has recently amended its statute creating a two year statutory limitation period to exclude expressly certain types of atomic energy industry injuries from the scope of the limitation. The New York statute reads as follows:

> The right to claim compensation under this chapter shall be barred, except as hereinafter provided, unless within two years after the accident . . . a claim of compensation shall be filed . . . . The right of an employee to claim compensation under this chapter for disablement caused by . . . blood or lung changes or malignancies due to occupational exposure to or contact with . . . beryllium, zirconium, cadmium, chrome, lead or fluorine or to exposure to x-rays, radium, ionizing radiation or radioactive substances, shall not be barred by the failure of the employee to file a claim within such period of two years, provided such claim shall be filed after such period of two years and within ninety days after disablement and after knowledge that the disease is or was due to the nature of the employment. . . .[90]

This New York legislation obviously anticipates the problem of potential injuries and warrants consideration by other states. However, it is unfortunate that the exception is phrased in terms only of "blood or lung changes or malignancies" since these may be restrictively interpreted so that the exception may not apply to some atomic energy injuries such as sterility, damage to bone marrow, or cataract.

[87] The court would not overrule the finding of the commission that the employer was not prejudiced by the long delay in Morris Gaffer's Case, 279 Mass. 566, 181 N.E. 763 (1932).

[88] Wheaton's Case, 310 Mass. 504, 38 N.E. 2d 617 (1942).

[89] In re Carroll, 225 Mass. 203, 114 N.E. 285 (1916).

[90] N.Y. Workmen's Comp. Law §28, as amended by N.Y. Laws 1957, c. 411.

C. Notice and Claims for Occupational Diseases

Since occupational diseases are the result of chronic exposure to hazards over a long period of time, one anticipates more variety in the selection of the particular event which will start the running of the period. It is possible to choose (1) the time of the last exposure to the hazardous conditions, (2) the time of termination of the employer-employee relationship, (3) the time of the actual disability, or (4) any set period of years following exposure to the conditions which created the disease.

In Arkansas, which treats occupational diseases as injuries by accident, the notice and filing of claim requirements are:

> A claim for compensation for disability on account of injury which is either an occupational disease or occupational infection shall be barred unless filed with the Commission within two years from the date of the last injurious exposure to the hazards of the disease. . . .[91]

This statute commences the running of the period as of the time of the last injurious exposure. Thus, it would cover those injuries which manifested themselves while the employee was still exposed to the hazard, or within two years thereafter. If the employee continued to work on the job and continued to be subject to the hazard, his latent injury would be compensable. The statute does not cover the situation where the employee was transferred to another department, or where the operation creating the hazard was changed, if the incubation period is longer than two years. Since radiation and ingestion of radioactive materials can have a much longer latent period of development, the relation of the statutory period to the last exposure is inadequate.[92] Under Utah law [93] a limitation is imposed upon "partial" disability cases; the partial disability must result within two years following the last day of exposure to the occupational disease to be compensable. If the manifestation of the disease or injury simply resulted in a partial disability two years after the last exposure to radiation or radioactive materials, it would not be compensable.

A slightly different approach is taken by the Arizona statute which

[91] Ark. Stat. §81-1318(a)(2) (1957).

[92] Some other states also have statutory language which sets the period of the statute running, in relation to the time of the last exposure, but which cuts the period off at different times, such as 1 year or 3 years.

[93] Utah Code Ann. §35-2-56(c) (1953).

speaks in terms of "disablement" rather than "last exposure," and reads:

> The right to compensation under this act for disability or death from an occupational disease shall be forever barred unless written claim is filed with the commission. . . . (2) If the claim is made by an employee and based upon a disease other than silicosis or asbestosis it shall be filed within sixty days after the employee first becomes disabled. . . .[94]

Under this statute, it would make no difference when the latent injury or disease occurred because the period of the statute does not commence running until the employee is actually disabled. This could be at any time after the employee had ceased to be exposed to the hazards of radioactive materials. The language should cover all latent injuries, including toxic or radiation ingestion injuries and injuries caused by external exposure to radioactive materials.

However, there is the possibility that the employee, even after his disability occurs, may not discover its relationship to his employment until the sixty day period has elapsed. This is especially true in the case of latent injuries caused by internal irradiation. In many cases the injury may not appear for years after the exposure to radiation or radioactive materials has ceased. Also, radiation-induced diseases such as cancer or leukemia are not peculiar to persons working with radioactive materials. When the factor of time is coupled with the factor of ignorance, the occupational link between the disease and the employment may be difficult to discover even by competent physicians.

Would the discovery of occupational connection between the work and the injury after the sixty day period had elapsed bar the claim? This raises the question of whether "disablement" means not only the actual condition of the injury, but also awareness of its cause. The Pennsylvania court, under a similar statute which cuts off compensation unless notice is given the employer within ninety days after the beginning of disability, has held in *Roschak* v. *Vulcan Iron Works*[95] that where an employee did not realize the industrial connection of his disability within the time limit set by the statute, the date of disability was the date he learned the occupational nature of his disease. In the case, the physician did not inform the employee of the occupational nature of his disease until seven months after he had discontinued work, although he had been under constant medical care in the mean-

[94] Ariz. Rev. Stat. §23-1224 (1956).
[95] 157 Pa. Super. 227, 42 A. 2d 280 (1945).

time. The court adopted a liberal rule of construction, stating that the legislature could not have intended that the employee do the impossible, *i.e.,* file a claim when he was unaware that he had one. The court did suggest, as a limitation on this doctrine, that a possibility that the employee should have known of the industrial connection of the disease would start the statute running. This construction gives the disabled employee a reasonable opportunity to ascertain the industrial connection of his disablement before he is barred by the running of the period.

The Ohio court by way of dictum took the opposite approach in *Raymond* v. *Industrial Commission*[96] applying the statute literally without considering whether knowledge was present or not, saying, "Just why these claimants indulged in these delays is a matter about which this court is not informed nor permitted to concern itself." Under a statute which required that a claim must be filed within six months following the injury, "injury" being interpreted to include occupational diseases, the California court said in *Marsh* v. *Industrial Accident Commission:*[97] "Rather, according to our view should the date of the injury be deemed the time when the accumulated effects culminate in a disability traceable to the latent disease as the primary cause, and by the exercise of reasonable care and diligence it is discoverable and apparent that a compensable injury was sustained. . . ."

In Connecticut the statute does not commence to run until the employee is aware of the industrial connection of his disability:

> No proceedings for compensation under the provisions of this chapter shall be maintained unless a written notice of claim for compensation shall be given within one year from the date of the accident or from the first manifestation of a symptom of the occupational disease. . . . For the purposes of this section, "manifestation of a symptom" shall be deemed to mean its manifestation to the employee claiming compensation, or to some other person standing in such relation to him that the knowledge of such a person would be imputed to him, in such manner as is or ought to be recognized by him as symptomatic of the occupational disease for which compensation is claimed.[98]

The Connecticut court has interpreted this language by stating that: "The other implication arising out of the phrase in question is that there

[96] 140 Ohio St. 233, 42 N.E. 2d 992 (1942).
[97] 217 Cal. 338 at 351, 18 P. 2d 933 (1933).
[98] Conn. Gen. Stat. §7442 (1949).

must be a clear recognition of the symptom as being that of the occupational disease in question; however plain is the presence of the symptom itself, unless its relation to the particular disease also clearly appears, there cannot be said to be a manifestation of a symptom of that disease." [99]

The Wisconsin statute is similar to the Connecticut statute and reads:

> No claim for compensation shall be maintained unless, within 30 days after the occurrence of the injury or within 30 days after the employee knew or ought to have known the nature of his disability in its relation to his employment, actual notice was received by the employer. . . . Regardless of whether notice was received, if no payment of compensation . . . is made, and no application is filed with the commission within 2 years from the date of injury or death, or from the date the employee or his dependent knew or ought to have known the nature of the disability and its relation to the employment, the right to compensation therefor shall be barred, except . . . if the employer knew or should have known, within the 2-year period, that the employee had sustained the injury on which the claim is based.[100]

This legislation has been interpreted fairly literally. In the case of a nurse who had acquired tuberculosis by working in a hospital, but who knew of its connection to her employment more than two years before filing her claim, the court said in *Reinhold* v. *Industrial Commission:*[101] "The statute does not require absolute knowledge of this relationship but simply that the applicant know facts indicating its likelihood. What she probably did not know at that time was that she could get compensation. This is an error of law that we cannot relieve against." In *Trustees, Middle River Sanitarium* v. *Industrial Commission*[102] where a nurse did not know she had contracted tuberculosis the court said: "What an employee thinks must be based on something more than suspicion and conjecture in order to start the running of the statute of limitations. Such thought must be based upon knowledge of, or upon reliable information regarding the nature of his disability and its relation to his employment."

Utah commences the running of the period from the time of the accrual of a cause of action, the statute reading:

[99] Bremner et al. v. Marc Eidlitz & Son, Inc. et al., 118 Conn. 666, 174 Atl. 172 (1934).

[100] Wis. Stat. Ann. §102.12 (1957).

[101] 253 Wis. 606, 34 N.W. 2d 814 (1948).

[102] 224 Wis. 536, 542, 272 N.W. 483 (1937).

> The right to compensation under this act for disability or death from an occupational disease shall be forever barred unless written claim is filed. . . . (b) If the claim is . . . based on a disease other than silicosis it must be filed within 60 days after the cause of action arises. . . .[103]

Since the statute permits the filing of the claim up to sixty days after a "cause of action arises," it could be quite unlimited in scope of coverage for latent occupational diseases, depending upon when a cause of action accrues in an occupational disease case. Such language could be interpreted to mean that the period commences running as of the time of the last exposure, as of the time of the disability, or as of the time the employee is not only disabled but knows of the industrial connection of his disablement. How the Utah court will interpret this language in atomic energy injury cases is not known, but the present attitude of the court is enlightening. In *State Insurance Fund* v. *Industrial Commission*[104] a welder became disabled due to the inhalation of fumes over a period of twenty-two years, but was unaware of the industrial connection of his disability; the court held that the period of the statute had run against him. The welder had not filed the claim within the sixty day limit, although the full facts or reasons therefor did not appear. The court, in reaching its conclusion, said:

> The cause of action arises in this kind of case when the employee suffers compensable disability under the act and could by reasonable diligence ascertain that his disability was employment caused and by its nature compensable. . . . But if on account of his own failure to press his case or have a complete examination made under circumstances which would reasonably put him on notice that he was probably entitled to compensation, he failed to discover that this disability was compensable, then the fault is his own and he cannot recover.[105]

Thus Utah tends to take care of the situation where the individual, even though he is disabled, does not know of the industrial connection of his disease in much the same manner as those states which use the term "disability" and interpret it to mean the time when a disabled employee, as a reasonable man, should know of the industrial connection.

Besides the limitations of the previously discussed language relating

[103] Utah Code §35-2-48(b) (1953).
[104] 116 Utah 279, 209 P. 2d 558 (1949).
[105] *Id.* at 284-285.

to the time when the period commences to run for the giving of notice or the filing of a claim, there are other broad limitations, often in the same statutes. These limitations are designed to cut off liability at some final point, regardless of the fact that the statute may speak in terms of the date of injury or disability as the point from which the statute commences to run.

The statute of Connecticut contains such a limitation:

> No proceedings for compensation under the provisions of this chapter shall be maintained unless a written notice of claim for compensation shall be given within one year from the date of the accident or from the date of the first manifestation of a symptom of the occupational disease . . . provided no claim on account of an occupational disease shall be made by an employee or his dependents against the employer in whose employ the disease is claimed to have originated, except while the employee is still in such employ, or within five years after his leaving such employ.[106]

The additional limitation that the claim has to be filed during the employment or within five years after its termination has the effect of cutting off the period during which the claim may be filed, perhaps even before it has begun to run. If the claim must be filed within one year after the first manifestation of the disease and if the disease does not even materialize within five years after the employment terminates, then liability is cut off without regard to the period.

A distinction would probably be advisable in atomic energy industry between employees still employed and employees who have left for more than five years. Most of the concerns dealing with atomic energy are keeping records of the amount and types of exposure to radiation to which an employee is subjected. This is being done through the use of film badges and various monitoring devices. Therefore, the employer may have some material available in the form of records to use as evidence in disputing latent injury claims by disabled employees. This is a different situation from the case where the employer (*e.g.*, in a stone cutting or grinding operation) does not have any records of the amount of dust to which any employee was exposed, and has, therefore, to conduct the initial investigation when the claim is made. In the atomic energy field, it would seem that since the employer should maintain records, there would be less reason to cut off liability because the passage of time operates to the prejudice of the employer.

[106] Conn. Gen. Stat. §7442 (1949).

The Michigan statute serves to illustrate a slight modification in those provisions which might affect atomic energy injuries. The Michigan statute reads:

> No proceedings for compensation for an injury under this act shall be maintained, unless a notice of the injury shall have been given to the employer within three months after the happening thereof, and unless the claim for compensation with respect to such injury, which claim may be either oral or in writing, shall have been made within six months after the occurrence of the same . . . *Provided, however,* That in all cases in which the employer has been given notice of the injury, or has notice or knowledge of the same within three months after the happening thereof, but the actual injury, disability or incapacity does not develop or make itself apparent within six months after the happening of the injury, but does develop and make itself apparent at some date subsequent to six months after the happening of the same, claim for compensation may be made within three months after the actual injury, disability, or incapacity develops or makes itself apparent to the injured employee, but no such claim shall be valid or effectual for any purpose unless made within two years from the date the personal injury was sustained . . . and *Provided further,* That in all cases in which the employer has been given notice of the happening of . . . said accident within three months after the happening of the same, and fails, neglects, or refuses to report said injury to the compensation commission as required by the provisions of this act, the statute of limitations shall not run against the claim of the injured employee or his dependents, or in favor of either said employer or his insurer, until a report of said injury shall have been filed with the compensation commission.[107]

Provision is made for an extended time in case of latent injuries, provided that the employer has been given notice of the injury within three months of the happening thereof. This statute also provides that the statute of limitations will not run in the event that the employer has notice or knowledge of the happening of the accident or notice of the happening of the injury and does not report this information to the industrial compensation commission. The notice requirements in respect to occupational diseases are made applicable by another section which reads in part:

> The requirements as to notice as to occupational disease and death resulting therefrom and the requirements as to the bringing of proceedings for compensation for disability or

[107] Mich. Stat. Ann. §17.165 (1950).

> death resulting from such occupational disease shall be the same as required in section 15 of part 2 of this act, except that the notice shall be given to the employer within one hundred and twenty days after the disablement.[108]

Under the requirement of this section that notice of occupational disease be given to the employer within 120 days after disablement, the court has held that notice must be given within such time after the employee has knowledge or reasonable ground for knowledge of his disability.[109] The provision of the Michigan statute which does not allow the employer to plead the statute of limitations in regard to the giving of notice unless he has filed a report of the injury, is somewhat unusual. In a case involving benzol poisoning, where the employee subsequently interviewed an official of the defendant company, and the official had made the comment that he did not believe there was any of the "stuff in the finishing room," the court said:

> The reference to the "stuff in the finishing room" demonstrates that the official had knowledge of the fact that the plaintiff attributed his condition to a substance in the room in which he had worked, and, therefore, the defendant employer cannot successfully claim in this case, . . . that, although informed of plaintiff's condition, the employer was not told that it arose out of and in the course of the employment. . . .
>
> In the instant case, the employer had knowledge of the plaintiff's contention within 73 days after the occurrence of the disablement. It filed no report with the department and, therefore, is estopped to plead the statute of limitations.[110]

It should be noted that in accordance with an amendment made subsequently the commission promulgated a rule stating when and what reports of injuries and accidents should be made. Thus, unless the conditions of such injury or accident are such that a report has to be made, the employer is not estopped from using as a defense the statute of limitations.[111] The pertinence of this particular provision to atomic energy injuries lies in the fact that it will give relief from the notice requirements of the statutes in those cases where the employer, with notice or knowledge of the disability, fails to file a report. This might be especially important in the cases of atomic energy injuries because even though the employer may know of the disability, there may be considerable confusion regarding the industrial connection of such disability.

[108] Mich. Stat. Ann. §17.229 (1950).
[109] Finch v. Ford Motor Co., 321 Mich. 469, 32 N.W. 2d 712 (1948).
[110] Nicholas v. St. Johns Table Co., 302 Mich. 503, 516-17, 5 N.W. 2d 442 (1942).
[111] Amamotto v. J. Kozloff Fish Co., 317 Mich. 641, 27 N.W. 2d 118 (1947).

D. Summary

From the available evidence, atomic energy injuries often may be of a latent nature. In workmen's compensation laws the "injury by accident" statutes generally start the period for notice and the filing of claims as of the date of the accident. However, some states start the period running from the date that the injury appears. Another course is that of making a statutory exception in the case of latent injuries. Also, whereas some states do not start the period running until the injury develops, others go one step further, and do not commence the period running until the employee would also know of the industrial connection of his injury. As for occupational diseases, some statutes start the period running as of the date of the last injurious exposure to the condition or hazard which caused the disease, while others commence it as of the time the disability appears. At least one statute starts the period when a cause of action accrues. Many other limitations appear even where these requirements which concern the running of the period are met. Some states impose an over-all limitation, such as one year or five years, following the occurrence of the disability. Others cut off the claim within so many years after termination of employment. Of possible significance in atomic industry is the use of a provision that the employer may not use the defense of the statute of limitations if he does not file a report with the industrial commission. It may be concluded, therefore, that the amount of coverage afforded latent atomic energy injuries will depend in most cases upon the period of time allowed, after exposure to radiation, for filing the claim or giving notice. The application of notice and claim provisions to atomic energy injuries can be determined fully only by experience. It already seems evident that even on the basis of present knowledge of the nature of these injuries, and the causal relation between them and atomic radiations, amendments of the more restrictive statutes are desirable or essential.

V. RECOMMENDATIONS

Since atomic energy is already a significant factor in industrial operations and is destined to become even more important in our society, it seems clear that workmen's compensation laws should be amended to accommodate radiation injuries to the existing statutory patterns. There seems to be no reason at this time to conclude that an entirely separate compensation system is essential to deal adequately with the

peculiar features of atomic energy. Therefore, we conclude that each state should amend its laws to attain the following objectives:

1. Complete coverage of all radiation injuries sustained as a result of an accident.

2. Complete coverage of all radiation injuries which may be classified as occupational diseases.

3. Satisfactory second injury fund provisions in order to assist persons who have suffered prior radiation injuries to secure additional employment.

4. Apportionment of liability among employers where the worker has been exposed in a number of employments and a cumulative radiation injury results. (More accurate scientific and medical data are required before a satisfactory method of handling this objective can be resolved.)

5. Medical benefit payments in a sufficient amount and for a sufficient period to provide essential medical care for persons suffering radiation injuries.

6. Limitations period for filing notice of injury and claims sufficiently flexible to permit recovery for latent injuries and to permit recovery when the injured person discovers the connection of his employment to his injury.

It may be argued that these extensions of existing legislation will unduly burden atomic energy entrepreneurs. However, it must be remembered that employees may still face serious handicaps in proving that a particular injury was caused by radiation exposure. In fact, at some future date it may become necessary to change the burden of proof in respect to certain radiation injuries. Necessarily the workmen's compensation boards will have to exercise considerable discretion to assure that all real injuries are compensated and at the same time deny compensation in those cases having tenuous or even imaginary bases. The boards have had considerable experience in drawing similar lines under existing legislation, and it appears that they will be able to administer efficiently statutory provisions designed to handle radiation injuries. Furthermore, as experience is gained and as more scientific information concerning radiation injuries is developed, it will be possible to revise the governing legislation accordingly. Meanwhile, both employers and employees in atomic energy industry will find it beneficial if the state legislatures adopt statutes sufficiently broad to award compensation for those sustaining injuries during the infancy of the industry.

PART III

STATE REGULATION OF ATOMIC ENERGY

Chapter I

INTRODUCTION *

A prospective entrepreneur in the field of peaceful uses of atomic energy is immediately faced with the task of investigating and evaluating existing and potential types of governmental regulation. Among the crucial questions that must be answered are: (1) What types of governmental regulation will be encountered in financing, constructing, and operating atomic energy facilities? (2) What aspects of regulation will be unduly burdensome? (3) Can regulation be minimized properly by selection of place of activity, or by selection of financial and corporate organization techniques, or by requesting changes in legislation and regulation? Similarly, those responsible for formulation of public policies must examine such questions as: (1) Are existing powers and regulations adequate from the standpoint of protection of the public interest, health, and safety for application to atomic energy activities? (2) Do existing regulations unduly restrict the development of a new technology? (3) Should new legislative and administrative regulatory techniques be developed for the control of atomic energy activities?

The purpose of this study is to present a brief survey of the principal types of state and interstate regulations likely to have application in the development of an atomic energy industry both for the generation of electric power and for other industrial uses. Although it is too early to encounter any considerable number of statutes and regulations dealing with the peculiar problems arising out of the use of fissionable and radioactive materials, some explicit recognition of these issues has already found its way into the books. Moreover, many aspects of the development of atomic energy will be regulated extensively under statutes originally adopted for other purposes but general enough in nature to embrace atomic affairs. Since the earliest commercial utilization of atomic energy seems likely to be the production of electrical

* The authors wish to acknowledge the research assistance of Marvin O. Young, Legislative Analyst, Legislative Research Center, University of Michigan, member of the Michigan Bar, A.B., Westminster College, J.D., Michigan, 1954; Ivor M. Richardson, Legislative Analyst, Legislative Research Center, University of Michigan, Solicitor of the Supreme Court of New Zealand, LL.B., New Zealand, LL.M., S.J.D., Michigan, 1955; and Charles D. Olmsted, Research Assistant, Phoenix Project, University of Michigan, member of the Michigan Bar, LL.B., Michigan, 1957.

energy, considerable emphasis will be placed upon state public utility regulations which may affect the financing, construction, and operation of nuclear power reactors. In addition, state health and safety regulations will be emphasized because of the hazardous aspects of the utilization of fissionable and radioactive materials.

Federal, international, and certain types of state regulation will, however, be omitted from this discussion. For example, state labor relations acts, various forms of social insurance laws, general corporation laws, and blue sky laws are not discussed, since they are applicable to industry generally and have no unique application to the atomic energy field. Local zoning ordinances and building regulations are likewise excluded, for they are too localized and varied in character, although, of course, they must be explored prior to embarking upon an enterprise located in any particular locality. Furthermore, in the interests of brevity, the details of the specific legal problems arising out of the statutes and regulations will not be discussed, the purpose of this study being primarily to provide a check list which atomic energy entrepreneurs and governmental policy-makers may use as a basis for further investigation of specific legal problems. Limited in this manner, this study will serve to reveal the scope and character of the legal and policy problems raised by state regulatory enactments which must be considered in formulating plans for the development of a peacetime atomic energy industry.

In order to reduce the breadth of the examination of state regulations affecting atomic energy developments, ten states have been selected for the study: California, Illinois, Michigan, Missouri, New Jersey, New York, Ohio, Pennsylvania, Texas, and Wisconsin. Furthermore, because of the wide variations found from state to state in the distribution of regulatory powers among various state and local agencies, it has been found preferable to analyze the effect of these powers according to type of regulation rather than type of agency.

Chapter II

PUBLIC UTILITY REGULATION

The use of a nuclear reactor to generate electric power would undoubtedly subject the power plant to regulation as a public utility. All ten of the states under study have created regulatory commissions, commonly called public utility commissions or public service commissions, to regulate specified businesses said to be "affected with a public interest" and known as public utilities. It should be noted at the outset, however, that because electric companies are excepted from the jurisdiction of the Texas commission, an atomic energy electric power plant in Texas would encounter no regulation by a state public utility commission, although it would be subject to a rate-making power which has been delegated to incorporated cities and towns.[1]

The extent of the jurisdiction of the commissions in the nine states other than Texas is, of course, determined by statute, subject to constitutional limitations. In considering the jurisdiction of the commissions in these nine states, the first question encountered is whether an atomic energy power plant, engaged in generating electricity, falls within the statutory jurisdiction of the state commissions. In the event electricity is supplied directly to consumers, the power plant would unquestionably be subject to regulation by the respective public utility commissions. With the possible exception of Ohio, it also seems clear that an atomic power plant which sells electricity at wholesale to other electric companies would also be subject to the jurisdiction of the various state utility commissions. For example, the New York statute gives the Public Service Commission jurisdiction over "the manufacture, conveying, transportation, sale or distribution of . . . electricity" and over "electric plants" and "persons or corporations owning, leasing or operating the same." [2] The term "electric plant" includes "all real estate, fixtures and personal property operated, owned, used or to be used for or in connection with or to facilitate the generation, transmission, distribution, sale or furnishing of electricity. . . ." [3] It seems clear that the language embraces an atomic power generating plant. It would seem, moreover, that the definition is sufficiently broad to

[1] Tex. Civ. Stat. art. 1119.
[2] N.Y. Public Service Law §5(2).
[3] *Id.*, §2(12).

include a separate corporation operating a nuclear reactor and engaged in the business of selling heat energy to a generating station for conversion by the generating company into electric energy. In defining terms such as "public utility," "electric corporation," and "electric plant," the statutes of the other states are equally broad.[4]

However, a different situation may prevail in Ohio. There, "public utility" is defined as: "An electric light company, when engaged in the business of supplying electricity for light, heat, or power purposes *to consumers* within this state." [5] The Ohio Supreme Court has held that a plant supplying electric energy to other utility companies for distribution is not a public utility within the Ohio statute, and the statute has not been amended since this decision was rendered.[6] A corresponding provision defining a "gas company" [7] was amended in 1933 to include a person or corporation engaged in the business of supplying artificial or natural gas to consumers or of supplying artificial gas to gas companies or natural gas companies.[8] Thus, it is not unlikely that the Ohio legislature may amend the statute in order to include an electric company supplying electricity to other electric companies. Nonetheless, only Ohio among the states having commissions regulating electric companies would seem to permit a general industrial firm to avoid regulation by the device of selling power to existing utilities rather than directly to consumers.

Assuming that the nuclear plant itself is denoted a public utility and thereby subjected to regulation, what are the restrictions imposed upon one or a group of existing utilities in attempting to finance, construct, and operate a nuclear reactor for producing electricity? Moreover, what restrictions are imposed on investment by a general industrial firm in an atomic power corporation? In considering these questions, four specific problems have particular significance: (1) regulation of the acquisition of an atomic reactor by a corporation organized for the specific purpose, or by an existing corporation; (2) restrictions affecting the purchase of voting common stock in an atomic power corporation; (3) regulation of transactions between affiliated utility companies; and (4) rate regulation.

[4] Cal. Public Utilities Code §§216, 217, 218; Ill. Stat. Ann. c. 111 2/3, §10.3; Mich. Stat. Ann. §22.141; Mo. Rev. Stat. (1949) §§386.020(12), (13), (25); N.J. Rev. Stat. (1937) §48:2-13; Pa. Stat. Ann. tit. 66, §1102(17); Wis. Stat. (1957) §196.01.

[5] Emphasis added. Ohio Rev. Code §4905.03(4).

[6] The Southern Ohio Power Co. v. Public Utilities Commission, 110 Ohio St. 246, 143 N.E. 700 (1924).

[7] Ohio Rev. Code §4905.03(5).

[8] See Orndoff v. Public Utilities Commission, 135 Ohio St. 438, 21 N.E.2d 334 (1939).

A. Regulation of the Ownership of an Atomic Reactor by a Corporation Organized for the Specific Purpose, or by an Existing Corporation

The development by private capital of atomic energy for power production may take place under a variety of organizational forms. An existing utility company may acquire an atomic reactor, owning and operating it within its existing corporate structure. Or it may be found advisable, at least during the experimental and developmental stage, to organize a separate corporation to construct and operate the reactor. Several statutes which may be applicable, depending on the organizational pattern adopted, and which present problems unique to the atomic energy business, must be consulted.

1. Ownership of Nuclear Reactor by an Existing Corporation

Whether an existing public utility corporation could legally own a nuclear reactor without altering its corporate powers depends, of course, on the charter of the corporation involved. However, notwithstanding the uniqueness of the source of energy, it would seem that generation of electric current, whatever the means used, and research for improved methods of generation would be rather clearly incidental to the business of supplying consumers with electric power; hence, there is little likelihood that such a venture would be deemed *ultra vires*.

Actually, considerations other than corporate power to purchase a nuclear reactor probably will be controlling in determining whether the reactor should be owned by an existing public utility company or by one created for the special purpose. These considerations include financing, possible effect on rate determination, and damage liability problems.

2. Certificates of Convenience and Necessity

Obtaining a certificate of public convenience and necessity is frequently a prerequisite to the initiation of a new type of activity on the part of a public utility. Statutes of six of the ten states covered in this survey specifically require that such a certificate be obtained before an electric utility may construct a plant. Of these six statutes, that of California is typical:

> No . . . electrical corporation . . . shall begin the construction of a . . . plant, or system, or of any extension thereof, without having first obtained from the commission

> a certificate that the present or future public convenience and necessity require or will require such construction.[9]

Moreover, a certified copy of the corporation's charter must be filed with the state commission, and any required municipal or county franchise must be obtained.[10] The statutes of Illinois, Michigan, Missouri, and New York are substantially the same.[11] The Wisconsin statute is somewhat more elaborate and detailed than those of the above five states. It permits the public service commission to require the utility periodically to submit plans of proposed construction. Furthermore, the commission is empowered to refuse a certificate if it appears that the completion of the project

> . . . (a) will substantially impair the efficiency of the service of such public utility; (b) provides facilities unreasonably in excess of the probable future requirements, or (c) will, when placed in operation, add to the cost of service without proportionately increasing the value or available quantity thereof unless the public utility shall waive consideration by the commission, in the fixation of rates, of such consequent increase of cost of service.[12]

Until nuclear reactors are proved to be commercially competitive, this statute will undoubtedly have a substantial effect because of the probable high cost of constructing the early nuclear reactors. Moreover, prospects of developing within a few years technological processes for commercial utilization of the fusion process and improved methods of using the fission process may lead public utility commissions to exercise cautiously their power to issue certificates of convenience and necessity because of a possible high obsolescence factor in first commercial reactor designs. It is likely that a similar result will also be reached in states that have adopted the California type of statute. As will be noted later, the problem of rate determination is one that is likely to assume considerable importance in the development of atomic energy for power purposes.

The statutes of Pennsylvania, while not specifically requiring permission to build a plant, require, subject to minor exceptions not relevant here, that a utility must obtain a certificate before acquiring any kind of property from any person.[13] This seemingly would em-

[9] Cal. Public Utilities Code §1001.

[10] *Id.*, §1004.

[11] Ill. Stat. Ann. c. 111 2/3, §56; Mich. Stat. Ann. §22.142; Mo. Rev. Stat. (1949) §393.170; N.Y. Public Service Law §68.

[12] Wis. Stat. (1957) §196.49(4).

[13] Pa. Stat. Ann. tit. 66, §1122.

brace plant construction.[14] In addition, in Pennsylvania and also in Missouri, the commissions are specifically given authority, in granting certificates of convenience and necessity, to impose such conditions as they deem reasonable and just.[15] These statutes obviously place great power in the hands of these commissions.

New Jersey and Ohio do not require that a certificate of convenience and necessity be obtained by a utility before it may construct a major property addition.[16] As previously noted, Texas has no state commission with jurisdiction over electric companies.

It may be mandatory in some states to incorporate an atomic power plant in the state in which it is to be operated in order to obtain a certificate of convenience and necessity. An Ohio statute provides:

> No franchise, permit, license, or right to own, operate, manage, or control any public utility which is an electric light company . . . shall be granted or transferred to any corporation not incorporated under the law of this state.[17]

Substantially identical provisions are found in the laws of California, Illinois, and Wisconsin.[18]

3. Financing a Corporation to Construct a Nuclear Reactor

State statutes frequently regulate various aspects of public utility financing. The statutes of nine of the ten states under study require that all proposed electric utility security issues be approved by the state public utility commissions, subject to a few minor exceptions to be noted later. Again, Texas is the exception.[19] These statutes are almost certain to affect substantially the financing of early nuclear electric power plants, especially for the reason that such developments frequently take the form of cooperative action by several utilities or possibly a combination of utilities and industrial corporations. Indeed, it may appear that desired financing programs are precluded by the applicable state regulatory statutes.

[14] The state officials so reported to the Federal Power Commission; see FPC, State Commission Jurisdiction and Regulation of Electric and Gas Utilities 24 (1948).

[15] Mo. Rev. Stat. (1949) §393.170; Pa. Stat. Ann. tit. 66, §§1121, 1123.

[16] FPC, State Commission Jurisdiction and Regulation of Electric and Gas Utilities 24 (1948).

[17] Ohio Rev. Code §4905.62.

[18] Cal. Public Utilities Code §704; Ill. Stat. Ann. c. 111 2/3, §28; Wis. Stat. (1957) §196.53.

[19] FPC, State Commission Jurisdiction and Regulation of Electric and Gas Utilities 26 (1948).

New York and Wisconsin were the first states to create the modern type of public utility commission with broad powers. Many states have patterned their laws, to some extent, upon these pioneer statutes.[20] For this reason the New York utility financing statute will be examined in some detail.

The New York statute provides that an electric utility corporation may issue stocks, bonds, notes, or other evidences of indebtedness if it has obtained from the public utility commission an order authorizing such issue, stating the purposes to which proceeds thereof are to be applied, and declaring that, in the opinion of the commission, the money, property, or labor to be procured or paid for by the issue of such stock, bonds, etc., is reasonably required. The purposes for which such securities may be issued are enumerated: (1) acquisition of property, (2) construction, completion, extension, or improvement of plant or distributing system, (3) improvement or maintenance of service, (4) refunding, (5) reimbursement of moneys "actually expended from income or from other moneys in the treasury of the corporation not secured or obtained from the issue of stocks, bonds, notes or other evidences of indebtedness. . . ." [21]

As a matter of procedure, in New York, a public utility must obtain a certificate of convenience and necessity authorizing construction of a new plant before the public service commission can authorize the issuance of securities to finance it.[22] A rather important judicial decision holds that consent may be given for issuance of securities only for purposes designated in the statute.[23]

The statutes of California, Illinois, Michigan, Missouri, and Ohio contain provisions very similar to those of New York.[24] In each of these statutes, construction of new facilities is stated to be a purpose for which securities may be issued.

The New Jersey statute is less specific and provides merely that the commission shall approve the proposed issue when the commission is satisfied that the issue is in accordance with law, and the commission approves it as within authorized purposes. The executive officer of the Board of Public Utility Commissioners in New Jersey has indicated

[20] Trachsel, Public Utility Regulation 111-112 (1947).

[21] N.Y. Public Service Law §69.

[22] People ex rel. N.Y. Edison Co. v. Willcox, 207 N.Y. 86, 100 N.E. 705 (1912).

[23] P.S.C. v. N.Y. & Richmond Gas Co., 244 App. Div. 398, 279 N.Y. Supp. 824 (1935).

[24] Cal. Public Utilities Code §§816-819; Ill. Stat. Ann. c. 111 2/3, §21; Mich. Stat. Ann. §22.101; Mo. Rev. Stat. (1949) §393.200; Ohio Rev. Code §4905.40.

that, when confronted with a proposed security issue to finance an atomic energy facility, the New Jersey commission would consider the question as to whether or not such a plant could be expected to produce electric energy at or below the unit costs of a conventional plant.[25] In Pennsylvania and Wisconsin the commissions are empowered to take into account the present and probable future capital needs of the public utility and "other relevant considerations" when an application for approval of a security issue is presented.[26] Presumably, all of these states would consider the possibility of initial reactors becoming obsolete at an early date because of improved technology or because of the development of processes for commercial exploitation of the fusion process.

The commissions of six states, California, Michigan, Missouri, New Jersey, New York, and Ohio are authorized to require competitive bidding on security issues, although none of them actually requires it in all cases.[27]

In view of these statutes requiring a commission permit to raise funds by the issuance of securities, cooperative action may be precluded unless the corporate contribution can be drawn from surplus.

a. Exemption of Short-Term Loans

Conceivably the request for a financing permit could be avoided by resort to short-term loans. The New York statute permits an electric corporation to issue notes "for proper corporate purposes," payable at periods of not more than twelve months, without approval of the commission.[28] Without further limitations, there is nothing to prohibit a utility from renewing these notes from year to year. However, the New York commission seeks to combat this practice whenever possible, as for example by requiring as a condition for approval of a bond issue that the company submit a plan for retirement of its outstanding short-term notes.[29] There is some indication that the New

[25] Letter from H. J. Flagg, dated Aug. 25, 1953. He also felt that the New Jersey commission would not be faced with the problem for many years because of an adequate supply of oil, coal, and natural gas providing for cheap thermo-electric generation in New Jersey.

[26] Pa. Stat. Ann. tit. 66, §1243; Wis. Stat. (1957) §184.03.

[27] FPC, State Commission Jurisdiction and Regulation of Electric and Gas Utilities 7 (1948).

[28] N.Y. Public Service Law §69.

[29] Re The Patchogue Electric Light Co., 73 P.U.R. (N.S.) 129 (1948). In this case, unsecured notes were involved. However, the statutory language appears to cover both secured and unsecured notes.

York courts might hold such a condition unlawful as in excess of the commission's powers, although no such decision has actually been rendered.[30] The Missouri statute is nearly identical with that of New York.[31]

In California, Illinois, and Pennsylvania, notes maturing in less than one year are exempted, but limitations on renewal are included in the California and Illinois statutes.[32] Michigan permits financing by notes maturing within twenty-four months without the consent of the Public Service Commission, but a refunding limitation is imposed.[33]

In Wisconsin, obligations maturing in less than one year are exempt, since such obligations are not included in the statutory definition of "security," requiring approval.[34] In New Jersey and Ohio the statutes are silent as to short-term obligations, but approval is required for those payable at periods of twelve months or more, hence short-term notes are exempted by implication.[35]

Accordingly, the short-term note possibility of financing cooperative atomic power development is attended by numerous difficulties and is by no means an assured method of avoiding regulation of security issues.

b. New York Public Service Commission—Basic Principles

Certain other aspects of financing warrant mention at this juncture. All that can be done at present is to suggest certain problems that may have to be faced and the attitudes that seem to prevail among public utility commissions.

The New York Public Service Commission indicates that approval of public utility securities should be guided by seven basic principles: (1) the issue must be for proper corporate purposes; (2) it must be adequately supported by assets; (3) there must be a proper ratio between funded debt and capital stock; (4) the utility must show that earnings will be sufficient to meet interest or dividends on securities

[30] See 22 Fordham L. Rev. 77, 81 (1935). In Rochester Gas & Electric Corp. v. Maltbie, 298 N.Y. 867, 84 N.E.2d 635 (1949), it was held that the commission had no power to require, as a condition to approving a security issue, that a certain type depreciation accounting be followed.

[31] Mo. Rev. Stat. (1949) §393.200.

[32] Cal. Public Utilities Code §823; Ill. Stat. Ann. c. 111 2/3, §21; Pa. Stat. Ann. tit. 66, §1241.

[33] Mich. Stat. Ann. §22.101.

[34] Wis. Stat. (1957) §184.01(3).

[35] N.J. Rev. Stat. (1937) §48:3-9; Ohio Rev. Code §4905.40.

authorized; (5) the utility must make an effort to obtain the best terms possible; (6) financing costs must be reasonable; (7) competitive bidding and public sale may be required in some cases.[36] Although similar policy enunciations have not been issued by other public utility commissions, it may be expected that they will follow some, if not all, of these principles.

Of these enumerated principles, two warrant special attention. The ratio between funded debt and capital stock may cause difficulty. The New York commission attempts to limit the proportion of bonds and fixed interest obligations to a maximum of 60% of the total capital structure.[37] This limitation is significant because of the preference of utilities for use of a higher percentage of debt obligations in high-cost undertakings.[38]

Again, the requirement of a showing that earnings will be sufficient to meet interest and dividends on securities authorized may prove to be a substantial problem in view of possible high operating costs of initial electric generating plants employing atomic fuel. This problem seems intimately related to the matter of rate determination, and a further discussion of it will therefore be deferred until the rate-making problem is analyzed.

B. Restrictions Affecting the Purchase of Securities of an Atomic Power Corporation

In the event that a separate corporation should be formed to construct and operate a nuclear reactor generating plant, it is necessary to determine what restrictions may be imposed upon the ownership of stock in such a corporation. In this connection, it is desirable to consider the effect of state regulatory measures upon a form of organization that involves stock ownership of the nuclear reactor public utility by existing electric utility companies and also by non-utility companies. Related to this general problem is the more specific question of whether either type of corporation has authority to acquire and own stock in a nuclear generating plant company. Limitations on methods of financing the purchase of such stock likewise demand attention.

[36] N.Y. Annual Report of the Public Service Commission 13 (1951).

[37] N.Y. Annual Report of the Public Service Commission 46 (1949).

[38] For example, the projects undertaken by electric utilities to supply AEC installations with electricity at Portsmouth, Ohio and at Paducah, Kentucky. Re Ohio Valley Electric Corp., 96 P.U.R. (N.S.) 143 (1952); Re Central Ill. Public Service Co., 88 P.U.R. (N.S.) 28 (1951).

1. Regulation of Acquisition by Utility Companies of Stock in Other Utility Companies

Many states require that the acquisition of voting stock of certain types of corporations by other corporations be approved by a state commission. In the electric utility area this requirement is very common. In eight of the ten states surveyed in this study, there is a requirement that a public utility company must obtain the permission of the public utility commission before it may acquire stock in another public utility. Only the Michigan and Texas statutes fail to impose such a limitation upon electric utilities. The ramifications of the statutes vary considerably. In some instances, bonds as well as stock are included.[39] In seven states, approval of the public utility commission is necessary when any amount, no matter how small, of the stock of one utility is acquired by another utility.[40] However, in Pennsylvania approval of the commission is required only when a public utility seeks "to acquire five per centum or more of the voting capital stock of any corporation." [41]

It is difficult to determine the standards that will be applied in determining whether in any particular instance the acquisition of stock by one public utility in another utility will be approved. Statutes are frequently rather general in nature, conferring broad discretionary powers upon the commissions and typically requiring that the commission shall approve the acquisition if it is "consistent with the public interest." [42] Other statutes are completely silent regarding the standards to be applied by the respective commissions.[43] In such states no doubt the public interest criterion is also applied by implication.

On the other hand, the statutes of several states appear to be somewhat more restricted in scope. For example, the California statute apparently requires approval of the commission only when the stock to be acquired is that of a utility "organized or existing under or by virtue of the laws of this State." [44] In Illinois, New Jersey, and Wis-

[39] Ill. Stat. Ann. c. 111 2/3, §27(e); Mo. Rev. Stat. (1949) §393.190(2); N.Y. Public Service Law §70.

[40] Cal. Public Utilities Code §852; Ill. Stat. Ann. c. 111 2/3, §27(e); Mo. Rev. Stat. (1949) §393.190(2); N.J. Rev. Stat. (1937) §48:3-10; N.Y. Public Service Law §70; Ohio Rev. Code §4905.48(D); Wis. Stat. (1957) §196.80(1)(b).

[41] Pa. Stat. Ann. tit. 66, §1122(f).

[42] Ill. Stat. Ann. c. 111 2/3, §27; N.Y. Public Service Law §70; Wis. Stat. (1957) §196.80(3).

[43] Cal. Public Utilities Code §852; Mo. Rev. Stat. (1949) §393.190(2); N.J. Rev. Stat. (1937) §48:3-10; Pa. Stat. Ann. tit. 66, §1122(f).

[44] Cal. Public Utilities Code §852.

consin approval apparently is required only for the purchase of stock in utilities *operating* within the state.[45]

Ohio has a somewhat unique statute concerning the necessity for commission approval of stock acquisitions by public utilities in other public utilities. The statute provides:

> With the consent and approval of the public utilities commission:
>
> (A) Any two or more public utilities furnishing a like service or product and doing business in the same municipal corporation or locality within this state, or any two or more public utilities whose lines intersect or parallel each other within this state, may enter into contracts with each other that will enable them to operate their lines or plants in connection with each other.
>
> * * *
>
> (D) Any such public utility may purchase the stock of any other such public utility.[46]

These provisions apparently mean that acquisitions by one public utility of the stock of another utility need be approved only if both are operating in the same locality, or if their lines are parallel or intersect.[47]

As a result of this type of regulation, existing utilities desirous of investing in an atomic power corporation will have to obtain commission approval by showing the necessary prerequisites. A commission policy opposing such investments will preclude public utilities from engaging in a jointly sponsored enterprise to develop atomic power.

2. Regulation of Acquisition by Non-Utility Companies of Stock in Electric Utility Companies

Only three of the ten states under study require commission approval in case of a non-utility company seeking to acquire the capital stock of an electric company. The New York statute provides: ". . . [N]o stock corporation of any description, domestic or foreign, other than a gas corporation or electric corporation . . . shall purchase or acquire . . . more than ten per centum of the voting capital stock issued by any gas corporation or electric corporation organized or

[45] Ill. Stat. Ann. c. 111 2/3, §10.3; N.J. Rev. Stat. (1937) §48:2-13; Wis. Stat. (1957) §196.01(1).

[46] Ohio Rev. Code §4905.48.

[47] 33 Ohio Jurisprudence 521. Such a restrictive interpretation of the section has been made by the Ohio Public Utilities Commission in respect to Clause (A); see Re Cincinnati Gas and Electric Co. No. 827 (1916) O.P.U.C.R. 419, P.U.R. 1916 D 929; Re Cincinnati Gas and Electric Co. No. 3112 (1924) O.P.U.C.R. 122.

existing under or by virtue of the laws of the state . . ." unless approved by the Public Service Commission.[48] However, the commission may not act arbitrarily in refusing its approval.[49] A Missouri statute is patterned after the New York provision.[50] The third state, New Jersey, requires approval by the Board of Public Utility Commissioners when, as a result of the sale of any portion of the capital stock of a public utility incorporated in New Jersey, there will be vested in any corporation, domestic or foreign, "a majority in interest of the outstanding capital stock of such public utility corporation." [51]

Where non-utility companies must obtain commission approval to purchase securities of an atomic power corporation, a restrictive commission policy may prevent a jointly owned project. In view of the substantial interest of chemical companies in nuclear reactor technology and resulting radioactive byproduct wastes and materials, these regulatory provisions may have a particularly unique effect on possible cooperation among utility and chemical companies in atomic energy affairs.

3. Financing the Purchase of Common Stock in an Atomic Energy Power Plant

Financing the purchase of common stock in an atomic energy power plant by existing electric utility companies presents some additional problems apart from the above-mentioned requirements that security issues be approved by state public utility commissions, and that security acquisitions by public utilities likewise be approved. Again, the fact that several utilities may wish to join in a cooperative effort during the early stages of the development of atomic power gives particular pertinence to these provisions. If any existing utility should have insufficient surplus with which to finance such a purchase, and should it desire to issue stocks, bonds, or debentures to cover such financing, approval by the state public utility commissions would be needed in all states under study except Texas.

[48] N.Y. Public Service Law §70.

[49] See New York State Electric Corp. v. Public Service Commission, 227 App. Div. 18, 236 N.Y. Supp. 411 (1929), 260 N.Y. 32, 182 N.E. 237 (1932). The Appellate Division held that the Public Service Commission had acted arbitrarily in refusing to permit a New York electric utility to sell stock to a Delaware holding company. The Court of Appeals in ruling that the order of the Appellate Division was not appealable seemed to say, however, that the order of the Appellate Division did not limit or destroy the discretion of the Public Service Commission.

[50] Mo. Rev. Stat. (1949) §393.190(2).

[51] N.J. Rev. Stat. (1937) §48:3-10.

In an administrative proceeding to obtain authority to issue stocks or bonds to finance the purchase of stock in an atomic energy corporation, there may be uncertainty as to whether or not it is a corporate purpose for which the commission may approve a security issue. It will be recalled that the statutes of New York, California, Ohio, Michigan, Missouri, and Illinois enumerate the purposes for which a public utility may issue securities. These purposes include: (1) the acquisition of property; (2) the construction, completion, extension, or improvement of its plant or distributing system; and (3) the improvement or maintenance of its service. The New York courts have approved the action of the Public Service Commission interpreting this statute to preclude approval of security issues for purposes other than those enumerated.[52]

The Ohio commission, under a nearly identical statute, had prior to 1945 repeatedly held that securities of another company do not constitute *property,* within the act, and that an issue for the purpose of acquiring such securities cannot be approved.[53] Probably because of these decisions, the Ohio statute was amended in 1945 to permit a public utility to issue shares of common stock (bonds are not mentioned) to acquire or pay for shares of common capital stock of another public utility, when approved by the commission. But certain limitations are imposed, including a requirement that the applicant must acquire 65% or more of the issued and outstanding common stock of the company whose shares are to be acquired. Moreover, the public utility whose shares are to be acquired must be located in Ohio or in an adjoining state so as to permit the operation of the properties as an integrated system.[54] In August 1953 the general counsel of the Ohio Edison Company was asked to comment on this statute. His reply indicated that with respect to his company, the statute has not been a problem, since they financed stock purchases in other utilities from "uncapitalized capitalizable expenditures"; in other words, from surplus.[55] However, in the absence of such reserve funds the Ohio statutes would become an obstacle.

In states other than Ohio, the commissions might approve the issuance of stocks or bonds to finance the purchase of electric utility

[52] P.S.C. v. N.Y. & Richmond Gas Co., 244 App. Div. 398, 279 N.Y. Supp. 824 (1935).

[53] See 33 Ohio Jurisprudence, Public Utilities, §169c, and cases cited therein.

[54] Ohio Rev. Code §4905.40. On the amendment, see 33 Ohio Jurisprudence, Public Utilities, §169c.

[55] Letter from D. Bruce Mansfield, dated Aug. 31, 1953.

securities either on the theory that such securities constitute "property" or that they are being purchased for the "improvement or maintenance of service." [56] As hitherto noted, the statutes of New Jersey, Wisconsin, and Pennsylvania are less specific than New York in regard to the purposes for which securities of public utilities may be issued, and accordingly in those states less difficulty could be anticipated. Nevertheless, a prospective entrepreneur in the atomic reactor field will be obliged to inquire of the state commissions to ascertain their views concerning approval of a security issue to finance the purchase of common stock in an atomic energy power plant. A letter received from the New Jersey Board of Public Utilities Commissioners indicates that because the cost of generating electricity by the use of nuclear fuels may prove to be higher than by conventional methods, the commission will be obliged to consider this factor in determining whether or not to grant the necessary approval for a security issue.[57]

C. Regulation of Transactions Between Affiliated Companies

Again, because some type of joint financing among public utilities and non-utility corporations may be desirable during initial phases of developing the atomic power industry, atomic energy entrepreneurs are necessarily interested in the regulations that are imposed in respect to the resulting intercorporate arrangements. In some instances this regulation may be considered so unacceptable to some firms, particularly non-utilities, that they may not consider it feasible to engage in a joint venture.

It must be kept in mind that state commission regulation of utilities varies not only with the statutes of the various states, but also with the strictness or liberality with which the commissions and courts interpret the laws granting regulatory power to administrative agencies. While certain commissions interpret their powers narrowly, others extend their regulatory authority to activities reached only by a broad construction of the pertinent statutes.[58] This difference in basic approach is manifested especially in the area of regulation of intercorporate relations between public utilities and affiliates.

Transactions with affiliates can be regulated to some extent without

[56] There are no reported court decisions defining these terms in other jurisdictions.

[57] Letter from H. J. Flagg, Executive Officer, N.J. Department of Public Utilities, dated Aug. 25, 1953.

[58] See FPC, State Commission Jurisdiction and Regulation of Electric and Gas Utilities (1948).

specific statutory authority, for such regulation is really an implied part of the power to control rates in that the commission may consider the propriety and reasonableness of expenditures of utilities subject to its jurisdiction.[59]

However, expressly authorized state regulation of such relations began in 1930 when New York and Wisconsin specifically accorded their commissions jurisdiction over these matters.[60] Because of federal constitutional difficulties, the states have resorted to indirect regulation of transactions with affiliated holding companies: by asserting jurisdiction over contractual relations of all local utilities over which they have jurisdiction, the states thereby reach affiliated companies regardless of whether they are domestic or foreign corporations. A 1932 United States Supreme Court decision upheld this type of state control.[61] Today, only California, Michigan, and Texas, of the ten states herein examined, do not have specific statutory provisions for regulation of transactions with affiliates of public utilities.[62] The other seven state commissions all exercise some degree of regulation over contracts and transactions between affiliated companies.

On the basic preliminary question of what constitutes "affiliated interests" the statutory definition is likely to be very comprehensive, as in New York. There such interests are defined to include:

> a. Every corporation and person owning or holding directly or indirectly five per centum or more of the voting capital stock of such utility corporation.
>
> b. Every corporation and person in any chain of successive ownership of five per centum or more of voting capital stock.
>
> c. Every corporation five per centum or more of whose voting capital stock is owned by any person or corporation owning five per centum or more of the voting capital stock of such utility corporation or by any person or corporation in any such chain of successive ownership of five per centum or more of voting capital stock.
>
> d. Every person who is an officer or director of such utility corporation or of any corporation in any chain of successive ownership of five per centum or more of voting capital stock.
>
> e. Every corporation which has one or more officers or one or more directors in common with such utility corporation.
>
> f. Every corporation or person which the commission may

[59] Barnes, The Economics of Public Utility Regulation 634-635 (1942).

[60] *Id.*, 628.

[61] Western Distributing Co. v. P.S.C. of Kan., 285 U.S. 119, 52 S. Ct. 283 (1932).

[62] FPC, State Commission Jurisdiction and Regulation of Electric and Gas Utilities 26-27 (1948).

> determine as a matter of fact after investigation and hearing is actually exercising any substantial influence over the policies and actions of such utility corporation even though such influence is not based upon stockholding, stockholders, directors or officers to the extent specified in this section.
>
> g. Every person or corporation who or which the commission may determine as a matter of fact after investigation and hearing is actually exercising such substantial influence over the policies and actions of such utility corporation in conjunction with one or more other corporations and/or persons with which or whom they are related by ownership and/or blood relationship or by action in concert that together they are affiliated with such utility corporation within the meaning of this section even though no one of them alone is so affiliated.[63]

The Illinois definition is substantially similar, except that the percentage of stock ownership is fixed at ten per cent, instead of five per cent as in New York.[64] The Wisconsin definition is nearly identical with that of New York.[65] All three state commissions are empowered to obtain the names of all shareholders who own one per cent or more of the voting capital stock of utilities under their jurisdiction.[66] The Pennsylvania definition of "affiliated interests" also employs the five per cent stock ownership criterion as well as the "substantial influence" test.[67] New Jersey defines affiliated interests only in terms of five per cent stock ownership.[68]

As to the type of regulation imposed on affiliated interests, the statutes in these states generally require that contracts providing for management, construction, engineering, accounting, legal, financial, or similar services must be filed with and approved by the state public utility commissions, and that contracts found to be not in the public interest may be disapproved by the commission.[69] The commissions are also given the power to examine all necessary accounts and records relating to transactions between affiliated interests.[70] These controls

[63] N.Y. Public Service Law §110(2).

[64] Ill. Stat. Ann. c. 111 2/3, §8a.

[65] Wis. Stat. (1957) §196.52(1).

[66] Ill. Stat. Ann. c. 111 2/3, §8a(1); N.Y. Public Service Law §110(1). Wis. Stat. (1957) §196.02(4).

[67] Pa. Stat. Ann. tit. 66, §1102(1).

[68] N.J. Rev. Stat. (1937) §48:3-7.1.

[69] Ill. Stat. Ann. c. 111 2/3, §8a(3); N.J. Rev. Stat. (1937) §48:3-7.1; N.Y. Public Service Law §110(3); Pa. Stat. Ann. tit. 66, §1271; Wis. Stat. (1957) §196.52(3).

[70] See Legis, "The Servicing Function of Public Utility Holding Companies," 49 Harv. L. Rev. 957, 982 (1936) for general discussion of this type regulation. See also Barnes, *supra* note 59 at 630-655.

are, of course, familiar to public utilities, but for many non-utility industries, such controls are often considered so restrictive on management policies that management scrupulously avoids subjection to the regulation. If financing an atomic power development in any area is rendered more difficult by these provisions, a re-examination of the desirability of the regulation may be warranted in order to encourage development of the new technology.

The statutes of Missouri and Ohio do not employ the term "affiliated interests," but the commission of each of these states has reported to the Federal Power Commission that it has jurisdiction over transactions with affiliates.[71] In Missouri it seems that the Public Service Commission regards the transactions between affiliates as within its rate-making authority, although there appears to be no express statutory provision giving it this power of control. There are several provisions in the Ohio statutes dealing with the subject. One states that when and as required by the Public Utilities Commission, "every public utility shall file with it a copy of any contract, agreement, or arrangement, in writing, with any other public utility relating in any way to the construction, maintenance, or use of its plant or property, or to any service, rate, or charge." [72] Another Ohio statute provides that if the consent of the Public Utilities Commission is obtained, "Any two or more public utilities furnishing a like service or product and doing business in the same municipal corporation or locality within this state, or any two or more public utilities whose lines intersect or parallel each other within this state, may enter into contracts with each other that will enable them to operate their lines or plants in connection with each other." [73] In neither of these states is it clear what kinds of transactions among affiliates are actually regulated since there are no reported court decisions or statements of commission policy interpreting the scope of the commissions' powers.

Since it may be desirable in the early stages of development of the atomic power industry to engage in a jointly financed product, these provisions will also have considerable importance for atomic energy entrepreneurs.

[71] FPC, State Commission Jurisdiction and Regulation of Electric and Gas Utilities 27 (1948).

[72] Ohio Rev. Code §4905.16.

[73] *Id.*, §4905.48(A).

D. Rate Regulation Problems

The primary function of public utility commissions is the determination of rates that may be charged by the regulated public utilities. Many of the regulatory powers conferred on public utility commissions, such as the supervision over accounting, control of capitalization and security issues, and regulation of intercorporate relations, are added for the principal purpose of effectuating and perfecting control over rates.[74] All of the states under study excepting Texas provide for the regulation of electric rates by a state commission. In Texas rate-making power is delegated to the governing body of each incorporated town or city.[75]

The rate-making function of public utility commissions involves many complex and technical concepts, and no attempt will be made here to explain and discuss the many ramifications which have been the subject of extended discussion in legal periodicals and treatises. However, several unique rate-making problems which may stem from the development and use of nuclear reactors for the production of electrical power should be noted. These problems may be divided conveniently into two categories: (1) the treatment of expenditures for research and experimentation by existing electric utilities in the initial stages of the development of atomic energy for power production, and (2) accounting and rate-making problems which may arise from the construction and operation of a full-scale atomic power plant financed by private capital.

1. Expenditures for Research and Experimentation

At present, certain electric utility companies are expending considerable sums for research and experimentation in the use of nuclear reactors as a source of heat to generate electricity. The position taken by the state utility commissions concerning the allowance of these expenditures for rate-making purposes will have a significant bearing upon the amounts utility companies are likely to spend for the development of this new form of heat energy. To the extent that these expenditures are allowed to be charged to operating expenses (or perhaps capitalized and then amortized), they are of course being borne by the consumer. It is important, therefore, to examine the considerations which will influence the decisions of the commissions and to

[74] Barnes, *supra* note 59 at 282.
[75] Tex. Civ. Stat. art. 1119.

attempt to ascertain their attitude or probable attitude in regard to this matter.

At present, nearly seventy-five per cent of the electrical power produced in the United States is derived from steam-electric plants utilizing coal, oil, and gas as fuels. The remaining twenty-five per cent is produced in hydro-electric plants. The electrical power needs of the United States have been increasing tremendously year by year. In 1953 the electric energy production was 442.7 billions of kilowatt hours as contrasted with a total production of 141.8 billions of kilowatt hours in 1940. Since available water power is limited, steam-electric production has been steadily gaining in relative importance as a power source.[76] As compared with 75.8 millions of kilowatt capacity available in 1951,[77] it is estimated that by 1960 the required generating capacity will be about 164 millions of kilowatts, and by 1970, 205 millions of kilowatts. In view of diminishing supplies of coal, oil, and gas used in steam-electric generation, the importance of discovering a new source of heat energy becomes obvious. Atomic energy appears to be an excellent solution for increasing power needs, and the public will benefit. However, much research and experimentation will be necessary before atomic fuels may be utilized as a source of energy at a cost competitive with conventional fuels. Even the possibility of valuable byproduct production still leaves the balance sheet in a questionable state. If atomic energy does prove to be a cheaper source of energy, the public will benefit even more. These considerations certainly seem to indicate that public utility commissions will be fully justified in allowing substantial expenditures to be charged against operating expense for the development of this new power source. Therefore, in rate proceedings, allowances for the expenditures would seem to be eminently reasonable.

There are only a few reported rate cases in which allowance of expenditures for research has been a contested issue. Of course, payments to affiliates for services have frequently been questioned by utility commissions, but in such cases the question has usually been whether the payments have exceeded costs reasonably incurred by the affiliate furnishing the services.[78] State utility commissions have allowed reasonable expenditures for advertising and promotional activi-

[76] See FPC, Thirty-Fourth Annual Report 7, 63 (1955).

[77] Cisler, "Electric Power Systems and Nuclear Power," Atomic Energy—Industrial and Legal Problems 62, 1952 Summer Institute, Univ. of Mich. Law School.

[78] See, *e.g.*, New Jersey Bell Tel. Co. v. N.J., 12 N.J. 568, 97 A.2d 602 (1953); Michigan Bell Tel. Co. v. P.S.C., 332 Mich. 7, 50 N.W.2d 826 (1952).

ties to be claimed in rate proceedings.[79] Somewhat more analogous to the development of electric power from atomic energy are the allowances which have been made for costs of development of new wells by the gas utility industry. Limited expenditures for research and for development of new gas sources have been allowed as operating expenses in some cases [80] but large expenditures have usually been treated as capital outlay.[81]

The public utility commissions of the nine states (Texas being excluded) have been surveyed in an effort to determine their attitude toward expenditures for research and experimentation in the use of nuclear reactors for power production. The commissions of three states have indicated that they would allow "reasonable" expenditures for such purposes. The Pennsylvania Public Utility Commission recently in a rate proceeding allowed a "substantial sum" to be claimed for this purpose.[82] While such expenditures have not been involved in rate cases in Michigan and Wisconsin, the public service commissions have taken official action by prescribing that the expenditures be charged to Account No. 801, Miscellaneous General Expenses.[83] This accounting treatment results in the expenditures being allowed as operating expenses in current rate-making proceedings. This procedure has been recommended by the Accounting Committee of the National Association of Railroads and Utilities Commissioners (NARUC).[84] The California Public Utilities Commission has indicated that no official action has been taken in this matter.[85] No information on this specific problem could be obtained from the other five state commissions.

It seems probable that most public utility commissions will allow

[79] See, *e.g.*, United Ice & Coal Co. v. Pa. Power & Light Co., 89 P.U.R. (N.S.) 432 (1951); Re Pacific Electric Railway Co., 96 P.U.R. (N.S.) 105 (1952).

[80] See, for example, Re Northern Nat. Gas Co., 95 P.U.R. (N.S.) 289 (1952); Re Peoples Nat. Gas Co., 1921E P.U.R. 390; Re Clarksburg Light & Heat Co., 1917A P.U.R. 577.

[81] See, for example, Clarksburg Light & Heat Co. v. Public Service Commission, 84 W.Va. 638, 100 S.E. 551 (1920); Re Montgomery Gas Co., 1917C P.U.R. 924; Re Mormarc Utilities Corp., 80 P.U.R. (N.S.) 53 (1949); Public Service Commission v. Mountain Fuel Supply Co., 73 P.U.R. (N.S.) 428 (1947).

[82] Letter from Leon Schwartz, Chairman, Pa. Public Utility Commission, Oct. 7, 1953.

[83] Letter from John H. McCarthy, Chairman, Mich. Public Service Commission, March 17, 1954; letter from George P. Steinmetz, Commissioner, Public Service Commission of Wisconsin, March 29, 1954.

[84] Letter from George P. Steinmetz, *supra* note 83.

[85] Letter from R. J. Pajalich, Secretary, Cal. Public Utilities Commission, April 15, 1954.

reasonable expenditures for research and experimentation in the use of atomic fuels to be charged to operating expenses in the rate-making process. Most states do not have formal procedures whereby such expenditures can be approved in advance, but instead the question is determined by the allowance or disallowance in a subsequent rate proceeding.[86] Therefore, companies contemplating such expenses will presumably follow the usual practice of trying to obtain the informal consent of the state commission before substantial expenditures are incurred. In this connection it should be noted that the Pennsylvania Public Utility Commission is authorized by statute to require public utilities to file budgets of estimated expenditures. The commission may reject part or all of any contemplated expenditure found to be "contrary to the public interest." If rejected at this stage, the expenditure will not subsequently be allowed in a rate or valuation proceeding. If not rejected, the commission may nevertheless subsequently determine whether expenditures made under the budget were reasonable.[87] In New Jersey, Ohio, and Wisconsin budgets are required by regulation to be submitted in advance to the public utility commissions.[88] Since the statutes contain no provisions concerning such budgets, it is doubtful if the commissions of the three latter states have authority to reject proposed expenditures. In all probability, expenditures for atomic research may be charged to operating expenses, but the possibility that a commission may later either reject them as unreasonable or require a portion to be capitalized and subsequently amortized should not be overlooked. If the latter were done, the amount thus capitalized would become a part of the rate base until written off in subsequent years.[89]

Apparently, the federal government is taking the position that the taxpayers generally should bear some part of the costs of research in the development of atomic energy for power production and other purposes. For example, under the agreement between the AEC and the Duquesne Light Company for the construction and operation of the nation's first full-scale atomic power plant, Duquesne supplied only a portion of the reactor costs plus the generating facilities; other costs were absorbed by the federal government, with the electricity generated

[86] Barnes, *supra* note 59 at 605.

[87] Pa. Stat. Ann. tit. 66, §1216.

[88] FPC, State Commission Jurisdiction and Regulation of Electric and Gas Utilities 27 (1948).

[89] See Burt and Highsaw, "Developmental Costs Under the Prudent Investment Theory," 94 U. of Pa. L. Rev. 1, 11 (1945).

going through Duquesne's distribution system to consumers at rates comparable to those charged for conventionally generated electricity. The Power Demonstration Reactor Program of the AEC, initiated in 1955, also contemplates considerable federal financial assistance in the form of research assistance without charge, research and development contracts, and the waiver of certain source and special nuclear material charges.[90] The object of this program is to promote the development of nuclear reactors for power production in the hope that future development of the technology will produce a fully competitive operation.

Of course, no question concerning the propriety of research expenditures will arise in rate proceedings if the research costs are underwritten by a government subsidy, and in all probability, the federal government will continue to contribute to the development of atomic energy for peacetime uses. Private industry, however, is expected to contribute financially to the costs of atomic research and experimentation even under the Power Demonstration Reactor Program.[91] Whenever such private contributions are made, the question of how they will be treated for rate-making purposes will become important.

2. Construction of a Full-Scale Atomic Power Plant

There is little doubt that after further research and experimentation in the use of atomic fuels, it will become financially feasible for private capital to build electric power plants utilizing such fuels in conjunction with conventional generating equipment. The commencement of such a program does not seem too remote, especially if favorable uses for byproducts can be developed. When this stage is reached, several regulatory problems somewhat unique in the electric utility field may arise. These problems can be understood only in the light of certain fundamental postulates regarding the cost of power and the role of a nuclear reactor in a power plant.

The cost of power from any source may be said to be comprised of

[90] Power Demonstration Reactor Program: "First Round," AEC Release No. 589 (Jan. 10, 1955); "Second Round," AEC Release No. 695 (Sept. 21, 1955); "Third Round," AEC Release No. 953 (Jan. 7, 1956). See CCH Atomic Energy Law Rep. ¶3021ff.

[91] *Ibid.* Also see Atomic Energy Act of 1954, §33, 42 U.S.C.A. §2053, which provides: "Where the Commission finds private facilities or laboratories are inadequate to the purpose, it is authorized to conduct for other persons, through its own facilities . . . [such research and development activities] . . . as it deems appropriate to the development of atomic energy. The Commission is authorized to determine and make such charges as in its discretion may be desirable for the conduct of such activities and studies."

two major elements, first, operating expenses and fixed charges (including, among the former, labor, fuel, materials, and among the latter, taxes, depreciation, and obsolescence) and second, return on capital (including interest and dividends, these being limited to a fair return on the fair value of the assets). In theory, the utility is entitled to establish a rate schedule which will result in total revenue equal to the aggregate of these costs. A conventional thermal-electric generating station may be considered as having two major components, one providing steam from heat energy sources and the other generating electricity by the use of the steam in the turbine. In an atomic power plant, the latter component will be substantially the same, but a reactor will be substituted as the heat source to produce steam. In a typical thermal-electric generating station utilizing conventional fuels, approximately one half of plant cost per kilowatt of capability is attributed to each of these two components.[92] The total per kilowatt cost of installed capacity of a conventional plant ranges between $150 and $250.[93] Present estimates of the per unit construction cost of a nuclear power plant greatly exceed these figures.[94] Moreover, it is undoubtedly a fact that the first nuclear plants will suffer a very high rate of obsolescence occasioned by the rapid development of the technology. Furthermore, development of methods of commercially utilizing the thermonuclear process may make present reactor technology obsolete in a relatively short period. However, entrepreneurs in the field hope that the resulting higher fixed charges and capital expenses can be offset in two ways: by lower operating expenses, principally because of lower fuel costs, and by the production and sale of byproducts. It will be deemed feasible from a competitive cost standpoint to construct and operate an atomic power plant when it appears that the reduction occasioned by fuel economies plus returns from the sale of byproducts compensate for the increase in construction costs, plus the higher obsolescence charges.

As noted earlier, before a new plant may be constructed it is necessary in most states to obtain a certificate of convenience and necessity from the state public utility commission. In determining whether such a certificate will be granted, or whether a proposed security issue to finance the plant will be approved, one factor that will surely be taken into account by most commissions is whether the new plant can be

[92] Cisler, *supra* note 77 at 64-65.
[93] AEC, Fifteenth Semi-Annual Report 17 (1954).
[94] *Ibid.*

expected to produce electric energy at as low or lower a unit cost as a plant of conventional design.[95] Until a nuclear plant can produce electric power at as low or nearly as low a per unit cost as that of existing generating methods, it is doubtful whether necessary commission approval can be obtained (excepting always for the small margin allowable in the name of research and development). Increasing scarcity of conventional fuels plus increased handling costs will certainly accelerate the time when favorable competitive costs can be shown, and this is a factor to be considered by the commission. Furthermore, there are already certain areas in the country where higher than average fuel costs may possibly make an atomic reactor plant economically feasible at the present time. In the absence of these conditions, there may be a possibility of obtaining approval upon the condition that only a part of the capital expenditure will be included in the rate base for future rate-determination. Apparently this is a device that may be utilized in at least one state, Wisconsin,[96] although it can not be regarded as an attractive course of action for any utility concerned.

If a certificate of convenience and necessity is issued for the construction of a nuclear plant which produces more expensive power than that produced in conventional plants, there is no legal assurance that actual costs will be reflected in the rate base for the purpose of determining rates. The issuance of the certificate of convenience and necessity by the state public utility commission merely represents a determination by the commission that the proposed construction is in the public interest. On subsequent rate proceedings the valuation of the facility is determined *de novo* as a legal matter. In other words, the issuance of the certificate does not commit the public utility commission to any specific valuation although the facility must be given some value since the certificate represents a determination that the construction was in the public interest. In fact, most state public utility commissions consider several costs, including reproduction cost, replacement cost, historical cost, and the original cost, in the valuation process. Therefore, the atomic energy power entrepreneur has no legal assurance that he will be able to recoup all costs through the established rate structure. If a statute authorized the public utility commission to commit itself to a specific valuation at the time of issuing a certificate of convenience and necessity, the atomic energy entrepreneur would then be able to proceed

[95] See especially Wis. Stat. (1957) §196.49. Letter from H. J. Flagg, N.J. Board of Public Utility Commissioners, dated Aug. 25, 1953.

[96] See Wis. Stat. (1957) §196.49.

with full knowledge of whether or not the consumer would be required to bear some portion of the increased costs occasioned by a change in generating methods at the time the atomic power plant is constructed. But as a practical matter, and wholly apart from the question of statutory authority, state commissions probably will decline to make binding decisions at the time of certifying the construction for the reason, among others, that many of the estimates of cost will necessarily be somewhat speculative in nature.

There are those who predict that all of the foregoing considerations may result in several private utility companies refraining from building nuclear power plants until they are actually known to be competitive with existing methods.[97] When that time arrives the development of atomic energy as a power source will not affect rates, except possibly in a downward direction if the new source produces relatively cheaper power.

There is a further aspect of the matter that demands consideration. If it proves possible to produce and sell byproducts from an atomic power plant in sufficient quantity to affect the balance sheet materially and thus to produce power at costs competitive with power from conventional fuels, several additional problems will be raised.

Today, there appear to be two primary types of marketable atomic energy byproducts.[98] First, fissionable material may be produced and sold; secondly, radioisotopes and radioactive waste products of value may be produced, refined, and sold. Fissionable materials have value as the initial charge for new reactors, as fuel replacements for nonbreeding reactors, and for military purposes. Reactor-produced radioisotopes will also yield substantial revenues, for they are being used in increasing quantities by industry, medicine, and agriculture. As of the end of June 1957, 4,109 organizations in the United States were licensed to use radioisotopes by the AEC,[99] and the number of users and shipments continues to increase. Furthermore, an increasing number of new uses of radioisotopes by industry, medicine, and research can be expected as the technology advances.

One problem of a unique character arises out of the fact that under

[97] This proposition was suggested by Leon Schwartz, Chairman, Pennsylvania Public Utility Commission, in a letter dated Oct. 7, 1953.

[98] "Byproducts" is used in a broader sense here and is to be distinguished from that used in the Atomic Energy Act of 1954. Under Section 11e, 42 U.S.C.A. §2014(e), "byproduct material" means any radioactive material except special nuclear material (fissionable material) produced in the processes of producing or utilizing fissionable material.

[99] AEC, Twenty-Second Semi-Annual Report 31 (1957).

the Atomic Energy Act of 1954, the federal government takes title to all special nuclear material (fissionable material) produced in private operations.[100] Lawful private producers are to be paid a "fair price" [101] for their product. Moreover, the federal government has retained a monopoly over the distribution of fissionable materials, and normal competitive pricing and sales thereof are not to be expected in the near future. In respect to radioactive byproducts, under Section 81 of the Atomic Energy Act of 1954, the AEC is authorized to distribute, "with or without charge," radioactive byproduct material.[102] To date the practice of the AEC has been to distribute radioisotopes at cost. Accordingly, as to fissionable materials the only market is the government; and as to other radioactive materials, the cost prices established by the federal government probably will have to be met by private utilities producing the same products. Therefore, abnormal market conditions are to be expected, and this fact not only has its bearing on rate regulation, but it presents some unusual problems of federal-state relations.

Another important question is the effect of the production and sale of byproducts on rate-making. Public utility commissions may treat the byproduct aspect of a nuclear reactor business in one of two ways, each of which will bear a definite relation to the establishment of power rates.

First, the byproduct operations may be treated as an entirely separate and distinct activity. In that event, costs directly attributed to each activity will have to be accounted for separately, and costs attributable to both activities will have to be properly allocated between them.[103]

[100] 42 U.S.C.A. §2072. "Special nuclear material" is defined as plutonium, uranium enriched in the isotope 233 or in the isotope 235 or any other material determined by the Commission to be capable of releasing substantial quantities of atomic energy.

[101] 42 U.S.C.A. §2072.

[102] *Id.*, §2111. Radioisotopes for biomedical, agricultural, and medical research are available to domestic users at 20 per cent of catalog price. AEC Release No. 627 (April 21, 1955).

[103] In several cases collateral operations of a utility have been treated as entirely separate for purposes of rate making. See, for example, Re Farmers Elevator Co., 1928A P.U.R. 469 (North Dakota) (grain elevator and electricity); Re Estelline Telephone & Electric Co., 1917F P.U.R. 151 (South Dakota) (telephone and electricity); Milwaukee Electric R. & Light Co. v. Milwaukee, 1919D P.U.R. 504 (Wisconsin) (heating and electricity); Re Manchester Street Railway, 19 N.H.P.S.C.R. 421 (1937) (New Hampshire) (street railway and electricity); Re Lockport Light, Heat & Power Co., 12 P.U.R. (N.S.) 413 (1935) (New York) (steam and electricity); Monticello v. Blue Mountain Irrigation Co., Case No. 1489 (Oct. 29, 1935) (Utah) (irrigation and electricity); Re Northwestern Electric Co., 36 P.U.R. (N.S.) 202 (1940) (FPC) (steam heating and electricity); Re Arkansas Power & Light Company, 55 P.U.R. (N.S.) 129 (1944) (Arkansas) (water, street railway, steam

The allocation of costs will be most difficult in regard to a nuclear reactor. A requirement that a large percentage of the costs be attributed to the separate and distinct byproduct operation will make electricity rates lower but may make the byproduct operation unprofitable. At the same time a different allocation of costs could conceivably make the byproduct operation extremely profitable. The method of allocation of costs will undoubtedly be prescribed by most public utility commissions. Except for Texas, all states examined in this study grant to their commissions a board authority over accounting.[104] Furthermore, in several states there are statutes which relate specifically to accounting aspects of non-utility business of a public utility. For instance, an Illinois statute provides:

> The Commission may require every public utility engaged directly or indirectly in any other than a public utility business, as defined by law, to keep separately in like manner and form the accounts of all such other business, and the Commission may provide for the examination and inspection of the books, accounts, papers and records of such other business, in so far as may be necessary to enforce any provision of this Act. The Commission shall have the power to inquire as to and prescribe the apportionment of capitalization, earnings, debts and expenses fairly and justly to be awarded to or borne by the ownership, operation, management or control of such public utility as distinguished from such other business.[105]

A second method of treating the byproduct operation would be to regard it as an integral part of the utility operation and, in establishing electricity rates, to include in the total estimated income, revenues anticipated from byproduct sales. This method has been employed in respect to certain gas utility byproducts such as coke, tars, and gasoline.[106] Moreover, in cases in which a subsidiary or affiliate has refined certain

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heat, ice, and electricity); Re Consolidated Gas, Electric Light & Power Co., 61 P.U.R. (N.S.) 94 (1945) (Maryland) (gas, steam heat, merchandising, and electricity); Detroit v. Detroit Edison Co., 50 P.U.R. (N.S.) 1 (1943) (Michigan) (steam heating and electricity, where there was no physical interdependence).

[104] FPC, State Commission Jurisdiction and Regulation of Electric and Gas Utilities 22 (1948).

[105] Ill. Stat. Ann. c. 111 2/3, §12. See also Ill. Stat. Ann. c. 111 2/3, §8. Substantially identical provisions relating to electric companies may be found in Mo. Rev. Stat. (1949) §393.140(12); and N.Y. Public Service Law §66(13).

[106] See Re Uniform System of Accounts, 1917D P.U.R. 122 (New York); Re Los Angeles Gas & Electric Corp., 1919D P.U.R. 140 (California); Re Portage American Gas Co., 26 Wis. R.C.R. 369 (1922); Green Bay v. Wisconsin Public Service Co., 1922B P.U.R. 671 (Wisconsin); Re Wisconsin Gas & Electric Co., 1922C P.U.R. 829 (Wisconsin); Re Great Falls Gas Co., 1922D P.U.R. 385 (Montana).

byproducts, public utility commissions have required the parent utility to include in its estimated revenues a substantial percentage of the net proceeds from sales, even though the contract between the utility and subsidiary or affiliate may have established a different percentage.[107] Thus, when the revenues from byproduct sales are substantial, they will be reflected in lower electricity rates.

To summarize, whether the production and sale of byproducts is treated as an entirely distinct activity or as an integral part of the utility operation of an atomic energy facility, the byproduct aspects of the business will have a definite effect on rate-making. The greater the net proceeds of the byproduct activity, the lower will be the cost of electricity.

One additional aspect pertinent to rate-making should be mentioned. Public utility commissions may seek to impose, as a condition on the issuance of a certificate of public convenience and necessity for the construction of an atomic power facility, the requirement that the utility will not charge higher rates than those permitted for electricity produced by a conventional facility. Whether or not the imposition of such a condition is permissible under existing law is perhaps questionable, for statutory authority is ordinarily not explicit, and the commissions have apparently not hitherto attempted to impose such limitations under other circumstances.[108] As a matter of policy, it would seem inadvisable for commissions to impose such conditions, since they would unduly hamper the development and use of the new technology. Only through experience in operation can it be expected that the most economical methods of utilizing atomic energy will be achieved. Nonetheless, it must be recognized that the cost estimates of an atomic energy facility will be examined by the utility commission and will be taken into consideration in connection with the issuing of certificates. In fact, it would be extremely difficult for a commission to decide that a reactor plant producing electricity at a cost, for example, twice that of conventional plants should be regarded as constructed "in the public interest," at least if the costs are to be borne by the consumer by the imposition of

[107] See, for example, United Fuel Gas Co. v. Kentucky Railroad Commission, 278 U.S. 300, 49 S. Ct. 150 (1929); Charleston v. Public Service Commission, 95 W.Va. 91, 120 S.E. 328 (1924); East Ohio Gas Co. v. Cleveland, 27 P.U.R. (N.S.) 387 (1939) (Ohio); Hope Natural Gas Co. v. FPC, 134 F.2d 287, 47 P.U.R. (N.S.) 129 (1943).

[108] However, under the Federal Power Act, licenses contain limitations requiring that rates be computed upon the basis of original cost and that excess earnings be kept in reserve. See 16 U.S.C.A. §§803 *et seq.*

higher rates. Thus, the probable fixed charges and capital expenses and treatment of revenues from sale of byproducts will receive careful consideration both in issuing certificates of public convenience and necessity and in subsequent rate proceedings.

E. Conclusions

By way of summary of the foregoing discussion of the effect of public utility regulation statutes on atomic energy development we may observe that:

(1) Industrial development of atomic energy for power purposes poses several unique financial problems for an existing stabilized public utility and all pertinent statutes and regulations must be carefully analyzed before any particular financial organization or arrangement can be agreed upon;

(2) Moreover, advance approval of many types of expenditures in the highly regulated public utility industry appears desirable if the economic costs are to be borne by the consumers; and

(3) Finally, the accounting treatment of atomic energy byproducts costs and revenues should be ascertained at the earliest possible date because of the potential effect upon utility rates.

In some instances, it will doubtless happen that unfavorable public utility commission orders will prevent particular utilities from establishing nuclear reactor facilities, and especially will this be true if no opportunity for recoupment of costs is provided. Such action may make the raising of capital difficult, if not impossible, of achievement. On the other hand, if lower power costs may eventually be expected, it would seem that most public utility commissions will look favorably upon investments by existing utilities in nuclear reactor power facilities.

Chapter III

HEALTH AND SAFETY REGULATION

As with many industrial operations, proper precautionary measures must be taken in making industrial use of atomic energy if serious hazards to employees and the general public are to be avoided. The use of atomic energy presents a number of unique hazards, not so much from sudden atomic accidents, although these may occur, as from the cumulative effect of exposure to excessive radiation, the damaging effects of which may not be known for many years. However, the general nature of the hazards is known and so are the techniques for preventing or minimizing them. In the program of the Atomic Energy Commission, expenditures for radiation protection of workers as well as the public consume a substantial portion of the total expenditures for atomic energy development.[1] Under the Atomic Energy Act, the Commission has imposed rather stringent health and safety standards, not only on operations in government-owned installations, but also upon licensees who obtain and use fissionable materials and radioisotopes for private research and other purposes.[2] The experience of the Commission clearly indicates that the application of rigorous health and safety standards makes it possible to use atomic energy for many, if not most, peacetime purposes without endangering the health of workers or the public generally.[3]

Excessive radiation may become dangerous to health and even life in either of two ways. Due to close physical proximity to an external source of radiation, such as might result from inadequate shielding of radioactive materials or improper disposition of radioactive wastes, the human body may be injured by exposure to the source of radiation. Another type of radiation injury which can be even more serious than external radiation results from the ingestion of food, liquids, or gases contaminated by radioactivity. Radioactive particles which are ingested may remain lodged inside the body until the radioactivity has spent itself, which in the case of certain isotopes may be greatly in excess of

[1] AEC, "27 Questions and Answers About Radiation and Radiation Protection," 16 (1951).

[2] 10 Code Fed. Regs. Pt. 20 ("Standards for Protection Against Radiation"), reprinted as Appendix A, Item 1.

[3] AEC, Eighth Semi-Annual Report, "Control of Radiation Hazard in the Atomic Energy Program" (1950).

the life of the victim. This is referred to as internal radiation. Even small amounts of either type of radiation can have a very harmful effect on both animal and plant life. Therefore, in industrial use of atomic energy, the problem of protection against radiation hazards is a very important one. Not only are the hazards insidious in nature, just as with several other industrial operations, but the precautionary measures are often very expensive.

In 1954, in asking Congress to amend the Atomic Energy Act of 1946 to allow private industry to enter the field, President Eisenhower recommended the continuation of provisions authorizing the Atomic Energy Commission to establish minimum health and safety standards to govern the use and possession of fissionable and radioactive materials.[4] As a result, the Atomic Energy Act of 1954, like the 1946 Act, gives the Commission a broad authority to establish such standards.[5] This authority presents some unique problems for federal-state relationships in the regulation of health and safety with respect to industrial users of atomic energy.

Whether or not Congress intended to pre-empt the field of radiation health and safety regulation of Atomic Energy Commission licensees from state control, and the extent to which it may constitutionally do so, are questions for which no very clear answers exist at the present time. Prior to and at the time the Atomic Energy Act of 1954 was passed, Congress has very little to say on the subject, and the act itself does not contain an unequivocal statement of intent. Similarly, the case authority on the general subject of federal pre-emption in other areas of government activity is in a state of some confusion. Because the purpose of this chapter is to examine the general pattern of state health and safety regulation in the ten states selected for study—to consider the types of state agencies which may be involved, their respective jurisdictions, and the nature of their powers—analysis of the pre-emption questions is deferred until Chapter V of this Part where recent state radiation health and safety regulations are discussed in some detail. In this chapter it is assumed that state agencies may exercise power in respect to those radiation hazards regulated by the Atomic Energy Commission.

There are three general categories of state agencies which may possess specific authority under existing statutes to regulate various health and

[4] Message of the President to Congress, dated Feb. 17, 1954, New York Times, Feb. 18, 1954, p. 8, col. 8.

[5] 42 U.S.C.A. §§2133, 2134.

safety aspects of the use of atomic energy for industrial purposes. If private industry constructs plants which utilize nuclear fuels to generate electricity, the public utility commissions may have such authority. Furthermore, state labor departments or industrial commissions [6] are typically given authority to promulgate rules and regulations to protect the health and safety of employees. Finally, state and local health boards or departments usually exercise extremely broad powers over matters of health and safety. Thus, both labor and health agencies are likely to possess powers affecting the operation of atomic energy power plants even though public utility commissions also have regulatory powers in this area. In fact, the following discussion will demonstrate the confusing pattern of potential regulation and the overlapping jurisdiction of regulatory agencies in every state embraced in this study.

A. Public Utility Commissions

In the ten states surveyed in this study, most of the public utility commissions have been given general statutory authority that would permit the establishment of health and safety regulations relating to the construction and operation of atomic energy power plants. Since the first privately owned nuclear power generating station is yet to be built, there has been no occasion for the issuance of health and safety regulations by state public utility commissions relating to the operation of such a plant, but the authority is there ready to be exercised at the appropriate time. Actually, some of the commissions have not attempted to assert their health and safety regulatory powers, even in respect to conventional plants, and Texas, as previously indicated, has no state utility commission with jurisdiction over electric utilities.

In California, Illinois, and Missouri the state utility commissions are granted statutory authority to require a public utility, by special or general order, to construct, maintain, and operate its plant, equipment, and premises in such manner as to promote and safeguard the health and safety of its employees and the public generally.[7] However, none of these commissions has exercised its powers in this respect.[8]

[6] The name of the agency exercising rule-making power over the safety of employees varies from state to state.

[7] Cal. Public Utilities Code §768; Ill. Stat. Ann. c. 111 2/3, §61; Mo. Rev. Stat. (1949) §386.310,

[8] See Cal. Adm. Code, tit. 20, for regulations of the Public Utilities Commission. Letter from Marvin P. Moore, Secretary of the Missouri Commission, March 15, 1954. The Illinois Commerce Commission has not replied to a specific inquiry concerning health and safety regulations and available published records reveal no exercise of the authority.

The Wisconsin Public Service Commission has power to "make reasonable rules, regulations, specifications and standards for the installation, operation and maintenance of all safety devices and measures." [9] Another section of the Wisconsin statutes provides that every public utility which owns, controls, or operates any wires over which electricity is transmitted "shall construct, operate and maintain such wires and the equipment used in connection therewith in a . . . safe manner. . . ." [10] The commission may also order "any alteration in construction or location or change of methods of operation required for public safety. . . ." [11] As a matter of practice, in Wisconsin the Public Service Commission collaborates with the Wisconsin Industrial Commission in the preparation of the Wisconsin Electric Safety Code, and these two commissions administer the code jointly.[12] The Public Service Commission administers that part of the code having to do with outside plant and equipment, and the Industrial Commission administers that relating to inside equipment.[13] This method of demarking lines of authority serves to alleviate possibilities of duplicating and inconsistent regulation by the two agencies. In other states the extent of the jurisdiction exercised by these two types of agencies is not so clearly defined.

The New York Public Service Commission is given authority to investigate methods employed in manufacturing electricity, and it has power "to order such reasonable improvements as will best promote the public interest, preserve the public health and protect those using such gas or electricity and those employed in the manufacture and distribution thereof. . . ." [14] Many years ago, in 1913, an order was promulgated by the Public Service Commission relating to safeguarding and protecting employees from injury resulting from generating equipment, but it was revoked in 1932.[15] No other regulations relating to the health and safety of employees have been found. Moreover, it should be noted that the term "factory," as defined for purposes of the jurisdiction of the New York Labor Department, excludes generating plants of public utilities subject to the jurisdiction of the Public Service Commission.[16]

[9] Wis. Stat. (1957) §195.03(18).

[10] *Id.*, §196.74.

[11] *Ibid.*

[12] Provision is made for this type of joint administrative action in Wis. Stat. (1957) §20.904.

[13] Letter from George P. Steinmetz, Commissioner, Wis. Public Service Commission, March 29, 1954.

[14] N.Y. Public Service Law §66(2).

[15] 5 N.Y. Official Compilation of Codes, Rules & Regulations 1435, 1437 (1945).

[16] N.Y. Labor Law §2(9).

But whether the statutory definition means that the Public Service Commission is intended to have exclusive jurisdiction over the adoption of standards to protect the health and safety of employees of electric plants utilizing nuclear energy is apparently far from clear.[17]

The Ohio Public Utilities Commission is given general supervision over the manner in which public utilities are operated with respect to the "adequacy or accommodation afforded by their service, the safety and security of the public and their employees." [18] The commission also may require that repairs, improvements, or additions be made to the plant or equipment of any public utility "in order to promote the convenience or welfare of the public or of employees. . . ." [19]

In Pennsylvania the service and facilities of public utilities must conform with regulations and orders of the Public Utility Commission, and every public utility "shall make all such repairs, changes, alterations, substitutions, extensions, and improvements in or to such service and facilities as shall be necessary or proper for the accommodation, convenience, and safety of its patrons, employees, and the public." [20] A letter from the chairman of the Pennsylvania Public Utility Commission states: "While this Commission has express authority over matters of safety of workers and this would extend by implication to atomic energy plants the matter rarely comes up for adjudication." [21]

The Michigan and New Jersey statutes are somewhat less specific in granting authority to the utility commissions to prescribe health and safety regulations. The Michigan commission, however, apparently assumes that a general grant of power is sufficient. The Michigan statute vests power in the Public Service Commission to "regulate all rates, fares, fees, charges, services, rules, conditions of service and all other matters pertaining to the formation, operation, or direction" of public utilities.[22] Under this language, the Public Service Commission has promulgated an extensive set of regulations applicable to electric utilities, which includes provisions to protect employees.[23] The only relevant New

[17] Doubts were raised by letters from George H. Kenny, Ass't Counsel, N.Y. Public Service Commission, March 5, 1954, and Irving R. Tabershaw, Director, Division of Industrial Hygiene, N.Y. Dept. of Labor, March 25, 1954.

[18] Ohio Rev. Code §4905.06.

[19] *Id.*, §4905.38.

[20] Pa. Stat. Ann. tit. 66, §1171.

[21] Letter from Leon Schwartz, Chairman, Pa. Public Utility Commission, March 26, 1954.

[22] Mich. Stat. Ann. §22.13(6).

[23] Mich. Adm. Code (1954) R 460.501 *et seq.*, especially R 460.530-R 460.538 and R 460.560-R 460.565.

Jersey statute is one which provides that the Board of Public Utility Commissioners may require any public utility to furnish "safe, adequate and proper service and to maintain its property and equipment in such condition as to enable it to do so." [24] This provision seems to be directed primarily at the kind of service rendered rather than at the protection of employees, but it might, like the Michigan statute, be construed broadly to give the board jurisdiction over the safety of employees.

B. Labor Departments and Industrial Commissions

All ten states selected for this study have created some form of a state labor department or industrial commission to administer their labor laws. One of the primary functions of these labor agencies is the protection of the health and safety of employees, and accordingly the labor agency is usually given rule-making power to promulgate regulations safeguarding the health and safety of workers.

Many state labor agencies are evincing considerable interest in regulations relating to the use of fissionable and radioactive materials. As will be noted later, some states have already promulgated extensive regulations covering the use, handling, and storage of radioactive substances, and several other states plan to adopt similar regulations in the near future. Probably most of the state agencies will follow substantially the recommendations contained in handbooks published by the National Bureau of Standards on problems of radioactivity.[25] The extent of the jurisdiction of the labor agencies varies from state to state. In most states the agency is given jurisdiction over employers and employees

[24] N.J. Rev. Stat. (1937) §48:2-23.

[25] Several letters from state labor agencies indicated this intention. The recommendations contained in these handbooks are formulated by the National Committee on Radiation Protection and its subcommittees. The handbooks available thus far include: No. 23, "Radium Protection"; No. 27, "Safe Handling of Radioactive Luminous Compounds"; No. 41, "Medical X-ray Protection"; No. 42, "Safe Handling of Radioactive Isotopes"; No. 48, "Control and Removal of Radioactive Contamination in Laboratories"; No. 49, "Recommendations for Waste Disposal of Phosphorus-32 and Iodine-131 for Medical Users"; No. 50, "X-ray Protection Design"; No. 51, "Radiological Monitoring Methods & Instruments"; No. 52, "Maximum Permissible Amounts of Radioisotopes in the Human Body and Maximum Permissible Concentrations in Air and Water"; No. 53, "Recommendations for the Disposal of Carbon-14 Wastes"; No. 54, "Protection Against Radiations from Radium, Cobalt-60, and Cesium-137"; No. 55, "Protection Against Betatron-Synchrotron Radiations up to 100 Million Electron Volts"; No. 56, "Safe Handling of Cadavers Containing Radioactive Isotopes"; No. 57, "Photographic Dosimetry of X- and Gamma Rays"; No. 58, "Radioactive Waste Disposal in the Ocean"; No. 59, "Permissible Doses from External Sources of Ionizing Radiation"; No. 61, "Regulation of Radiation Exposure by Legislative Means"; No. 63, "Protection Against Neutron Radiation Up to 30 Million Electron Volts." All are available from the U.S. Government Printing Office at nominal prices.

wherever located. Because the employment relation is emphasized, the labor agency would seem to be without power to regulate safety standards for other persons, such as the self-employed person and the independent contractor, although the applicability of the statutes to the independent contractor is by no means clear. Therefore, under this type of statute there is a possible gap in the regulation by labor agencies of the use of atomic energy. But it is an extremely small gap, because most uses of atomic energy will undoubtedly involve employment of persons in the usual sense. Certainly any electric utility operation would involve an employer-employee relationship.

Another type of statute found in many states gives the labor agency jurisdiction over types of operations, typically "factories" or "manufacturing establishments." Under such statutes the jurisdiction of the agency will depend on the definition of these terms. Some states undertake to define further these terms, while others are silent as to their meaning. There are few cases in which it has been necessary to decide whether or not an electric utility is a "factory" or "manufacturing establishment." Certainly the weight of authority supports the view that an electric generating plant is a manufacturing establishment,[26] and it would seem also that the term "factory" would normally cover electric utilities.[27] However, as to certain potential users of radioactive by-products, such as hospitals, laboratories, etc., it is doubtful whether the statute will apply.

Because of the differences in the statutory patterns in the states under discussion, a state by state analysis seems to be the best method of surveying the kinds of powers possessed by state labor agencies,[28] together with questions of possible overlapping jurisdiction, and the current state of regulation with respect to the use of radioactive substances.

1. California

At least three provisions of the California labor statutes should be noted for possible bearing on the regulation of uses of radioactive sub-

[26] See Annot., "What is a 'manufacturing establishment' within meaning of regulatory statutes," 96 A.L.R. 1351 at 1354 (1935).

[27] See Annot., "What is a 'factory' within statutes relating to safety and health of employees," 163 A.L.R. 447 at 473 *ff.* (1946).

[28] Because many electric plants using nuclear power will still use steam boilers in their operations, it will be necessary for the industry to comply with any applicable state regulations. Nearly all states have statutes relating to the operation, inspection, and licensing of steam boilers. See, *e.g.*, Cal. Labor Code §§7681 *et seq.;* Ill. Stat. Ann. c. 24, §§23-72 *et seq.;* Mich. Stat. Ann. §17.132; N.Y. Labor Law §204; Ohio Rev. Code §§4103.01 *et seq.*

stances. One provision requires that every "factory or workshop in which one or more persons are employed" shall be ventilated so as to render harmless, so far as practicable, all injurious gases, vapors, dust, or other impurities which may be produced,[29] and criminal sanctions are provided for violations.[30]

Another statute requires the owner of every "factory" to register with the Division of Labor Statistics and Research, and also to furnish certain pertinent information.[31] "Factory" is defined as ". . . any factory, workshop, mill, or other manufacturing establishment where five or more persons are employed." [32] Although there is little authority on the matter, it is quite likely that an atomic power plant would be considered a "factory" for the purpose of this statute,[33] and therefore any such plant built in California would be required to register. Chemical plants built to process radioactive substances would seem likewise to be subject to registration under this statute.[34]

The most significant California statute, however, is that which confers industrial safety rule-making authority on the Division of Industrial Safety.[35] The division is given "power, jurisdiction, and supervision over every employment and place of employment in this State" in order to enforce all laws and lawful orders relating to the protection of the life and safety of employees.[36] "Employment" is defined to include "the carrying on of any trade, enterprise, project, industry, business, occupation or work . . . or any process or operation in any way related thereto. . . ." [37] "Place of employment" is defined to include "any place, and the premises appurtenant thereto, where employment is carried on, except a place the safety jurisdiction over which is vested by law in any State or Federal agency other than the division." [38] It was noted previously that in California the Public Utilities Commission is given authority to make rules and regulations to promote and safeguard the

[29] Cal. Labor Code §2351.

[30] *Id.*, §2354.

[31] *Id.*, §2601.

[32] *Id.*, §2600.

[33] See *supra* notes 26 and 27.

[34] The Division of Labor Statistics and Research has the duty to inform various health authorities of the location of factories registered with it. Cal. Labor Code §2604.

[35] *Id.*, §6500.

[36] *Id.*, §6312.

[37] *Id.*, §6303.

[38] *Id.*, §6302. An opinion of the Attorney General holds that the division's power is confined to the premises where the labor is performed. 13 Cal. Op. Atty. Gen. 48 (1949).

health and safety of employees in public utility plants.[39] Since an atomic power plant would be classified as a public utility, does the statute mean that because the Public Utilities Commission has safety jurisdiction over plant employees, the Division of Industrial Safety does not? A 1953 statute seems to answer this question in the negative, for it is there provided that the "jurisdiction vested in the division shall in no instance, except those affecting exclusively the safety of employees, impair, diminish, or in any way affect the jurisdiction of the Public Utilities Commission. . . ." [40] Therefore, the division apparently has jurisdiction over the safety of employees in public utility plants, and the similar power previously vested in the Public Utilities Commission is displaced.

Under this statutory authority over "employment" and "places of employment," and without any legislative authority to regulate radiation hazards specifically, the Division of Industrial Safety has promulgated a somewhat extensive set of regulations as a part of the "General Industry Safety Orders" establishing minimum standards for employees exposed to ionizing radiation.[41] These regulations are discussed in detail and compared with the standards of the Atomic Energy Commission and the National Committee on Radiation Protection and Measurement in Chapter V.

There are other General Industry Safety Orders which may be applicable to establishments in California using radioactive substances. There are regulations establishing minimum standards for the prevention of harmful exposure of employees to dusts, fumes, mists, vapors, and gases,[42] and other regulations create minimum standards for the use, handling, and storage of hot, flammable, poisonous, corrosive, and hazardous substances in all places of employment except laboratories.[43] The General Industry Safety Order concerning radiation protection does not explain its effect on these orders.

2. Illinois

The Illinois Health and Safety Act of 1937 [44] is applicable "to all employers engaged in any occupation, business or enterprise in this State, and their employees," except farming and coal mining opera-

[39] Cal. Public Utilities Code §768.

[40] Cal. Labor Code §6801.

[41] Cal. Adm. Code tit. 8, §§3800 *et seq.* The pertinent General Industry Safety Orders are set forth in full in Appendix A, Item 2.

[42] Cal. Adm. Code tit. 8, §§4100 *et seq.*

[43] *Id.*, §§4140 *et seq.*

[44] Ill. Stat. Ann. c. 48, §§137.1-137.21.

tions.[45] The Industrial Commission, an agency of the State Department of Labor,[46] is given authority to administer the act [47] and to make rules to protect the life, health, and safety of employees.[48] However, to effectuate these purposes, the act limits the Industrial Commission by providing that it "shall make such rules only for:

> (a) The proper sanitation and ventilation of all places of employment to guard against personal injuries and diseases.
>
> (b) The arrangement and guarding of machinery and the storing and placing of personal property to guard against personal injuries and diseases.
>
> (c) The prevention of personal injuries and diseases by contact with any poisonous or deleterious materials, dust, vapors, gases or fumes." [49]

While no rules relating specifically to radiation or radioactivity have been adopted under this act,[50] it would appear that the commission has power to adopt regulations affecting various aspects of the use of radioactive materials. Clause (a) would authorize regulations in regard to air contamination and the disposal of radioactive wastes, Clause (b) would authorize the regulation of shielding and the storage of radioactive materials, and Clause (c) would authorize rules for monitoring, maximum exposures, and the safe handling and use of radioactive substances. However, the commission is expressly denied power to make any rule requiring the "submission of any plan, specifications or other information concerning any proposed installation, alteration, construction, apparatus or equipment . . ." [51] and therefore no procedure can be established requiring advance approval of radiation installations.

In 1951 the Illinois Industrial Commission issued regulations relating to labeling in the use, handling, and storage of substances harmful to the health and safety of employees.[52] The regulations provide for the labeling of containers of substances "known to constitute a health,

[45] *Id.*, c. 48, §137.2.

[46] *Id.*, c. 127, §§5.03, 43.06.

[47] *Id.*, c. 48, §137.1.

[48] *Id.*, c. 48, §137.3.

[49] *Id.*, c. 48, §137.4. There are two other clauses which relate to artificial atmospheric pressure and scaffolds.

[50] Ill. Health and Safety Act and Health and Safety Rules (1953). These rules are required by statute to be published annually, and they are obtainable from either the Secretary of State or the Industrial Commission under a recent administrative procedure act. Ill. Stat. Ann. c. 127, §268.

[51] Ill. Stat. Ann. c. 48, §137.3.

[52] Ill. Health and Safety Rules, Industrial Commission (1953), Part "J".

poison, fire or explosion hazard." [53] Such regulations would probably apply to radioactive substances, since they constitute a health hazard and because poisons are defined as substances known to be "so toxic to man as to afford a hazard to health. . . ." [54]

It was noted previously that broad powers are granted to the Illinois Commerce Commission regarding the health and safety of employees and the public in the operation of public utilities.[55] In a rather recent case, it was argued that the authority given to the Industrial Commission under the Health and Safety Act gave that commission exclusive jurisdiction over matters relating to the health and safety of employees, and consequently by implication repealed the provisions of the Public Utilities Act giving jurisdiction to the Commerce Commission over the employees of public utilities. However, the Illinois Supreme Court rejected this argument on the well-recognized principle that a statutory construction which would result in repeal by implication of another statute is not favored, and that there must be an irreconcilable repugnancy to justify an inference of repeal. The court, therefore, enforced a Commerce Commission order applicable to railroad employees.[56] Apparently, the decision means that both the Industrial Commission and the Commerce Commission may prescribe rules and regulations establishing standards covering the use of radioactive materials and maximum radiation exposures in atomic energy power plants if built in Illinois.[57] This type of overlapping jurisdiction is confusing and objectionable.

3. Michigan

No general rule-making authority has been given to the Department of Labor in Michigan, consequently no general safety regulations are

[53] *Id.*, §1, Rule 1.

[54] *Id.*, §1, Rule 2(b).

[55] Ill. Stat. Ann. c. 111 2/3, §61.

[56] Brotherhood of Railroad Trainmen v. Elgin, Joliet and Eastern R. Co., 382 Ill. 55, 46 N.E.2d 932 (1943).

[57] One fact, peculiar to Illinois, which should be noted, is that the industrial hygiene program is administered by the State Labor Department [U.S. Federal Security Agency, Public Health Service, "Directory of State and Territorial Health Authorities —1952," p. 20], in contrast to other states in which this program is a function of the Department of Health. The statute provides that the Department of Labor shall prosecute any violation of law relating to the inspection of factories, provided that "before any prosecution is instituted based upon the laboratory findings of any industrial hygiene unit of the Department of Labor, any person dissatisfied with such findings shall be entitled to have an independent review by the central laboratory of the Department of Public Health." Ill. Stat. Ann. c. 48, §59.15.

in existence.[58] However, a statute requires that the owner of any factory operating "machinery of every description" must equip it with "proper safeguards." The "commission" or "factory inspector" shall determine whether machinery and equipment are properly guarded.[59] The Commissioner of Labor also has authority to order the installation of proper and adequate ventilation devices to preserve the health and safety of persons in "manufacturing, mercantile and other establishments." [60] Apparently, the conclusion to be drawn is that, while no generally applicable regulations can be adopted by the Department of Labor in Michigan, it has authority to deal with specific plants on an individual basis regarding industrial safety hazards.

Under existing statutes, perhaps the Public Service Commission would be more likely to adopt regulations establishing minimum safety standards in the use of radiation sources than would the Department of Labor. It was noted earlier that the Public Service Commission has promulgated employee health and safety regulations applicable to electric utility plants. If nuclear energy were used in such a plant in Michigan, it is conceivable that the Public Service Commission would formulate health and safety regulations to cover the peculiar hazards incident to such operations. Moreover, "the investigation and prevention of hazards associated with industrial operations is a function of the Division of Occupational Health," of the Michigan Department of Health, and that agency has recently promulgated comprehensive radiation safety rules.[61] Thus, in Michigan there is also the potentiality of at least three regulatory agencies having jurisdiction to regulate matters of radiological health, and inconsistent action could create a regulatory "maze" for atomic power installations.

4. Missouri

The Industrial Commission of Missouri, which controls and supervises the work of the Department of Labor and Industrial Relations, has authority to approve or disapprove all rules or regulations promulgated by any division within the department.[62] One of these divisions is the

[58] Regulations with respect to workmen's compensation, employment of women and minors, steam boilers, and elevators do exist. Mich. Adm. Code (1954) R 408.201-R 408.473.

[59] Mich. Stat. Ann. §17.25.

[60] *Id.*, §17.33.

[61] On February 14, 1958, a very comprehensive set of regulations governing the use of radioactive isotopes, X-radiation and all other forms of ionizing radiation published by this division, became effective in Michigan. Mich. Adm. Code (1954, Supp. No. 13).

[62] Mo. Rev. Stat. §286.060(4).

Division of Industrial Inspection.[63] Within one month after the occupancy of any factory, workshop, or mill, the Director of Industrial Inspection must be notified thereof,[64] and thereafter annual reports are required to be made to the director by every "factory, foundry or machine shop or other manufacturing establishment doing business within this state." [65] All machines and machinery used in "manufacturing, mechanical, and other establishments" must be "safely and securely" guarded to prevent injury to employees. In the alternative, notice of dangers must be posted when it is not possible to guard the equipment. The director may order necessary alterations, additions, or repairs to enforce compliance.[66] Any person operating any machine which generates poisonous gases in its operation (this might embrace radioactive gaseous wastes) must provide the machine with a hood connected to a blower or suction fan.[67] Apparently, the director does not possess specific authority to promulgate generally applicable safety regulations, but he can order necessary alterations or additions to protect the health and safety of employees "of any establishment." [68] In this respect the situation in Missouri is somewhat similar to that prevailing in Michigan.

There are special provisions relating to the prevention of occupational diseases in the Missouri statutes which are more or less applicable to the hazard associated with radioactive materials. Every employer carrying on any "work, trade or process which may produce any illness or disease peculiar to the work or process carried on, or which subjects the employee to the danger of illness or disease incident to such work, trade or process . . ." shall provide approved and effective devices or methods to prevent industrial or occupational diseases.[69] This statute would seem to embrace the uses of radioactive materials which involve radiation hazards. Certain processes are declared especially dangerous to the health of employees. Included among them is any process involving certain enumerated metals "or any poisonous chemicals, minerals, acids, fumes, vapors, gases, or other substances," in which these substances are "generated or used, employed or handled by the employees in harmful quantities, or under harmful conditions, or come in contact with in a harmful way. . . ." [70] If radioisotopes are considered a "poisonous

[63] *Id.*, §286.110.
[64] *Id.*, §292.010.
[65] *Id.*, §291.090.
[66] *Id.*, §292.020.
[67] *Id.*, §292.120.
[68] *Id.*, §292.180.
[69] *Id.*, §292.300.
[70] *Id.*, §292.310.

chemical," their use by employees would be within the letter of the statute. Radioactive materials may and probably will be considered "poisonous substances." [71] If these special provisions apply to an employer, he must provide working clothes and "adequate and approved respirators." Moreover, employees subject to the hazards must be examined monthly by a physician.[72] Employers subject to these special provisions must also provide sanitary and adequate dressing rooms and lavatories,[73] maintain working areas in a sanitary condition,[74] take prescribed measures to prevent and remove dust,[75] and post prescribed notices.[76] The extent of the applicability of these provisions will have to be worked out from time to time as occupational hazards result from the radioactive substances.

5. New Jersey

The statutes of New Jersey do not precisely define the extent of the jurisdiction of the Department of Labor and Industry, but apparently it is broad enough to include factories and other establishments as well as extending to the employment relationship, and the commissioner has a general rule-making authority to enforce provisions of the labor laws he administers.[77] Several statutes and regulations may possibly be relevant to the use of radioactive materials.

One New Jersey statute requires that every person "engaging in any productive industry within the supervision of the department" shall register with the Commissioner of Labor and Industry.[78] An occupational disease statute provides: "Every employer shall, without cost to his employees, provide reasonably effective devices, means and methods to prevent the contraction by them of any illness or disease incident to the work or process in which they are engaged." [79] Certain special precautions are necessary with respect to especially dangerous processes, but these are so defined as to include only those relating to the manu-

[71] See St. Joseph Lead Co. v. Jones, 70 F.2d 475 (1934) and Langeneckert v. St. Louis Sulphur & Chemical Co. (Mo. App. 1933) 65 S.W.2d 648, for broad interpretations of the word "poisonous."

[72] Mo. Rev. Stat. §292.330.

[73] *Id.*, §292.360.

[74] *Id.*, §292.380.

[75] *Id.*, §292.390.

[76] *Id.*, §292.420.

[77] N.J. Rev. Stat. (1937) §34: 1-20, as incorporated by §34: 1A-6 (Cum. Supp. 1948-1950). See also *id.*, §34: 1A-3(e).

[78] *Id.*, §34: 6-141.

[79] *Id.*, §34: 6-48.

facture of certain lead compounds.[80] Other statutes require proper ventilation to render harmless any gases, vapors, dust, or other impurities injurious to health that may be generated in any manufacturing establishment,[81] and for proper safeguards to be placed on all machinery.[82]

Existing regulations of the New Jersey Department of Labor and Industry include a listing of "permissible concentration limits of vapors, gases, fumes, mists, dusts and radiant energy" applicable to "all places of employment." [83] In these regulations, radiant energy is defined as "energy derived from radio-active substances or shortwave radiation which, upon exposure, may have a toxic and injurious effect on the body." These limits, which are discussed in Chapter V of this Part, do not conform with the current standards of the Atomic Energy Commission or the National Committee on Radiation Protection and Measurement. In 1954 and 1955 the New Jersey Department of Labor and Industry indicated that it was in the process of formulating comprehensive rules and regulations to cover all types of radiation hazards.[84] These regulations were to follow the recommended standards of the National Committee on Radiation Protection and Measurement, except that a qualifying board was to be appointed to review applicants for certification. Furthermore, a substantial filing fee, based on the value of the installation, was to be exacted so that, in effect, the proposed New Jersey code would establish a licensing system for users of radiation sources. It does not appear that these regulations have been promulgated.

The Public Health Council of New Jersey, an official state agency having jurisdiction over general public health problems, has promulgated regulations relating to radiation. In the Sanitary Code, it is provided that "X-ray machines and all other sources of radiation shall be shielded, transported, handled, used and kept in such manner as to prevent users thereof and all persons within effective range thereof from being exposed to excessive dosage of radiation." [85] Maximum exposures, however, are not prescribed.[86]

[80] *Id.*, §34:6-49.

[81] *Id.*, §34:6-61.

[82] *Id.*, §34:6-62.

[83] State and Federal Labor Laws, New Jersey Edition, 434 (1953).

[84] Letters from J. Lyman Brown, Deputy Commissioner, N.J. Dept. of Labor & Industry, March 9, 1954, June 1, 1955.

[85] N.J. State Sanitary Code, June 22, 1953, pamphlet, p. 22.

[86] New Jersey labor regulations also require that safety committees be organized in plants under the jurisdiction of the Department of Labor and Industry. These committees supervise safety inspection work, devise methods to avoid accidents, and insure that new employees are properly instructed as to hazards and that employees are

6. New York

New York's Department of Labor, headed by an Industrial Commissioner,[87] contains the Board of Standards and Appeals [88] which has broad authority to promulgate rules and regulations to effectuate various provisions of the labor laws.[89] Rules may be made to minimize personal injuries and diseases and to require "reasonable and adequate" protection for the lives, health, and safety of employees.[90] Rules adopted by the board constitute the Industrial Code.[91]

New York statutes also require the registration of "factories" with the Industrial Commissioner.[92] In addition, there are provisions requiring the guarding of machinery in factories,[93] and others requiring adequate ventilation and removal of "gases, fumes, vapors, fibers or other impurities" from factories.[94] However, "power houses, generating plants and other structures owned or operated by a public service corporation or a municipal corporation other than construction or repair shops, subject to the jurisdiction of the public service commission" are excluded from the definition of factory.[95] Therefore, an atomic energy installation used exclusively to generate electrical energy would seemingly not be subject to the jurisdiction of the Industrial Commissioner over "factories."

However, it seems probable that the Board of Standards and Appeals could make certain rules applicable to atomic energy power plants, even though such plants would not be subject to the provisions relating to "factories," for it is provided that: "Whenever the board finds that any industry, trade, occupation or process involves such elements of danger to the lives, health, or safety of persons employed therein as to require special regulation for the protection of such persons . . . ," the board may make rules to guard against these dangers by requiring licenses, by

educated in safety practices. Safety inspectors are required, and weekly safety inspections must be made. Slightly different regulations apply to three categories of plants: 1 to 50 employees, 150 to 500 employees, and over 500 employees. There are other requirements as to first aid facilities, emergency hospital, and a dispensary, including the items of equipment that must be on hand in each of these units. State and Federal Labor Laws, New Jersey Edition, 493-500 (1953).

[87] N.Y. Labor Law §10.

[88] *Id.*, §12-a.

[89] *Id.*, §27-a.

[90] *Id.*, §28(1).

[91] *Id.*, §§29, 200.

[92] *Id.*, §250.

[93] *Id.*, §256.

[94] *Id.*, §299.

[95] *Id.*, §2(9).

requiring medical supervision of persons employed, and by "other appropriate means."[96] It is the opinion of the counsel to the Labor Department that this provision authorizes the board to make rules applicable to power plants even though they are subject to the general jurisdiction of the Public Service Commission.[97]

Under this provision, the Board of Standards and Appeals of the State Department of Labor has, in fact, issued regulations relating to radiation protection.[98] The code, effective December 15, 1955, is very extensive, and its purpose is to offer reasonable and adequate protection in "every place where any employee in the course of his work may be exposed to radiation in excess of one tenth the permissible weekly dose" except medical, dental, veterinary, and educational institutions, clinics, and officers which are subject to the provisions of the Sanitary Code.[99] The provisions of both the Labor and the Sanitary Codes, which apply to sources of radiation, are discussed and compared in Chapter V.

Since the New York State Department of Health has also issued regulations covering ionizing radiation, it should also be noted at this point that the Division of Industrial Hygiene in the Department of Labor administers all laws relating to industrial hygiene for the Department of Health.[100] But when a condition resulting from the operation of a business, plant, or public utility constitutes a threat to the general public health, as distinguished from that of employees only, the jurisdiction of the Department of Health will probably be paramount.[101] Furthermore, the regulations of the Labor Department do not apply to hospitals, medical clinics, dental offices, podiatry offices, veterinary clinics, educational institutions, and commercial, private, or research laboratories performing diagnostic procedures or handling equipment of material for medical use which are subject to the provisions of the New York State Sanitary Code promulgated by the Health Department.[102]

[96] *Id.*, §28(2).

[97] Quotation in letter from Irving R. Tabershaw, Director, Division of Industrial Hygiene, N.Y. Dept. of Labor, March 25, 1954.

[98] N.Y. Industrial Code Rule No. 38.

[99] N.Y. Public Health Law, Appendix, State Sanitary Code, c. XVI.

[100] Federal Security Agency, "Directory of State and Territorial Health Authorities —1952," 39; letter from Earl W. Murray, Counsel, N.Y. Dept. of Health, Feb. 15, 1954.

[101] People ex rel. New York, New Haven & Hartford R.R. v. Willcox, 200 N.Y. 423, 94 N.E. 212 (1911).

[102] N.Y. Industrial Code No. 38, Reg. 38-6.

7. Ohio

The Ohio Department of Industrial Relations has jurisdiction over "every employment and place of employment. . . ." [103] It has the duty, among others, to administer and enforce the general laws of Ohio relating to "manufacturing" and "electrical" establishments and all other laws protecting the life, health, safety, and welfare of employees.[104] Statutes require that the employer furnish safe employment; *i.e.*, furnish and use safety devices, safeguards, methods, and processes which will protect employees.[105]

All shops and factories, which are defined to include manufacturing and electrical establishments,[106] are subject to inspection by personnel of the Division of Workshops and Factories, and the division may order the owners of these establishments to correct dangerous, unhealthy, or unsanitary conditions.[107] Furthermore, numerous requirements are imposed on owners and operators of shops and factories relating to safety precautions,[108] accident reports,[109] notices to be posted on dangerous machinery,[110] and additional safety rules.[111]

Although independent of the Department of Industrial Relations, the key rule-making agency in matters of employee health and safety appears to be the Industrial Commission,[112] which has broad authority to adopt rules and regulations prescribing safety devices, safeguards, or other means or methods to protect the life, health, and safety of employees.[113]

It should be noted at this point that the Ohio Department of Health promulgated regulations in 1947 for the prevention and control of diseases resulting from toxic fumes, vapors, mists, gases, and dusts applicable to every place of employment.[114] One regulation provides that "No employer shall use or permit to be used in the conduct of his busi-

[103] Ohio Rev. Code §4101.03.
[104] *Id.*, §4101.02(B).
[105] *Id.*, §§4101.11, 4101.12.
[106] *Id.*, §4107.01.
[107] *Id.*, §4107.07.
[108] *Id.*, §4107.23.
[109] *Id.*, §4107.13.
[110] *Id.*, §4107.25.
[111] *Id.*, §4107.26.
[112] The Industrial Commission is not a part of the Department of Industrial Relations, Ohio Rev. Code §121.04, but apparently the Industrial Commission performs the rule-making functions for the department. See §§4101.06, 4121.22. See also, §§4121.02 to 4121.09 for establishment and organization of the Industrial Commission.
[113] *Id.*, §4121.13.
[114] Mimeographed regulations of the Ohio Dept. of Health.

ness, manufacturing establishment or other place of employment, any process, material or condition known to have an adverse effect on health, unless reasonable provisions have been made to prevent injury to the health of the employees and of the public." [115] Radiation exposures are limited to 0.1 roentgen per day,[116] which was the old standard. Regulations also exist with respect to ventilation,[117] personal protective equipment,[118] isolation of hazardous operations,[119] and posting notices and giving periodic instruction to employees regarding radiation hazards.[120] However, these Ohio Department of Health regulations do not contain the amplification of standards contained in detail in California and New York regulations. The failure to include standards in respect to handling, storage, and disposal of radioactive materials and to provide a more detailed listing of permissible exposures can be attributed largely to the fact that the Ohio regulations were adopted when relatively little technological information was available. Nonetheless, the action of the Ohio Department of Health in respect to places of employment coupled with the seemingly broad jurisdiction of the Ohio Department of Industrial Relations in respect to matters of employee health and safety further demonstrates the confusion in jurisdiction over atomic energy affairs among several state agencies.

8. Pennsylvania

In Pennsylvania the situation is somewhat confused by the existence of both a Department of Labor and Industry having broad rule-making powers and an Industrial Board [121] which not only has rule-making powers of its own [122] but also must approve or disapprove all regulations promulgated by the Department of Labor and Industry.[123]

The most important legislation is the Health and Safety Act of 1937,[124] which grants the Department of Labor and Industry power to make rules and regulations to effectuate the provisions of the act. The statute extends to every "establishment" in the state, which is de-

[115] *Id.*, Reg. 247.
[116] *Ibid.*
[117] *Id.*, Reg. 248, 249.
[118] *Id.*, Reg. 251.
[119] *Id.*, Reg. 252.
[120] *Id.*, Reg. 254.
[121] Pa. Stat. Ann. tit. 71, §§13, 63.
[122] *Id.*, §§1442, 1443, 1444.
[123] *Id.*, §§565, 574.
[124] Pa. Stat. Ann. tit. 43, §§25-1 to 25-15.

fined as "any room, building or place . . . where persons are employed . . . except farms or private dwellings. . . ." [125] All establishments must be "constructed, equipped, arranged, operated, and conducted as to provide reasonable and adequate protection for the life, limb, health, safety, and morals of all persons employed therein." [126] All toxic and noxious dusts, fumes, vapors, and other atmospheric impurities which create a condition of danger to employees must be removed, or if that is impractical, employees must wear personal protective devices.[127] Recognizing hazards of radioactivity, in 1953 the Pennsylvania legislature added the underlined words to the following provision:

> When employees, due to the nature of employment, are subject to injury from flying particles, falling objects, sharp or rough surfaces or materials, hot, corrosive or poisonous substances, acids or caustics and injurious light rays or harmful radioactive materials, they shall be provided with and shall wear goggles, other head and eye protectors, gloves, leggings, and other personal protective devices.[128]

Other Pennsylvania statutes require proper ventilation, sanitation,[129] and proper guarding of machinery [130] in all establishments within the state. Thus, in Pennsylvania, as in other states, there are several possibly applicable statutes governing atomic energy health and safety problems, and at least two state agencies apparently have rule-making power so that inconsistent regulations may prove overly burdensome on the new atomic energy industry.

In 1955 the Pennsylvania Department of Labor and Industry indicated that it intended to issue a comprehensive set of radiation health and safety regulations to protect persons within its jurisdiction,[131] but it was subsequently decided to establish an "Interdepartmental Committee and prepare regulations in which both the Department of Labor and Industry will be vitally interested. . . . It is the intent of the Interdepartmental Committee to have the Department of Health police the regulations and the Department of Labor and Industry enforce them." [132] As of February of 1958 no regulations had been promulgated by this committee.

[125] *Id.*, §25-1.
[126] *Id.*, §25-2(a).
[127] *Id.*, §25-2(e).
[128] *Id.*, §25-2(h).
[129] Pa. Stat. Ann. tit. 43, §§19, 25-3.
[130] *Id.*, §§19, 25-7.
[131] Letter from John R. Torquato, Secretary of Labor and Industry, June 2, 1955.
[132] Letter from William L. Batt, Jr., Secretary of Labor and Industry, Feb. 17, 1958.

9. Texas

Texas has not created an industrial board or commission with authority to adopt rules and regulations establishing health and safety standards for employees. There is, however, a Bureau of Labor Statistics, headed by a Commissioner [133] whose duties involve the gathering of data, making reports, and reporting to the appropriate authority the violation of any law with respect to employment.[134] Under a chapter entitled "Protection of Female Employees" are found several provisions which require that factories and establishments be kept free from poisonous or noxious gases and injurious dust arising from any process,[135] and that wastes be removed and disposed of "in such manner as not to cause a nuisance." [136] The Commissioner of Labor Statistics is authorized to inspect any factory or other establishment where five or more persons are employed and to require the correction of any unsanitary or dangerous condition.[137] But since the title of the statute embracing these provisions refers to the health, safety, and comfort of employees of establishments where *females are employed,* this statute may only be applicable to plants or establishments which employ women, even though the body of the statute does not seem thus to limit its applicability.[138] Hence, the extent of the authority of the Commissioner of Labor Satistics is not clear from a study of the statutes.

However, the Texas State Department of Health has general rule-making authority to require that industrial establishments provide adequate protection for the health and safety of workers.[139] A statute administered by the State Department of Health provides that no employer shall use in the conduct of any place of employment "any process, material, or condition known to have any possible adverse effect on the health of any person . . . employed therein unless arrangements have been made to maintain the occupational environment to the extent that such injury will not result." [140] The Department of Health is required to make available information concerning maximum allowable concentrations of toxic gases and concerning environmental standards

[133] Tex. Civ. Stat. art. 5144.
[134] *Id.*, arts. 5145-5149.
[135] *Id.*, art. 5174.
[136] *Id.*, art. 5175.
[137] *Id.*, art. 5179.
[138] See Texas Laws, Fourth Sess. 1918, p. 132.
[139] Tex. Civ. Stat. art. 4477-1, §19(c), as interpreted in a letter from V. M. Ehlers, Director, Bureau of Sanitary Engineering, Tex. State Dept. of Health, March 1, 1954.
[140] Tex. Civ. Stat. art. 4477-1, §19(a).

which pertain to the health and safety of employees of industrial establishments.[141] Pursuant to the above authority, the Department of Health issued Regulations on Radiation Exposure which became effective in September of 1956. These regulations, which are discussed in Chapter V, follow the recommendations of the National Committee on Radiation Protection and Measurement.

10. Wisconsin

In Wisconsin under the act which establishes the Industrial Commission,[142] it is made the statutory duty of every employer to furnish a safe place of employment and to do everything reasonably necessary to protect the "life, health, safety, and welfare" of employees and "frequenters." [143] The terms "place of employment" and "employment" are defined broadly to include all activity wherein any person is, directly or indirectly, employed by another for direct or indirect gain or profit, except in private domestic services and agricultural operations.[144]

The Industrial Commission has been given very broad rule-making powers to ascertain and determine reasonable safety devices and safeguards and to adopt standards to protect employees and "frequenters" of places of employment.[145] It is further provided that local regulatory bodies, such as city councils or boards of health, shall not be deprived of power over places of employment, but in case of conflict with an order of the Industrial Commission, the latter shall amend or modify the local order.[146]

Unquestionably, the Industrial Commission would have jurisdiction over an atomic power plant built in Wisconsin. Moreover, the fact that such a plant would be subject to the Wisconsin Public Service Commission seemingly has no effect on the powers of the Industrial Commission over the same plant.[147] As was noted earlier, the Industrial Commission and the Public Service Commission collaborate in the preparation and administration of regulations affecting electric utility plants.

[141] *Id.*, §19(b).

[142] Wis. Stat. (1957) §§101.01 *et seq.*

[143] *Id.*, §101.06. A "frequenter" is a person other than an employee who may be in a place of employment "under circumstances which render him other than a trespasser." *Id.*, §101.01(5).

[144] *Id.*, §101.01(1), (2).

[145] *Id.*, §§101.10(3), (4), (5); §101.09.

[146] *Id.*, §101.16(1).

[147] Letter received from O. T. Nelson, Director of Safety and Sanitation, Wisconsin Industrial Commission, dated Feb. 19, 1954.

The Industrial Commission has adopted a number of regulations relating to industrial safety which would be applicable to uses of radioactive materials.[148] An order prescribing maximum permissible exposures, as amended April 2, 1954, stipulates 0.3 roentgen per week.[149] Uranium is included on the list of toxic dusts, fumes, and mists, and the allowable limit for uranium in soluble compounds is 0.05 milligrams per cubic meter and 0.25 milligrams per cubic meter in insoluble compounds.[150] Other regulations require adequate ventilation, protection from dusts, proper disposal of exhaust materials, and personal protective devices.[151] Many other regulations are in force relating to specific operations or specific hazards.[152]

As with other states it is apparent that more than one agency has jurisdiction to promulgate regulations governing the health and safety of atomic energy operations. However, the cooperation between the Public Service Commission and Industrial Commission in Wisconsin has served to ameliorate potentialities of inconsistent or overlapping regulations that may have a detrimental effect on growth of atomic energy industrial pursuits.

11. Conclusion

The analysis of the foregoing statutory provisions concerning labor safety regulatory agencies reveals that the statutes and regulations applicable to an atomic energy industry vary considerably from state to state, but that in all the states covered by this study some type of regulatory agency has been granted sufficient power to have some authority over users of nuclear power and radioisotopes. A failure on the part of persons entering the atomic field to assess existing and prospective statutes and regulations may lead to wasteful expenditures if basic redesigning or supplemental equipment are required subsequently by order of a state labor agency. The establishment of an atomic energy industry where a state agency has regulatory power, but has not yet exercised the power, will be even more difficult to handle, since a later adoption of regulations may even cause temporary suspension of operations. Therefore, consultation with appropriate agencies appears advisable to determine in advance the permissible scope of activity.

[148] These regulations are available in pamphlet and mimeographed form from the Industrial Commission. They will be cited simply by number.

[149] Order 2002.

[150] *Ibid.*

[151] Orders 2003 to 2021.

[152] See General Orders on Safety, Orders 1 to 83.

Undoubtedly the most significant aspect of the present state regulatory pattern is the conflict of jurisdiction of state agencies in matters of employee health and safety. Not only do the public utility commissions typically have regulatory powers, but also labor departments and, in some instances, health departments are authorized to issue regulations relating to employees and places of employment. Moreover, as we progress to an examination of (1) the general powers of health departments in respect to the health and safety of members of the general public and (2) the powers of other typical state agencies, the confusing and overlapping jurisdictions of the several agencies will appear to have even a greater possibility of seriously impeding the exploitation of atomic energy if unreasonable duplication of effort is required on the part of the atomic energy industry.

C. Health Departments and Boards

All ten states selected for study have established state health departments and, in addition, have provided for various local boards of health. In the past, it would appear that the health departments have been primarily concerned with standards and measures to protect the general public, leaving specific safety regulations for employees to appropriate labor agencies. However, recent experience indicates that this may not be the case with respect to radiation hazards: of the seven comprehensive state radiation health and safety codes in effect as of April 1958, only two were promulgated by labor agencies, and, of the five issued by health departments, four are designed to protect employees as well as the general public.

Of all the state agencies which may regulate radiation hazards, the powers of the state health departments and boards appear to be the most significant. For the most part, the regulations of the departments of labor and the public utility commissions are limited in their application to places within the control of the person subject to the regulations. Quite obviously these boundaries are not recognized by either direct radiation or by disseminated radioactive materials which may contaminate the surface and underground waters, sewage systems, and the atmosphere of the state. Adequate employee protection standards do not necessarily assure that the health of the general public outside the radiation installation will be safeguarded against radiation hazards caused by products containing radioactive materials or radioactive stack gases, for example. While it appears that the state health departments have the broadest health and safety powers and, therefore, are in the best

position to give radiation hazards the sort of comprehensive attention required, it is unfortunately difficult to draw a clear line of demarcation between those matters which may be regulated by state health agencies and those matters which fall into the regulatory sphere of other state agencies. As is indicated in Chapter V of this Part, only New York has made any attempt to solve the jurisdictional problem, and that solution is not altogether satisfactory. Moreover, since both local boards of health and local legislative bodies may possess general powers over public health and safety, the problems created by overlapping jurisdiction are compounded.[153] It is desirable, therefore, to examine the general scope of the existing statutory powers of state and local health agencies, together with possible limitations thereon, in order to form some appraisal of the extent to which they will bear upon atomic enterprise.

1. State Health Departments

The state health departments of the ten states studied typically have "general supervision of the interests of the health and lives of the people of the state," [154] and are given power "to adopt, promulgate, repeal and amend rules and regulations consistent with law for the protection of the public health." [155] Under the Ohio statute conferring rule-making power on the Public Health Council, the Attorney General of Ohio has ruled that the council has authority to adopt regulations establishing maximum allowable concentrations for substances used in industry which are dangerous to public health.[156] As indicated in the discussion of labor department regulation, the Ohio Department of

[153] See Zullo v. Bd. of Health of Woodbridge Tp., 9 N.J. 431, 88 A.2d 625 (1952), indicating that a local board of health and a municipality had concurrent jurisdiction to regulate trailer camps.

[154] Ill. Rev. Stat. c. 127, §55.02. See also Mo. Rev. Stat. (1949), §192.020; Ohio Rev. Code §3701.13; Pa. Stat. Ann. tit. 71, §1403, tit. 73, §532; Wis. Stat. (1957) §140.05(1).

[155] Cal. Health & Safety Code §102. Substantially similar provisions: Ill. Rev. Stat. c. 111 1/2, §22; Mich. Stat. Ann. §14.7; Mo. Rev. Stat. (1949) § 192.020 (the Missouri statute extends only to "infectious, contagious, communicable or dangerous diseases." A letter from the Missouri Division of Health, dated March 17, 1954, written by L. E. Ordelheide, Director, Bureau of Public Health Engineering, indicates that the Division of Health feels that it has authority under this statute to adopt regulations prescribing maximum radiation exposures although they have not yet done so); N.J. Rev. Stat. §26:1A-7 (Cum. Supp. 1945-47); N.Y. Public Health Law §225(3); Ohio Rev. Code §3701.34; Pa. Stat. Ann. tit. 71, §532; Tex. Civ. Stat. art. 4418d; Wis. Stat. (1957) §140.05(3).

[156] 1945 Op. Atty. Gen. (Ohio) #609.

Health has in fact issued regulations governing places of employment.[157] In Michigan an inter-office memorandum to the Attorney General stated that the State Commissioner of Health has sufficient powers to issue "regulations concerning persons dealing in or operating with radioactive or fissionable materials." [158] As a result the commissioner has recently promulgated health and safety regulations pertaining to all sources of ionizing radiation in Michigan.[159] While the memorandum considered it doubtful if a registration requirement could be sustained under the existing powers, the Michigan regulations nevertheless contain such a provision. In contrast, it apparently was believed necessary to extend the powers of the health departments in Colorado, Connecticut, Massachusetts, New Jersey, New York, Oregon, and South Dakota to authorize them to regulate radiation hazards, for the legislatures of each of these states have recently enacted appropriate statutes. The Colorado Board of Health is authorized "to establish and enforce standards for exposure to environmental conditions, including radiation, that may be deemed necessary for the protection of the public health." [160] In Connecticut the State Department of Health may incorporate into the Sanitary Code regulations governing the operation of any source of ionizing radiation or the production, transportation, storage, possession, or disposition of radioactive materials.[161] These regulations are to be based on the standards of the Atomic Energy Commission or, in lieu thereof, upon the latest recommendations of the National Committee on Radiation Protection and Measurement. Registration requirements are specifically authorized. Massachusetts conferred a more limited authority upon its Department of Public Health in a statute which directs it to "prescribe and establish rules and regulations to control the transportation, storage, packaging, sale, distribution, production and disposal of radioactive materials which may affect the public health," [162] but the statute does not authorize the promulgation of regulations concerning the *use* of radioactive materials. Similarly, sources of radiation which do not consist of radioactive materials are not covered. Furthermore, the act specifically states that the powers of the Department

[157] *Supra* note 114.

[158] Inter-office Memorandum to Attorney General T. M. Kavanaugh from Assistant Attorney General R. A. Derengoski regarding the rule-making powers of the State Commissioner of Health, dated Nov. 8, 1955.

[159] Mich. Adm. Code (1954, Supp. No. 13). These regulations are examined in detail in Part III, Chapter V, *infra*.

[160] Colo. Rev. Stat. §66-1-7(21).

[161] Public Acts of Conn. 1957, Public Act 154.

[162] Mass. Ann. Laws c. 111.

of Labor and Industries to establish regulations for the protection of the health and safety of employees against radiation hazards are not impaired. In 1958 the New Jersey legislature enacted a "Radiation Protection Act" establishing a Commission on Radiation Protection within the Department of Health and empowering the Commission to adopt rules and regulations to prohibit and prevent "unnecessary radiation." [163] The New York Public Health Law was amended in 1955 to authorize the Department of Public Health to regulate the "public health aspects of the use of ionizing radiation and the handling and disposal of radioactive wastes." [164] Similarly, the Oregon Board of Health in 1957 was directed to promulgate regulations and standards for the safe use, handling, disposal, and control of all radiation sources within the state after it had conducted a two-year study of the problems.[165] Finally, the South Dakota Department of Health is authorized to "develop comprehensive policies and programs for the evaluation and determination of hazards associated with the use of radiation" and to "adopt, promulgate, and enforce such rules and regulations as may be necessary." [166] These statutes are analyzed in greater detail in Chapter V of this Part as are the regulations of the health departments of Connecticut and New York, which were promulgated pursuant to the above authorization.

Another general power commonly given to state departments of health is the power to investigate complaints involving nuisances or potential hazards to life and health and to require the abatement of any such nuisance.[167] In some states the abatement of nuisances is left to local boards of health.[168]

For illustrative purposes, two statutes may be noted. In Ohio it is provided that any industrial establishment which produces industrial wastes must submit plans for the treatment and disposal of such wastes to the State Department of Health. These plans must be approved before the plant may be constructed.[169] Under the California statutes, the State Department of Health is empowered to abate "contamina-

[163] N.J. Laws 1958, c. 116.

[164] N.Y. Public Health Law §201(1)(s).

[165] Ore. Laws 1957, c. 399.

[166] S.D. Laws 1957, H.B. 826.

[167] Cal. Health & Safety Code §206; N.J. Rev. Stat. (1937) §26:2-43; N.Y. Public Health Law §201(o), §§1300, 1301; Pa. Stat. Ann. tit. 71, §1403; Wis. Stat. (1957) §146.14(1).

[168] For detailed provisions, see below.

[169] Ohio Rev. Code §3701.19.

tion." [170] "Contamination" is defined as a condition which results from the disposal of industrial wastes of such a nature as to create an actual hazard to the public health.[171] Contamination is also made a crime.[172] These two statutes illustrate the two different approaches to the problem; *i.e.*, advance approval on the one hand and subsequent action on the other.

Other states considered in this study have not yet adopted radiological health regulations, but some of them use as a guide to determine the existence of possible health hazards the standards adopted by the American Conference of Governmental Industrial Hygienists or by official bodies such as the United States Public Health Service, the National Bureau of Standards, or the Atomic Energy Commission.[173]

2. Local Health Agencies

Each of the ten states examined in this study has also established some form of health regulation at the city and county levels. In addition, many states have provided for the organization of township health boards and health districts which may be comprised of nearly any possible combination of political subdivisions. Usually these local health boards are invested with powers very similar to those of the state health departments, except that the territorial jurisdiction of the local health agency, of course, is limited, and the local health board is normally subject to the paramount authority of the state department of health.[174] As might be expected, there is considerable divergence in the types of health boards authorized by the various statutes. However, the powers conferred on the agencies appear to be somewhat similar, whether the boards are established at the city, township, county, or a hybrid district level.

a. Cities

In some states incorporated cities and towns are given authority to pass such ordinances as may be deemed necessary for the protection of the health of the inhabitants.[175] Other states authorize the creation of

[170] Cal. Health & Safety Code §5412.

[171] *Id.*, §5410(e).

[172] *Id.*, §5461.

[173] Letter from L. E. Ordelheide, Director, Bureau of Public Health Engineering (Missouri) March 17, 1954.

[174] See, *e.g.*, N.J. Rev. Stat. (1937) §26:3-64; Pa. Code Ann. tit. 71, §1406.

[175] Cal. Health & Safety Code §500; Ill. Stat. Ann. c. 24, §§23-81, 42-1 *et seq.*; Mich. Stat. Ann. §§5.1331, 5.1337, 5.1757; Mo. Rev. Stat. (1949) §§71.780, 73.110(10), 74.133(1), 77.560; Pa. Stat. Ann. tit. 53, §§3800-11, 9673, 13329; Tex. Civ. Stat. arts. 1015, 1072.

city health boards which are invested with powers to make rules and regulations necessary for the protection and preservation of the public health.[176] It is possible that an industry located within the corporate limits of a municipality may even be subject to regulation both by municipal ordinance adopted by the city council and by administrative regulation promulgated by a local health board.[177] Only detailed examination of the regulations applicable in any given area can resolve the complexities of the situation.

b. Counties

Again the statutory provisions are diverse. In Texas and Missouri health regulation at the county level is not very extensive. In Texas the statutes provide that a "City-County Health Unit" may be formed in any county containing an incorporated city which has a population of not less than 90,000 nor more than 120,000.[178] The City-County Board of Health is authorized to make rules and regulations "to promote and preserve the health of the county." [179] Apparently, this is the only instance of county health regulation in Texas. In Missouri rule-making power over public health matters is granted to the county court (a governing body) but only in counties having an assessed valuation of $300,000,000 or more.[180]

Each of the remaining eight states covered by this study provides for some form of health regulation either by a county health board or by the governing body of the county. In California and Illinois the governing body of each county is given power to adopt ordinances and regulations for the protection of the public health.[181] In Ohio townships and villages in each county constitute a general health district,[182] and the board of health of a general health district "may make such orders and regulations as are necessary for . . . the public health, the prevention or restriction of disease, and the prevention, abatement, or suppression of nuisances." [183] County health boards in Michigan, New

[176] Ill. Stat. Ann. c. 24, §42-5; Mich. Stat. Ann. §5.1764; N.J. Rev. Stat. (1937) §26:3-64; N.Y. Public Health Law §§308(e), 371; Ohio Rev. Code §3709.20; Pa. Stat. Ann. tit. 53, §12198-2307; Wis. Stat. (1957) §141.01(5).

[177] See Zullo v. Bd. of Health of Woodbridge Tp., *supra* note 153.

[178] Tex. Civ. Stat. art. 4436a-1, §1.

[179] *Id.*, §2.

[180] Mo. Rev. Stat. (1949) §192.300.

[181] Cal. Health & Safety Code §450; Ill. Stat. Ann. c. 34, §§25, 148, 149.

[182] Ohio Rev. Code §3709.01.

[183] *Id.*, §3709.21.

Jersey, New York, and Wisconsin are given authority to promulgate rules and regulations to protect the public health.[184]

The power to abate or suppress nuisances is normally a corollary of the rule-making power. In 1951 Pennsylvania passed a rather elaborate "Local Health Administration Act." [185] This act, applicable to all but first-class counties,[186] authorizes the creation of county or joint-county departments of health [187] which are given broad rule-making power to make regulations "for the prevention of disease, for the prevention and removal of conditions which constitute a menace to health, and for the promotion and preservation of the public health generally." [188] In 1943 Illinois passed a somewhat similar act providing for county or multiple-county public health departments.[189] However, under this act, the county health board recommends to the county governing board the adoption of ordinances, rules, and regulations necessary to promote and protect public health, which latter board has power to promulgate the ordinances, rules, and regulations.[190]

c. Townships

In at least four states township boards of health may also exist. In Michigan each township board is a board of health,[191] with authority to make regulations concerning nuisances or causes of sickness and to abate nuisances.[192] Likewise in Illinois and New Jersey rule-making powers may be exercised by township boards of health.[193] In Pennsylvania the governing authorities of townships are empowered to make such regulations as may be deemed necessary for the health and safety of the inhabitants of the township.[194]

d. Health Districts

Many states also authorize the consolidation of political subdivisions into "hybrid" health districts. For example, California provides that a

[184] Mich. Stat. Ann. §§14.161, 14.166; N.J. Rev. Stat. (1937) §26:11-26; N.Y. Public Health Law §§308(e), 347; Wis. Stat. (1957) §140.09(6).

[185] For a general discussion of this act, see Stahl and Earley, "The Pennsylvania Local Health Administration Law of 1951," 13 U. of Pitt. L. Rev. 232 (1952).

[186] This excludes only Philadelphia, *id.* at 248.

[187] Pa. Stat. Ann. tit. 16, §4205.

[188] *Id.*, §4211(c).

[189] Ill. Stat. Ann. c. 111 1/2, §§20c *et seq.*

[190] *Id.*, §20c13; *id.*, c. 34, §25.12.

[191] Mich. Stat. Ann. §14.61.

[192] *Id.*, §§14.63, 14.68.

[193] Ill. Stat. Ann. c. 34, §§148, 149; N.J. Rev. Stat. (1937) §§26:3-9, 26:3-64, 26:3-47.

[194] Pa. Stat. Ann. tit. 53, §19093-702 (XXIX).

local health district may be formed from either incorporated or unincorporated territory of one or more counties.[195] Illinois authorizes towns or road districts to be combined to form "public health districts." [196] Rule-making power is not given by express statutory provision to the governing boards of either of these types of districts, but by liberal statutory interpretation they may be deemed to have such power.[197] In Michigan, New Jersey, Ohio, Pennsylvania, and Wisconsin political subdivisions may join in the creation of a consolidated health district, consisting of two or more counties, two or more municipalities, or two or more existing health districts.[198] In New York "part-county health districts" may be established in counties containing one or more cities having a population of 50,000 or more. The cities themselves are excluded from such districts.[199] These health districts which are merely combinations of other health districts or counties have the same powers as the component elements had before combination.

3. Conclusion

This somewhat cursory examination of state and local health agencies and their powers is sufficient to indicate that an atomic energy entrepreneur will assuredly be confronted with a legion of health boards, commissions, and agencies when he embarks upon his atomic enterprise. He should consult with both state and local health agencies at the earliest possible planning stage. In spite of the fact that few of these agencies have established regulations governing the use of radioactive and fissionable materials, the legal power to do so exists. Therefore, the entrepreneur will necessarily have to assume the burden of ascertaining to the best of his ability the probable scope of health regulation. As an initial proposition, it would appear advisable to err on the side of safety by installing all proved types of safety equipment designed for the protection of the public health. However, prohibitive costs may constitute a substantial deterrent to following that course of action, and the possibility will always remain that subsequent administrative regulations may result in the necessity of expensive changes in equipment or manner of operation.

[195] Cal. Health & Safety Code §903.

[196] Ill. Stat. Ann. c. 111 1/2, §1.

[197] Cal. Health & Safety Code §936; Ill. Stat. Ann. c. 111 1/2, §17(3).

[198] Mich. Stat. Ann. §14.167; N.J. Rev. Stat. §26:3A1-2 (Cum. Supp. 1951-52); Ohio Rev. Code §§3709.07, 3709.10; Pa. Code Ann. tit. 16, §4205; Wis. Stat. (1957) §140.09(1)(a).

[199] N.Y. Public Health Law §340(2).

The burden thus placed on new atomic energy ventures to guess the extent of future health regulation suggests, of course, that the state and local health agencies should be induced to adopt extensive regulations as promptly as feasible. However, a general unfamiliarity with atomic energy health hazards prevails among state and local officials, and reliable scientific data as to the effect of radiation on human life is not yet available. Moreover, the technical nature of the requirements of standards adequate to afford safety against radiation is not generally understood although knowledge is increasing rapidly. These factors would seem to necessitate an attitude of extreme caution on the part of state and local health officials. Unduly burdensome health regulations may serve to delay or even prevent the establishment of a new industry in the community. On the other hand, too lax regulations may result in serious impairment of public health and safety. This dilemma is not one that is easily resolved, but on balance we are led to the conclusion that the wiser course is to avoid the promulgation of exhaustive health standards until such time as more reliable scientific data is available. Meanwhile, general regulations not only may provide a sufficiently definite pattern to justify industrial expenditures but they also may be adaptable to changing conditions.

D. Summary of State Health and Safety Regulations

The foregoing examination of the health and safety regulatory agencies and powers of the ten selected states makes it evident that in each state at least one, and in most cases, two or more state or local agencies have been given by statute sufficient power to regulate health and safety conditions for atomic energy enterprises. It is true that the precise reasons for conferring jurisdiction upon a labor department differ from those which result in the power being given to a health department or a public service commission. The labor department is primarily concerned with health and safety of employees; the health department is primarily concerned with the health and safety of the general populace; and the public service commission is responsible for the conservation of public interests in connection with public utilities and their operation. The regulations evolved by the different agencies for these separate purposes may happen to be identical or they may be so divergent as to be absolutely impossible of simultaneous achievement. When the latter situation prevails, and it is very likely to happen unless proper cooperative measures are taken, atomic energy enterprises will find themselves operating in violation of at least one set of valid regulations and as a

result becoming subject to consequent penalties. Then, too, there will be the very considerable waste of effort by the state and the regulated industry. Of course, the potentiality of inconsistent regulation by different state and local agencies already exists for industries other than atomic, but it generally has been avoided in fact by cooperative efforts among the several agencies. It is to be hoped, and perhaps expected, that the agencies will cooperate in a similar manner in regard to atomic affairs, and that they will adopt regulations which will be consistent and not impose insuperable burdens upon a new industry.

Chapter IV

MISCELLANEOUS REGULATION

A. Disposal of Wastes

Many industrial processes require the disposal of large quantities of noxious waste materials in the course of their operations. Since improper disposal of industrial wastes may endanger the health, safety, or comfort of persons or may be detrimental to property rights, special types of governmental regulation have been evolved to control such action. In the interests of public health, many states have established water pollution control programs which may restrict the disposal of certain types of industrial wastes. Also, in the interests of conservation, laws are frequently enacted protecting fish and wildlife by prohibiting the discharge of harmful or poisonous substances into waters of the state, and such laws may serve indirectly to regulate waste disposal. The prevention and abatement of air pollution in some states, especially in metropolitan areas, is another type of regulation of disposal of industrial waste products. Finally, the law of public and private nuisance, affording remedies to public officials as well as private individuals, may be invoked to restrict or prohibit the discharge of waste materials produced in industrial processes.

Waste products created in operations involving the use of atomic energy are unique and potentially even more dangerous than ordinary industrial wastes since they may contain substantial amounts of radioactivity. Radioactive wastes produced in reactor operation or in other utilization of atomic energy may be found in the form of either solids, liquids, or gases. Since either existing or future regulation of industrial waste disposal will no doubt embrace the disposal of radioactive wastes as well, an examination of the various types of regulation is desirable.

The subject of radioactive waste disposal has received express legislative or administrative attention in a number of states recently. In California "no person shall bury, throw away, or in any manner dispose of radioactive wastes in such a manner as to endanger the lives or health of human beings."[1] The California Department of Public Health is authorized to issue written orders prohibiting dispositions in

[1] Cal. Health & Safety Code §§25600 to 25604.

violation of this statute and to seek injunctions against violators of these orders. Similarly, the South Dakota Department of Health is authorized to "issue, modify, or revoke orders prohibiting or abating the discharge of radioactive material or waste into the ground, air, or waters of the state." [2] Violations of these orders are deemed misdemeanors upon each day in which they occur.[3] Since the term "radioactive materials" may be construed to include radioactive wastes under the laws of Connecticut,[4] Massachusetts,[5] New York,[6] and Oregon,[7] persons disposing of radioactive wastes in these states are subject to the appropriate regulations of the respective health departments. In Wisconsin the county board of each county with a population of 500,000 or more is authorized to regulate the discharge of radioactive materials into the open air.[8] The problem of radioactive waste disposal has received administrative attention in the health department regulations of Connecticut,[9] Michigan,[10] New York,[11] Pennsylvania,[12] and Texas.[13] The above mentioned statutes and regulations are discussed in greater detail in Chapter V of this Part.

1. Water Pollution Regulation

Liquid radioactive wastes may result from several possible operations, including using water as a reactor coolant,[14] processing radioactive materials by chemical means, and using radioisotopes in industry and laboratories.[15] If these wastes find their way into streams, they may become potential health hazards by invading domestic water supplies or by affecting fish or vegetation.

[2] S.D. Laws 1957, H.B. 826, §4(7).
[3] *Id.*, §9.
[4] Conn. Public Acts 1957, Public Act 154, §2.
[5] Mass. Ann. Laws c. 111, §5B.
[6] N.Y. Public Health Law §201(1)(s).
[7] Ore. Laws 1957, c. 399, §3.
[8] Wis. Stat. (1957) §59.07(53).
[9] Conn. Sanitary Code c. III, §181-1-287, §M.
[10] Mich. Adm. Code 1954, Supp. No. 13, R 325.1312.
[11] N.Y. Sanitary Code c. XVI, Reg. 9.
[12] Regulation 433, Radiation Protection, Pa. Dept. of Health, §14.
[13] Regulations on Radiation Exposure, Texas Dept. of Health, §14.
[14] Water used as a coolant becomes contaminated with radioactivity, creating a form of water pollution. At the Hanford AEC installation the water is held in a basin to permit decay of most of the radiation picked up by the soluble salts in the water before it is returned to the Columbia River. AEC, "Handling of Radioactive Wastes in the Atomic Energy Program," 7 (1951).
[15] *Id.* at 15-17.

Because pollution of streams and lakes from sewage and industrial wastes has become a very serious problem, statutes regulating water pollution have been enacted in most states. Water pollution boards or commissions, often associated with the state health departments, have been created by many of the states covered by this study. Some of the boards are given administrative discretion to determine what constitutes "pollution." Some statutes apparently define industrial wastes broadly enough to encompass radioactive wastes. Many states require that permits be obtained from the water pollution board before wastes of any kind may be discharged into waters of the state. Moreover, nearly every state has a statute which absolutely prohibits the discharge of "harmful" or "poisonous" substances into the waters of the state. In the event that deleterious substances likely to injure fish or wildlife are discharged into waters, conservation laws may be involved. Criminal sanctions may attach, or perhaps permits from conservation commissions may be necessary.

Solid radioactive wastes include the products of fission taken from atomic reactors together with such items as contaminated clothing, contaminated metals used as equipment, pipes, or shielding, contaminated buildings, and residues from the incineration of radioactive wastes. The control of many of these hazards lies within the sphere of state agencies having jurisdiction over matters of health and safety. However, several statutes, notably those of California, Ohio, and Texas, cover industrial waste disposal irrespective of whether water pollution is involved.

Because of the differences in the regulatory pattern of the ten states examined in this study with respect to the regulation of industrial waste disposal, water pollution, and the role of the conservation department, a state-by-state analysis will again be necessary.

a. New York

In 1949 New York enacted a rather comprehensive program of water pollution control. The Water Pollution Control Board, created within the Department of Health, is given wide administrative discretion with respect to fixing standards of water purity, the classification of various waters, etc.[16] A general prohibition against pollution makes it unlawful to discharge any organic or inorganic matter into waters of the state that will cause or contribute to a condition in contravention of standards adopted by the board.[17]

[16] N.Y. Public Health Law §1209.
[17] *Id.*, §1220.

A significant feature of the New York statute is the licensing power granted to the board. Subject to a few minor exceptions, it is necessary to obtain a permit from the board before any person may:

> (a) make or cause to make any new outlet for the discharge of sewage, industrial waste or other wastes, or the effluent therefrom, into the waters of this state, or
>
> (b) construct or operate and use a new disposal system for the discharge of sewage, industrial waste, or other wastes or the effluent therefrom, into the waters of the state. . . .[18]

"Industrial waste" is defined as: "any liquid, gaseous, solid or waste substance or a combination thereof resulting from any process of industry, manufacturing, trade, or business or from the development or recovery of any natural resources, which may cause or might reasonably be expected to cause pollution of the waters of the state in contravention of the standards adopted as provided herein." [19]

In addition to the license which must be obtained from the Water Pollution Control Board and even though the Commissioner of Health is a member of the board,[20] it will probably be necessary for businesses utilizing nuclear energy also to obtain the written permission of the Commissioner of Health himself.[21] On this point the New York statute provides:

> No person, corporation . . . shall place . . . or cause to be discharged into any waters of this state, in quantities injurious to the public health, any . . . substance, chemical or otherwise, or any refuse or waste matter, either solid or liquid, from any . . . shop, factory, mill or industrial establishment; unless express permission to do so shall have been first given in writing by the commissioner. . . .[22]

This permission may be given to an industrial establishment "whenever the public health and purity of the waters shall warrant it," subject to conditions as the public health may require.[23] Discharges into certain waters are absolutely prohibited.[24] The provisions, requiring the permission of the Commissioner of Health and prohibiting the discharge

[18] *Id.*, §1230.

[19] *Id.*, §1202(e).

[20] *Id.*, §1205.

[21] *Id.*, §1232 indicates that in certain cases permission of the Department of Health is not required, but this is only true when a permit is not required from the Water Pollution Control Board under §1230(4).

[22] *Id.*, §1150(1).

[23] *Id.*, §1161(1).

[24] See *id.*, §§1151 to 1155.

of waste into certain waters, are, however, currently effective only until April, 1959.[25]

In addition to the public health statutes, the New York conservation statutes prohibit the discharge of any deleterious or poisonous substance into the waters of the state which may be injurious to fish life. This is an absolute prohibition; *i.e.*, no administrative authority to permit deviations is conferred. Violation constitutes a public nuisance and is subject to abatement and possible criminal penalties.[26]

b. Pennsylvania

Pennsylvania also has adopted a comprehensive program of water pollution control, in many respects similar to that of New York. Under a water pollution control act enacted in 1937, a Sanitary Water Board, a part of the Department of Health, is charged with the administration of the program.[27] "Industrial waste" includes any liquid, gaseous, or solid substance which results from any industry and which causes pollution.[28] The Sanitary Water Board is empowered to determine when pollution exists and to establish standards to define pollution.[29]

As in New York, the Pennsylvania statute provides that it is unlawful to "erect, construct or open" any establishment which in its operation results in the discharge of industrial wastes causing pollution unless a permit is first obtained from the board approving the proposed process for treatment of the wastes.[30] All plans for the proposed construction of a plant or process to treat the wastes must be submitted to the board before construction.[31] This requirement of advance consultation with the Sanitary Water Board, before construction involving potential pollution is initiated, is burdensome but advantageous from both the standpoint of the public and that of the operator.[32]

A Pennsylvania conservation statute provides that no person shall allow any substance of any kind or character which is deleterious, destructive, or poisonous to fish to be discharged into any waters of the

[25] *Id.*, §1168.
[26] N.Y. Conservation Law art. IV, §180.
[27] Pa. Stat. Ann. tit. 35, §§691.1 *et seq.*
[28] *Id.*, §691.1.
[29] *Ibid.*
[30] *Id.*, §691.307.
[31] *Id.*, §691.308.
[32] See Note, 100 U. of Pa. L. Rev. 225 (1951), for a discussion of Pennsylvania's water pollution regulation. See Commonwealth v. New York and Pa. Co., 367 Pa. 40, 79 A.2d 439 (1951), and Commonwealth v. Sonneborn, 164 Pa. Super. 493, 66 A.2d 584 (1949) for prosecutions under this statute.

state unless it is shown to the satisfaction of the Board of Fish Commissioners that every reasonable and practicable means has been taken to abate and prevent the pollution of the water.[33] This prohibition is somewhat less severe than that set forth in the New York conservation statutes.

c. Ohio

In 1951 Ohio passed a comprehensive water pollution control act patterned on the Pennsylvania statute.[34] Like the New York and Pennsylvania water pollution boards, Ohio's Water Pollution Control Board is within the Department of Health.[35] The board has power to issue and deny permits for the discharge of industrial wastes into waters of the state;[36] and in order to avoid a possible determination after installation that an operation is polluting the waters of the state,[37] it is necessary to obtain a permit in advance from the board.[38]

As in New York, it appears necessary to obtain the consent of the Director of Health before discharging industrial wastes into the waters of the state, despite the fact that he is also the chairman of the Water Pollution Control Board.[39] The Department of Health is given general jurisdiction over the disposal of industrial wastes, and it is necessary to obtain the approval of this department relative to the manner of disposal of these wastes.[40] It is important to note that the supervisory power is not confined to disposal of wastes into waters, as it is in New York and Pennsylvania, but includes disposal in any manner. Furthermore, the department is given specific power to prevent pollution by adopting and enforcing regulations relative to the discharge of industrial wastes into waters of the state.[41] It also has the power to approve processes and plans for the treatment of such wastes.[42]

The Ohio statutes also create a Water Resources Board in the Department of Natural Resources. This board has power to prevent the

[33] Pa. Stat. Ann. tit. 30, §200.
[34] See 12 Ohio St. Law J. 376 (1951), for a brief analysis of this act.
[35] Ohio Rev. Code §6111.02.
[36] *Id.*, §6111.03(I).
[37] "Pollution" is defined very broadly, *id.*, §6111.01(A).
[38] *Id.*, §6111.04.
[39] *Id.*, §6111.02.
[40] *Id.*, §§3701.19, 3701.20.
[41] *Id.*, §3701.21.
[42] *Id.*, §3701.59.

contamination of underground waters,[43] but its principal authority is concerned with water conservation, use, and supply.[44]

Ohio has established still another sanction for the protection of the state's waters. A 1948 opinion of the Attorney General of Ohio [45] indicates that when the habitat, food supply, and other environmental conditions of fish are threatened with injury or destruction by pollution of waters of the state, the Director of Natural Resources [46] may bring an action for an injunction or for damages. The statute upon which such an action would be based provides that no person shall corrupt or render unwholesome or impure a watercourse, stream, or water.[47]

Furthermore, various types of control districts may be formed under Ohio statutes to regulate nearly every conceivable aspect of water usage. At least three kinds of districts have control over the discharge of wastes and water pollution: conservancy districts,[48] sanitary districts,[49] and regional water and sewer districts.[50] If any of these districts are in existence and embrace an area considered for the location of an atomic energy generating plant, it is essential that the board of directors or trustees be consulted and any necessary approval obtained from them.

d. Wisconsin

Like New York and Ohio, Wisconsin has a dual set of controls over water pollution. The State Board of Health is vested with general jurisdiction over the waters of the state,[51] and it is necessary to obtain the approval of this board before using streams to dispose of industrial wastes.[52] The State Health Officer is also a member of the Committee on Water Pollution.[53] This committee, having general jurisdiction over water pollution, may require the submission and approval of plans for the installation of systems and devices for disposing of industrial

[43] *Id.*, §1521.04(F).
[44] *Id.*, §1521.04.
[45] 1948 Ohio Op. Atty. Gen. #4095.
[46] Ohio Rev. Code §1501.01.
[47] *Id.*, §3767.13.
[48] *Id.*, §§6101.01 *et seq.*
[49] *Id.*, §§6115.01 *et seq.*
[50] *Id.*, §§6119.01 *et seq.*
[51] Wis. Stat. (1957) §144.03.
[52] *Id.*, §144.04.
[53] *Id.*, §144.52.

wastes.[54] It is unlawful to deposit any acids, wastes, or refuse arising from the manufacture of articles of commerce or any other substance deleterious to fish life into any of the waters of the state, unless it is done in compliance with the orders of the Committee on Water Pollution.[55] The constitutionality of this regulatory scheme has been attacked on the ground that parts of the statute are indefinite and uncertain, there being no standard or guide set forth to govern the actions of the Committee on Water Pollution. The attack failed, and the statute was sustained by the Wisconsin Supreme Court.[56]

The powers of the State Board of Health and the Committee on Water Pollution overlap, but these agencies apparently cooperate and issue joint orders. In 1944 a joint order was held to be *ultra vires* and hence invalid on the ground that different modes of judicial review were authorized for each of the two agencies.[57] However, a year later the legislature promptly remedied this defect by the addition of a statutory provision expressly permitting the issuance of a joint order.[58] Thus, the concurrent nature of the jurisdiction of the Health Department and the Committee on Water Pollution is expressly recognized in Wisconsin,[59] whereas the situation in New York and Ohio is somewhat more uncertain in this respect. However, the Wisconsin statutes retain individual jurisdiction for both the Committee on Water Pollution and State Board of Health when either or both agencies assume jurisdiction in a situation involving pollution.[60]

e. Illinois

In 1951 Illinois passed a new comprehensive water pollution statute.[61] A Sanitary Water Board, with extensive regulatory powers, was created, together with a Water Pollution Control Advisory Council.[62] The statutory definition of "industrial waste" is nearly identical with the New York definition, quoted above. But it is interesting to note that

[54] *Id.*, §144.53.

[55] *Id.*, §29.29.

[56] State ex rel. Martin v. City of Juneau, 238 Wis. 564, 300 N.W. 187 (1941). Other constitutional arguments made, including improper delegation of legislative and judicial powers to both the State Board of Health and the Committee on Water Pollution, were likewise rejected.

[57] American Brass Co. v. State Board of Health, 245 Wis. 440, 15 N.W.2d 27 (1944).

[58] Wis. Stat. (1957) §144.565.

[59] See *id.*, §144.535.

[60] *Ibid.*

[61] Ill. Stat. Ann. c. 19, §§145.1 *et seq.*

[62] *Id.*, §145.3(e).

Illinois attempts a broad definition of "pollution" [63] whereas New York leaves the establishment of standards to the discretion of the Water Pollution Control Board.

It is necessary to obtain a permit from the Illinois Sanitary Water Board before constructing, installing, or operating any establishment which will cause the discharge of wastes into the waters of the state.[64]

In addition, river conservancy districts may be organized under the Illinois statutes for the purpose of preventing water pollution.[65] However, it is provided that the authority of the Sanitary Water Board shall not be superseded,[66] which would seem to mean that if a permit is obtained from the Sanitary Water Board to discharge waste into a stream, the trustees of a river conservancy district would have no power to interfere.

Furthermore, sanitary districts, primarily concerned with sewage problems, may be organized under various Illinois statutes.[67] The board of trustees of a sanitary district has authority to prevent pollution of any waters from which any city or town obtains its water supply,[68] and any person proposing to discharge industrial waste within a sanitary district must obtain a permit from the trustees of the district.[69]

Finally, the Department of Conservation has general authority to take measures to prevent water pollution to preserve fish and game and to cooperate with other departments to prevent water pollution.[70] Another statute empowers the attorney general to bring an action to recover the reasonable value of any aquatic life destroyed by pollution of waters of the state.[71] Moreover, it is a public nuisance to corrupt or render unwholesome or impure the waters of any stream to the prejudice of others.[72]

f. California

A somewhat different water pollution regulation scheme is in effect in California. In 1949 the Dickey Water Pollution Act was passed which creates a State Water Pollution Control Board and nine re-

[63] *Id.*, §145.2(a).
[64] *Id.*, §145.11.
[65] *Id.*, c. 42, §§383 *et seq.*
[66] *Id.*, c. 42, §409.
[67] *Id.*, c. 42, §§299, 319.1, 320.
[68] *Id.*, §326aa.
[69] *Id.*, §326bb(3).
[70] *Id.*, c. 127, §63a(6).
[71] *Id.*, c. 56, §160.
[72] *Id.*, c. 38, §466.

gional water pollution control boards.[73] The state board is concerned only with formulation of policy, research, and administration of the financial aspects of water pollution,[74] whereas the regional boards are charged with the abatement, prevention, and control of water pollution and nuisances.[75] It is the appropriate regional board which must approve any proposed discharge of industrial waste and which prescribes requirements with respect to the treating of these discharges.[76] Each regional board also has power to investigate any source of water pollution or nuisance within its region and to order an abatement thereof.[77]

The act was designed to coordinate the actions of various state agencies regulating water pollution.[78] While power to regulate water pollution was not taken away from other state agencies, it is no longer necessary to secure a permit from the State Health Department in order to dispose of wastes, and this would seem to be a thoroughly worthy achievement.[79]

The California Water Pollution Act contains the usual definitions which are substantially similar to those of the other states discussed above, except that the definition of "contamination" is somewhat unique in its breadth and scope:

> "Contamination" means an impairment of the quality of the waters of the State by sewage or industrial waste to a degree which creates an actual hazard to the public health through poisoning or through the spread of disease. "Contamination" shall include any equivalent effect resulting from the disposal of sewage or industrial waste, *whether or not waters of the State are affected.*[80]

The matter of "contamination" is not mentioned elsewhere in the Water Pollution Act. However, the Health and Safety Code employs definitions identical to those of the Water Pollution Act,[81] and that code prohibits the discharge of industrial waste which will result in contamination, pollution, or nuisance.[82] Contamination is also made a crime[83]

[73] Cal. Water Code §§13000, 13010, 13040.
[74] *Id.*, §§13022 to 13024.
[75] *Id.*, §§13052, 13063.
[76] *Id.*, §13054.
[77] *Id.*, §§13055 to 13064.
[78] *Id.*, §13000.
[79] "California's Water Pollution Problem," 3 Stan. L. Rev. 649, 650-52 (1951).
[80] Emphasis added. Cal. Water Code §13005.
[81] Cal. Health & Safety Code §5410.
[82] *Id.*, §5411.
[83] *Id.*, §5461.

and the Health Department is charged with the abatement of any contamination,[84] although pollution and nuisance are referred to the appropriate regional water pollution board for action.[85]

Moreover, the California statutes make it unlawful to cause any substance or material deleterious to fish, plant life, or bird life to pass into waters of the state of California.[86] The Fish and Game Commission is required to report any condition of pollution to the appropriate regional water pollution control board.[87]

g. New Jersey

New Jersey has adopted a unique pollution control system. It has not created a specific water pollution board to regulate pollution. Rather, the statutes leave this matter to the State Department of Health. Sprinkled liberally throughout the statutes are provisions which prohibit the discharge of any kind of polluting matter into the waters of the state.[88] It is necessary to obtain the consent of the State Department of Health before any "harmful" or "deleterious" matter may flow into the waters of the state.[89]

Moreover, the person responsible for the operation of any "factory, workshop or place for the manufacture of materials or goods" must obtain a written permit from the Health Department before it may be established in any watershed in the state above the point at which any public supply of potable water is taken.[90] The permit is required even though no discharge of wastes into the waters of the state is contemplated. The Health Department must also be furnished with information concerning any processes established or intended to be established for the purification or treatment of industrial wastes.[91]

Industrial establishments in New Jersey must also give consideration to the possible existence of sanitary sewer district authorities. These may be established by any first- or second-class county when a stream flowing through the county is subject to pollution.[92] "Sewage" is defined to include industrial wastes and any other matter having a tendency

[84] *Id.*, §§5412, 5460.
[85] *Id.*, §5413.
[86] Cal. Fish & Game Code §481 (1944).
[87] *Id.*, §481.5.
[88] See, *e.g.*, N.J. Rev. Stat. (1937) §§58:10-1, 58:10-5, 26:3B-4.
[89] *Id.*, §58:12-3.
[90] *Id.*, §58:10-7.
[91] *Id.*, §58:10-17.
[92] *Id.*, §40:36A-1.

to pollute streams and watercourses.[93] A 1953 amendment prohibits the discharge of any polluting matter into the waters of any stream or river included within the sewer district established by a county.[94] Finally, New Jersey has made it a crime to discharge into waters of the state any deleterious or poisonous substance which is injurious to or disturbs the habits of fish.[95]

h. Michigan

In Michigan water pollution is subject to regulation by the Water Resources Commission.[96] The commission is empowered to establish pollution standards for the various bodies of water in the state and has authority to "make regulations and orders restricting the polluting content of any waste material or polluting substance discharged or sought to be discharged into any lake, river, stream, or other waters of the state." [97] The jurisdiction of the commission extends to both surface and underground waters as well as the Great Lakes.[98] It is unlawful to discharge any substance which is harmful to the public health, fish, and wildlife, or to lawful enterprises.[99]

The statutes make no provision for obtaining a permit, but undoubtedly industrial managers should consult the Water Resources Commission when an industry plans to use water from a stream or lake or to discharge wastes into such waters.

In Michigan the Conservation Commission is given general power to prevent water pollution and to encourage the propagation of game and fish.[100] Again, there seems to be no requirement that a license be obtained; rather, it is made a violation of the conservation statutes to discharge wastes into the waters of the state if they will tend to "stupefy, injure or kill" any fish.[101] The State Health Department's broad powers over problems of general public health also extend to matters of water pollution, and therefore, as in other states, overlapping jurisdiction in problems of water pollution presents unusual problems for atomic energy industries.

[93] *Id.*, §40:36A-19.
[94] N.J. Laws 1953, c. 389.
[95] *Id.*, §23:5-28.
[96] Mich. Stat. Ann. §3.521.
[97] *Id.*, §3.525.
[98] *Id.*, §3.522.
[99] *Id.*, §3.526.
[100] *Id.*, §13.3.
[101] *Id.*, §13.1671.

i. Texas

Texas has not established an administrative agency with authority to regulate water pollution, although in 1953 a five-member water pollution council, without regulatory powers, was created.[102] The function of this council is to collect and disseminate information relating to water pollution, its prevention, and abatement.

However, water pollution is made a crime in Texas.[103] The Penal Code defines pollution as rendering the water unfit "for one or more of the beneficial uses for which such water was fit or suitable prior to the introduction of such substance, material, or thing," or is detrimental to public health, game, birds, fish, etc.[104] Insofar as fish are affected by pollution, enforcement power is given to the Game and Fish Commission.[105]

Moreover, the State Board of Health has power to enjoin water pollution,[106] and it is unlawful to store, dispose of, or deposit wastes which will *pollute surrounding land* or contaminate well waters to the extent of endangering public health.[107]

The Texas statutes also provide for the establishment of several types of districts which relate to various aspects of water use, supply, and control. These districts are normally established by counties or a combination of counties. "Water Control and Improvement Districts" may be organized to protect, preserve, and restore the purity and sanitary condition of water [108] and to control, process, and dispose of industrial wastes.[109] "Water Control and Preservation Districts" may be organized to control and preserve the purity of the waters within the district.[110] Other types of districts authorized in Texas include "Underground Water Conservation Districts," [111] "Fresh Water Supply Districts," [112] "Levee Improvement Districts," [113] "Drainage Districts," [114]

[102] Tex. Laws 1953, H.B. No. 448, c. 353.
[103] Tex. Civ. Stat. art. 7577.
[104] Tex. Penal Code art. 698b.
[105] *Ibid.*
[106] Tex. Civ. Stat. art. 4444.
[107] *Id.*, art. 4477-1, §4(c).
[108] *Id.*, arts. 7880-2, 7880-3.
[109] *Id.*, art. 7880-3a.
[110] *Id.*, art. 7809.
[111] *Id.*, art. 7880-3c.
[112] *Id.*, art. 7881.
[113] *Id.*, art. 7972.
[114] *Id.*, art. 8097.

"Conservation and Reclamation Districts," [115] and "Navigation Districts." [116] Industrial planners must consult the directors of these districts, if they exist in the county, in connection with the planning of an industry which may use water in any way.

j. Missouri

Missouri adopted a statute in 1957 which establishes a program of water pollution control similar to those of New York, Pennsylvania, and Ohio.[117] As in those states, the principal feature of the program is the establishment of a Water Pollution Board, organized within the Department of Public Health and Welfare, which is empowered to issue and deny permits for the disposal of wastes into waters of the state. The statute directs that "No person, without first securing from the board a permit, shall construct, install or modify any system for disposal of sewage, industrial wastes, or other wastes . . . when the disposal . . . constitutes pollution as defined in this act." [118]

The Water Pollution Board may require the submission of such plans and specifications as it deems relevant in connection with the issuance of permits and is empowered to determine whether or not the proposed discharge will "cause a condition contrary to the public interest." [119] The board is also given the power to determine when pollution exists and to establish standards of water purity for any waters of the state.[120]

The Missouri statutes also contain a provision prohibiting the discharge of any deleterious substance which is injurious to fish life into any stream in the state; however, the State Conservation Commission has authority to grant exceptions to industries.[121]

k. Conclusion

Although the statutory and regulatory pattern concerning water pollution varies from state to state, it is clear that atomic energy industries will be required to meet some rather positive standards if waste products are to be discharged into the waters of any state. In fact, close supervision of the disposal of wastes seems imperative in the public interest

[115] *Id.*, art. 8194.
[116] *Id.*, art. 8198.
[117] Mo. Stat. Ann. §§204.010-204.170 (1957).
[118] *Id.*, §204.030.
[119] *Ibid.*
[120] *Ibid.*
[121] *Id.*, §252.210.

because both the toxic and radioactive nuclear wastes are highly dangerous to the public health particularly where the streams constitute a source of water for human consumption.

It should be noted that under certain types of statutes, some atomic energy activities may not be regulated at the present time under statutes governing water pollution. For example, where the statutes govern only industrial activity, research laboratories and hospitals may not be subject to regulation. Nonetheless, use of radioactive materials and their disposal through conventional sewerage and drainage systems may so pollute bodies of water as to constitute a definite health hazard. Therefore, in those states where discharges of certain radioactive materials into state waters are not controlled under present statutes, amendatory legislation appears advisable and will doubtless be forthcoming as soon as the hazards become known in legislative halls.

The foregoing review of the statutes reveals that water pollution is in many states subject to regulation by several different agencies. This duplication of effort and overlapping of jurisdiction raises once again the problem of administrative conflicts. Obviously, coordination of the several health and safety regulations affecting atomic energy enterprises is desirable. This coordination can be achieved either by cooperation among the agencies or by transferring all atomic energy health and safety regulatory powers including control of water pollution to one agency. The latter course has much to be said in its favor, especially if all types of specialization can be represented within the regulatory agency. In the absence, however, of the creation of a single authority, persons desiring to engage in atomic energy activities must consult with all regulatory agencies exercising health and safety powers. Certainly they should encourage cooperative efforts among those agencies.

2. Regulation of Air Pollution

Several types of operations which utilize atomic energy may produce radioactive particles which will create a hazard if discharged into the air. Radioactive gases may result from air-cooled reactor operations, chemical processing operations, refining operations of uranium ores, laboratory uses of radioisotopes, and incineration of radioactive wastes, byproducts, or contaminated apparel or materials.[122] To prevent dangerous atmospheric contamination near Atomic Energy Commission installations, high stacks have been utilized for the discharge of radio-

[122] AEC, "Handling Radioactive Wastes in the Atomic Energy Program," 11-15 (1951).

active gases, thus causing them to be diluted with uncontaminated air.[123] In addition, the Commission has engaged in meteorological surveys and has instituted a program of area monitoring in the vicinity of installations such as Brookhaven, where air-cooled reactors are in operation.[124]

Insofar as employees may be adversely affected by the presence of radioactive gases in the place of employment, the powers of public utility commissions, labor departments, and health departments will be involved. However, if the atmospheric contamination extends outside the installation itself the public health may be endangered. Radioactive particles may be inhaled or deposited on plants which may in turn be eaten by animals or people. Notwithstanding the use of high stacks and the processing of the gases in connection with air-cooled reactors or chemical operations, adverse weather conditions may render hazardous otherwise satisfactory operations. Under the general authority granted to various state and local health agencies, regulations may be promulgated which establish limits for permissible contamination of the atmosphere from smoke and other foreign substances.[125] Municipalities also have broad powers to pass ordinances regulating matters of air pollution, such as smoke emission. These powers can and doubtless will be used to regulate contamination by radioactive gases.

In recent years, because of the "smog" conditions prevailing in many industrial communities, interest in air pollution control has grown. Because it was felt that the prevention and reduction of air contamination could not be handled adequately by local legislative bodies,[126] the California legislature in 1947 passed a comprehensive statute providing for the creation of air pollution control districts. In 1954 the New Jersey legislature also enacted comprehensive legislation for the control of air pollution.[127] Detailed examination of the California and New Jersey statutes seems desirable.[128]

Under the California statute, each county is declared to be an air

[123] *Id.*, at 7-8.

[124] *Id.*, at 12-13.

[125] In Bd. of Health of Weehawken Tp. v. N.Y. Central R. Co., 4 N.J. 293, 72 A.2d 511 (1950), the defendant railroad was charged with the violation of a smoke ordinance passed by the Board of Health of the Township of Weehawken by the operation of its power plant. The New Jersey Supreme Court upheld a conviction under this ordinance, holding that local boards of health may regulate and control air pollution in the interest of public health and welfare by barring the excessive emission of smoke.

[126] Cal. Health & Safety Code §§24198 to 24341.

[127] N.J. Laws 1954, c. 212.

[128] In 1953 the Illinois legislature created a commission to study air pollution and recommend regulatory legislation. Ill. Laws 1953, S. 204.

pollution control district.[129] Before a district can function, however, the board of supervisors of the county must hold a public hearing to determine the need of such a district.[130] The board must find that two conditions exist prior to adopting a resolution activating the district: (1) that the air in the county is polluted with air contaminants so that it is injurious to health, or is an obstruction to the free use of property, or is offensive to the senses of a considerable number of persons; and (2) that it is not practicable to rely on the enactment and enforcement of local county and city ordinances to prevent air pollution.[131] "Air contaminant" is defined to include "smoke, charred paper, dust, soot, grime, carbon, noxious acids, fumes, gases, odors, or particulate matter, or any combination thereof." [132] Although the definition does not expressly include radioactively contaminated air, it appears to be sufficiently broad to encompass this type of contamination. If a district is authorized to function, the following statutory prohibition is operative:

> A person shall not discharge from any source whatsoever such quantities of air contaminants or other material which cause injury, detriment, nuisance or annoyance to any considerable number of persons or to the public or which endanger the comfort, repose, health or safety of any such persons or the public or which cause or have a natural tendency to cause injury or damage to business or property.[133]

Any violation of this provision may be enjoined or punished criminally.[134] It is expressly provided, however, that the legislature does not intend to occupy the entire field or to supersede any local rules and ordinances imposing higher standards.[135]

The county board of supervisors constitutes the air pollution control board,[136] but it is required to appoint an air pollution control officer.[137] The air pollution control board is granted broad rule-making authority,[138] including power to make and enforce orders directing the reduction of the amount of air contaminants [139] and power to require that

[129] Cal. Health & Safety Code §24200.
[130] *Id.*, §24203.
[131] *Id.*, §24205.
[132] *Id.*, §24208.
[133] *Id.*, §24243.
[134] *Id.*, §§24252, 24253.
[135] *Id.*, §§24247, 24248.
[136] *Id.*, §24220.
[137] *Id.*, §24222.
[138] *Id.*, §24260.
[139] *Id.*, §24262.

a permit be obtained from the air pollution control officer before a structure is built or a contrivance is operated which may produce air contaminants.[140] This permit may be withheld unless it is shown that air contamination will not result.[141] Any applicant for or holder of a permit may be required to furnish information disclosing the nature, extent, quantity, or degree of air contaminants which are or may be discharged from any source.[142] However, the air pollution control board or a court, after hearing, may grant variances either from the regulations or from the statute itself when "necessary." [143] The board may "exercise a wide discretion in weighing the equities involved," [144] and it may prescribe different requirements applicable to certain industries or persons.[145]

It may be concluded that California has a rather complete and far-reaching system of regulating the air pollution, and since the discharge of radioactive particles is in all probability included in the definition of air contaminants, careful compliance by atomic energy users will be necessary if the contemplated use involves a discharge of radioactive gases into the atmosphere.

In contrast to California, the problem of air pollution in New Jersey is handled on a state rather than a local basis. In 1954 the New Jersey legislature created an Air Pollution Control Commission within the Department of Health.[146] The commission has power to promulgate rules and regulations controlling or prohibiting air pollution throughout the state.[147] "Air pollution" is defined as "the presence in the outdoor atmosphere of substances in quantities which are injurious to human, plant or animal life or to property, or unreasonably interfere with the comfortable enjoyment of life and property throughout the State . . . and excludes all aspects of employer-employee relationship as to health and safety hazards." [148] Clearly, release of radioactive gases and substances into the atmosphere falls within this broad definition. Persons engaged in operations which may result in air pollution may be required to register and file reports containing information

[140] *Id.*, §24263.
[141] *Id.*, §24264.
[142] *Id.*, §24269.
[143] *Id.*, §24291.
[144] *Id.*, §24297.
[145] *Id.*, §24296.
[146] N.J. Laws 1954, c. 212.
[147] *Id.*, §9.
[148] *Id.*, §2.

"relating to location, size of outlet, height of outlet, rate and period of emission and composition of effluent. . . ." [149]

The New Jersey Air Pollution Control Commission is authorized to establish county air pollution control associations to which rules of strictly local application must be submitted for discussion and report.[150] However, the county associations act only in an advisory capacity.[151]

Rules and regulations of the commission are enforced by the State Commissioner of Health,[152] and the Department of Health may seek injunctive relief to prevent violations, and fines may be imposed for continuing violations.[153]

Although none of the other states covered by this study has comprehensive air pollution legislation,[154] it should be noted that several cities have adopted ordinances concerning air pollution.[155] However, some of the ordinances refer only to smoke abatement, and they probably will be inapplicable to radioactive gases discharged into the air.

Conclusion: State agencies created especially for the control of air pollution are not yet as commonly established as are agencies for the control of water pollution. However, a definite trend in the direction of the creation of such agencies has resulted largely because of the increasing recognition of the "smog" problem in industrial areas. Moreover, in many instances existing powers of state departments of health are sufficiently broad to embrace control of air pollution. Therefore, atomic energy enterprises which involve the release of radioactive gases, vapors, and dusts into the atmosphere can expect regulation by some state agency and perhaps by a local government agency as well, depending, of course, upon location of the plant facilities.

Because the release of large amounts of radioactive materials into the atmosphere may be dangerous to surrounding populations and property, strict precautionary safety measures are definitely indicated, and, indeed, industry will no doubt exert extraordinary efforts in this direction. States which do not have agencies possessing authority to control

[149] *Id.*, §8.
[150] *Id.*, §§11, 12.
[151] *Id.*, §§11 *et seq.*
[152] *Id.*, §17.
[153] *Id.*, §19.
[154] In Wisconsin counties having a population of 500,000 or more are specifically authorized to regulate air pollution by ordinance. Wis. Stat. (1957) §59.07(53).
[155] For a good discussion of city ordinances, see "Smog—Can Legislation Clear the Air?" 1 Stan. L. Rev. 452 (1949). For a recent conviction under New York City air pollution control authority, see People v. Tatje, 121 N.Y.S.2d 147 (1953). From this case it appears that in 1952 the city created a Department of Air Pollution Control.

the discharge of dangerous substances into the atmosphere will no doubt be so equipped as soon as the legislature is informed of the existence of the problem. In states which have agencies with regulatory power as yet unexercised, the necessary investigation and study of air pollution problems will doubtless commence at an early date so that rules and regulations can be promulgated before atomic energy activities cause an extra-hazardous public health problem.

3. Nuisances

Thus far in this study, primary emphasis has been placed on state regulatory agencies which have been given statutory powers to regulate some of the aspects of peaceful uses of atomic energy. Now, however, we should turn briefly to an examination of the pertinent legal principles of the law of nuisance since under these principles some regulation of uses of atomic energy will be imposed by courts acting either at the instance of private individuals or of public officials. Even though applicable zoning ordinances and health regulations are complied with, a type of judicial zoning regulation may result from industrial operations which occasion harm or discomfort to individuals in the vicinity of the installation. Since radiation hazards may, and at the outset probably will, be greatly feared by those who live near plants utilizing atomic energy, account must be taken of the fact that such persons may institute legal actions to restrict operations thought likely to create these dangers. The law of nuisance will afford a basis for this type of action.

It has been said that "There is perhaps no more impenetrable jungle in the entire law than that which surrounds the word 'nuisance.' " [156] It is obvious that a subject so vast and confused cannot be examined in detail in this study. We can, however, suggest some of the problems that may arise under the application of the fundamental propositions which are a part of the law of nuisance. Abundant authority is available, but most cases provide little guidance since each case turns largely on its own fact situation. However, cases involving power plants and gas plants may have some special significance and will therefore be noted.

Nuisances are usually divided into two somewhat unrelated and separate categories: public nuisances and private nuisances. As will be seen, these involve different ideas and require separate discussion.

[156] Prosser, Torts 549 (1941).

a. Public Nuisances

Public nuisances are minor criminal offenses arising out of acts which cause interference with the public health, safety, morals, comfort, or convenience.[157] To be considered public, the nuisance must affect an interest common to the general public in the exercise of public rights, rather than rights belonging and peculiar to one or more individuals.[158]

Public nuisances are often defined by statutes, but definitions so given are often couched in very general terms. Violations of water pollution, smoke, or zoning ordinances are often made public nuisances. Statutes or ordinances also frequently declare that establishments which emit offensive odors are public nuisances.[159] The New York statutes define a public nuisance as any act or omission which, among other things, "1. Annoys, injures or endangers the comfort, repose, health or safety of any considerable number of persons. . . . 4. In any way renders a considerable number of persons insecure in life, or the use of property." [160] These provisions have been held to be declaratory of the common law.[161] Under the New York type of statute, the operation of an atomic energy establishment which discharges radioactive materials into the streams or gases into the atmosphere might be held to annoy or endanger the comfort, health, or safety of a considerable number of persons and hence to violate the statute. However, a public nuisance may be held privileged if it is authorized by the legislature.[162] The crucial question, of course, is what conduct has been so authorized. Another defense that may be effective in certain unusual circumstances is the fact that the public has an overriding interest in the activity, such as in essential war production. In such event, the defendant is relieved of criminal though not civil liability.[163] Remedies available to the state are either injunction or imposition of fines or other penalty. If a private individual can show special damage to himself, he may have a cause of action for injury.[164]

[157] *Id.* at 566-573 (1941).

[158] *Id.* at 568.

[159] See Anno., "Validity, construction, and application of statute or ordinance declaring plant or establishment which emits offensive odors to be public nuisance," 141 A.L.R. 285 (1942).

[160] N.Y. Penal Code §1530.

[161] People v. Borden's Condensed Milk Co., 165 App. Div. 711, 151 N.Y. Supp. 547 (1915); People v. Gaydica, 122 Misc. 31, 203 N.Y. Supp. 243 (1923).

[162] See Note, "Nuisance and Legislative Authorization," 52 Col. L. Rev. 781 (1952).

[163] See People v. Amecco Chemicals, 180 Misc. 1014, 43 N.Y.S.2d 330 (1943).

[164] Prosser, Torts 569 (1941).

b. Private Nuisances

A private nuisance is created when an unreasonable interference is inflicted upon an individual's use or enjoyment of land. There are two principal kinds of such interferences: (1) actual physical injury to land, such as damage to a structure caused by vibration or blasting, pollution of water, or injury to buildings or plant life resulting from the discharge of harmful substances, and (2) disturbance of the comfort or convenience of the occupant of land, such as by unpleasant or harmful odors or gases, or storage in the vicinity of highly dangerous materials.[165] An important feature of any liability incurred as a result of acts involving such interferences is the fact that the fault of the actor is immaterial; *i.e.*, liability may result whether the act is intentional, negligent, or entirely without fault.[166] In short, nuisance giving rise to liability is a type of damage or injury, rather than a type of conduct. Most of the litigation involving private nuisance has dealt with the broad question of the reasonableness of the defendant's conduct, and the issue is essentially one of resolving the conflicting interests of landowners.[167] In a sense, therefore, the law of private nuisance becomes a process of judicial zoning in which the nature of the locality and the public interest involved are two important factors weighed by the courts.

The two types of legal relief available against a private nuisance are an action at law for damages and injunctive relief in equity.[168] Under the latter remedy, a court may in rare instances completely restrain the operation of a plant which creates the nuisance. More often the court will require that the plant be shut down unless additional equipment is installed or care taken to eliminate the nuisance.[169] In contrast to the public nuisance it should be noted that legislative authorization, such as the grant of a franchise or permit by a branch or agency of a government, does not create a privilege in favor of a private nuisance, especially those that cause substantial injury, since this would amount to condemnation without payment of compensation.[170] Neither is it any de-

[165] *Id.* at 573-575.

[166] *Id.* at 553-557.

[167] *Id.* at 580.

[168] *Id.* at 588.

[169] Transcontinental Gas Pipe Line Corp. v. Gault, 198 F.2d 196 (4th Cir. 1952); Price v. Philip Carey Mfg. Co., 310 Pa. 557, 165 Atl. 849 (1933).

[170] Churchill v. Burlington Water Co., 94 Iowa 89, 62 N.W. 646 (1895); Rosenheimer v. Standard Gas Light Co., 36 App. Div. 1, 55 N.Y. Supp. 192 (1898); 37 A.L.R. 801 (1925); Note, 52 Col. L. Rev. 781, 784 (1952). For a discussion of the possible effect of zoning ordinances on private nuisance actions, see Beuscher and

fense that the best available devices or equipment are being employed in the operation of a plant since liability is not based on fault but arises from the injury itself.[171]

Private individuals, normally adjoining landowners, have brought numerous actions against public utility companies both for damages and for injunctive relief. In a substantial number of cases relief by way of damages for nuisance has been allowed,[172] but courts have been reluctant to enjoin the operation of such plants. In reaching such conclusions, reliance has been placed on such factors as the quasi-public character of the industries, the adequacy of the damage remedy, the nature of the area where the plant was located, the cost required to move the plant if enjoined, and the fact that the best available devices to prevent injury to adjoining landowners were being used.[173]

The general principle that an equity court will weigh the advantage to be gained by the plaintiff against the injury suffered by the public before restraining the operation of an industry is said to be especially applicable in the case of public utilities.[174] However, in a few instances, courts have temporarily restrained the operation of gas or electric power plants, by requiring that additional protective devices be installed and that the plant be shut down unless these are installed.[175] For example, in *Judson* v. *Los Angeles Suburban Gas Company* a decree enjoining the gas company "from conducting and operating the gasworks and manufactory . . . in such a manner as to cause or permit smoke, gases or offensive smells or fumes to be emitted therefrom or to be precipitated therefrom upon the property of the plaintiff" was affirmed.[176] In *Anstee* v. *Monroe Light and Fuel Co.* the gas company was perpetually enjoined from making further deposits of industrial waste that polluted neighboring soil, the gas company was required to alter its smokestack to abate a smoke nuisance, and in addition damages were awarded.[177]

Morrison, "Judicial Zoning Through Recent Nuisance Cases," 1955 Wis. L. Rev. 440, 453-457; Comment, 54 Mich. L. Rev. 266 (1955).

[171] Rosenheimer v. Standard Gas Light Co., *supra* note 170; Pritchard v. Edison Electric Illuminating Co., 92 App. Div. 178, 87 N.Y. Supp. 225 (1904).

[172] See cases collected in 37 A.L.R. 800 at 812-813 (1925).

[173] Elliott Nursery Co. v. Duquesne Light Co., 281 Pa. 166, 126 Atl. 345 (1924); Jedneak v. Minneapolis General Electric Co., 212 Minn. 226, 4 N.W.2d 326 (1942); Riedeman v. Mt. Morris Electric Co., 56 App. Div. 23, 67 N.Y. Supp. 391 (1900); Parker v. Pacific Gas & Elec. Co., 50 Cal. App. 264, 195 Pac. 60 (1920).

[174] 37 A.L.R. 800 at 802 (1925).

[175] Transcontinental Gas Pipe Line Corp. v. Gault, *supra* note 169; Price v. Philip Carey Mfg. Co., *supra* note 169 (power plant of a manufacturing company); English v. Progress Electric Light & Motor Co., 95 Ala. 259, 10 So. 134 (1891).

[176] 157 Cal. 168, 173, 106 Pac. 581 (1910).

[177] 171 Wis. 291, 177 N.W. 26 (1920).

In the light of these decisions, careful consideration must be given to the location, construction, and operation of industrial plants utilizing atomic energy, for conceivably such a plant could be partially or wholly restrained as a nuisance if injury to landowners resulted. Furthermore, because of the exceptionally dangerous character of atomic energy activities, a court would probably have less difficulty than in cases of conventional plants in holding the owners of an atomic energy plant liable for damages.[178]

c. Conclusion

Although a full development of the law of public and private nuisance is beyond the scope of this study, the foregoing brief mention of its ramifications suffices to show that it may serve in some instances as a regulatory device effectuated by the courts under common law principles. Since nuisance law is invoked only through litigation involving specific factual settings, it is impossible to draw any but the most general conclusions. However, so far as atomic energy plants are concerned, it is clear that both public officials and private persons may commence litigation with some likelihood of success, particularly if the atomic enterprise creates a hazardous or even an annoying condition in its vicinity. Atomic energy entrepreneurs undoubtedly will have to exercise exceptional prudence in selection of location especially since limited public knowledge of the subject coupled with the fears engendered by the mystery of atomic forces may easily precipitate troublesome litigation. Specific governmental authorization for a particular installation may provide a defense against the charge of committing a public nuisance, but the authorization will not provide a defense in respect to actions for private nuisance. Accordingly, sites embracing large exclusion areas well removed from populated centers seem advisable wherever possible, not only as a means of protection of the public against possible accidents, but also from the standpoint of avoiding monetary liability and regulation through court orders.

B. Diversion of Waters

If a nuclear reactor or other atomic energy plant utilizes large quantities of water,[179] diverted from regular watercourses, an additional problem arises. Many states have enacted statutes which restrict the

[178] See Part I of this volume.

[179] The full-scale atomic power plant built at Shippingport, Pennsylvania, by the AEC and Duquesne Light Company employs water as a coolant.

diversion of water, and unauthorized diversion of substantial quantities thereof may constitute a public or private nuisance. Most of these statutes were enacted for other specific purposes; *e.g.*, some of them are concerned with the building of dams or other obstructions in watercourses, with impeding the navigability of streams, with preventing the free passage of fish, or preserving water supply facilities. However, some of the language in these statutes may be broad enough to be applicable to the withdrawing of sizable quantities of water for industrial uses, even though it is subsequently returned to the body of water from which it is taken.

Obviously, states which are faced with the problem of water scarcity are more likely to regulate the use of waters than are states that have no such problem. In varying degrees five of the ten states surveyed in this study fall within this category.

Texas and California are among those western states which follow the law of "prior appropriation" with respect to water use. In these states it is necessary to obtain a permit from an appropriate state agency before water may be appropriated or diverted.[180] These state agencies are given authority to reject an application if the use is detrimental to the public interest. Elaborate systems of priority are set up to obtain the most beneficial use from the available water.

New Jersey requires that a permit be obtained from the Division of Water Policy and Supply if, in designated areas, water is to be taken from subsurface or percolating sources in excess of 100,000 gallons per day.[181] In Pennsylvania it is necessary to obtain a permit from the Water and Power Resources Board in order to change, diminish, or appropriate water from any body of water in the state.[182] This permit is required regardless of whether the stream is navigable or non-navigable. It is expressly made unlawful to divert water for use in the generation of electricity without such a permit.[183]

Ohio is another state in the category of those which regulate the use of water rather closely, but it appears to do so on a local level only, through the granting of permission for the organization of various types of local water control districts. In an area where one of these districts has been formed, it is necessary to obtain the consent of the

[180] In Texas the permit must be secured from the State Board of Water Engineers, Tex. Civ. Stat. art. 7492. In California the permit is obtainable from the Dept. of Public Works, Div. of Water Resources, Cal. Water Code §1252.

[181] N.J. Rev. Stat. §58:4A-2 (Cum. Supp. 1945-47).

[182] Pa. Stat. Ann. tit. 71, §468.

[183] Pa. Stat. Ann. tit. 32, §594.

governing board prior to making use of waters within the district. In addition, the board of directors of a conservancy district, the board of directors of a sanitary district, and the board of trustees of a regional water and sewer district are given the authority to "prescribe the permissible uses of the water supply provided by the district" by regulation.[184]

The possible existence of various types of local water districts authorized by statute must be checked and taken into account before an industry may select any given plant location. As was noted above in the discussion of pollution, both Texas and Illinois authorize various types of local water districts. Those authorized by the Illinois statutes seem primarily concerned with pollution problems,[185] but those authorized by Texas statutes are concerned as well with water usage.[186] California, too, provides for the formation of various types of local water districts.[187]

It may be necessary to secure the consent of a state agency when water from a particular stream is desired for industrial use. For example, the appropriation of water from the Delaware River is stringently controlled by at least three states: New Jersey, New York, and Pennsylvania,[188] as well as an interstate agency, as will appear below in the discussion of interstate compacts.

Several different statutory objectives may be involved in the statutes under consideration. In several states it is deemed a public nuisance to obstruct or impede the passage of any navigable river or waters without legal authority.[189] In others the statutes are apparently directed toward the maintenance of streams for navigable purposes. In at least two states there are provisions which prohibit the obstruction of streams so as to impede the free passage of fish.[190] Exceptions may be made by

[184] Ohio Rev. Code §6101.19(4) (conservancy districts); §6115.23(c) (sanitary districts); §6119.08(c) (regional water and sewer districts).

[185] But see Ill. Stat. Ann. c. 111 2/3, §§223-228, which authorize the establishment of "Water Authorities." The board of trustees appears to have some control over water use, although the act seems directed primarily at pollution of underground waters.

[186] See, *e.g.*, Tex. Civ. Stat. art. 7622 (water improvement districts), art. 7880-3c (underground water conservation districts), art. 7881 (fresh water supply districts).

[187] See, *e.g.*, Cal. Water Code §§30,000 *et seq.* (county water districts); §§34,000 *et seq.* (California water districts).

[188] N.J. Rev. Stat. §58:18-1; N.Y. Conservation Law, §§ 501 *et seq.*; Pa. Stat. Ann. tit. 32, §§815.1 *et seq.*

[189] Ill. Stat. Ann. c. 38, §466; Mich. Stat. Ann. §9.334; Mo. Rev. Stat. (1949) §236.240; Ohio Rev. Code §3767.13.

[190] Mich. Stat. Ann. §13.1657.

the Conservation Department in Michigan.[191] The statutes of Missouri and Wisconsin seem primarily concerned with the construction of dams.[192] In Wisconsin the Public Service Commission has jurisdiction over the level and flow of water in navigable streams,[193] and water declared surplus by this commission may be diverted.[194] Missouri provides for a condemnation procedure to divert water when used in connection with the generation of electric power for sale to the public.[195] Whether this statute may be used for obtaining water for cooling purposes in an atomic reactor rather than in conjunction with hydroelectric power is uncertain.

Several unique Michigan statutes should also be noted. One provides that the stage of water in any watercourse shall not be altered without the written consent of the commissioner having jurisdiction over all the bridges and culverts passing over the watercourse.[196] Another statute gives authority to each county board of supervisors to "permit or prohibit the construction of any dam or bridge over or across any navigable stream." [197]

Another possible source of restriction upon the use of streams stems from common law remedies available to riparian owners for an injury to their water rights. This type of remedy may take the form of either a suit for damages or an injunction against unreasonable use or pollution.[198] It is important also to note that statutes which outlaw or regulate water pollution in all probability do not displace the common law rights to abate pollution.[199]

The existing statutes do not cover the possible problem of substantially increasing water temperature which may occur in the operation of a nuclear reactor.

Conclusion: The consuming of large quantities of water in an atomic energy enterprise, such, for example, as a water-cooled nuclear reactor, may in several states necessitate approval by state and local governmental authorities. Although the problems involved are not especially unique as applied to atomic energy industries, nevertheless state and

[191] *Ibid.*

[192] Mo. Rev. Stat. (1949) §236.010; Wis. Stat. (1951) §31.02.

[193] Wis. Stat. (1957) §31.02.

[194] *Id.*, §31.14.

[195] Mo. Rev. Stat. (1949) §§236.010 to 236.280.

[196] Mich. Stat. Ann. §9.1195.

[197] *Id.*, §5.344.

[198] See, *e.g.*, Note, 100 U. of Pa. L. Rev. 225 at 227-231 (1951), where Pennsylvania common law remedies are discussed.

[199] Commonwealth ex rel. Shumaker v. New York & Pa. Co., *supra* note 32.

local control of water diversion represents one more factor that must be considered by atomic entrepreneurs in determining the type of facility and its location.

C. Regulation of Radioactive Materials as Drugs or Dangerous Substances

The use of radioactive materials in medical therapy and industrial operations has increased rapidly and can be expected to continue to increase as new applications and better techniques are discovered. Since radioisotopes can be produced as byproducts of any type nuclear reactor, it is probable that many owners of nuclear reactors will find themselves engaged in the sale of radioactive materials to medical, research, and industrial consumers. As a result, two additional types of state regulation may be encountered: namely, regulation of sale of drugs and regulation of transportation of dangerous substances.

At least four types of state statutes exist which may have some application to the manufacture, sale, and use of radioisotopes in connection with the study and treatment of diseases. Since the California statute books contain all four of these types and since the scheme of regulation in California in respect to drugs and poisons is quite extensive, its statutes will be examined in some detail. Similar provisions in the statutes of the other nine states will be indicated, together with other pertinent provisions not found in the California statutes.

California, as well as the other nine states covered in this study, has a statute regulating the pharmacy profession which provides for the licensing of pharmacists and pharmacies and establishes a State Board of Pharmacy.[200] In addition to regulating the sale of drugs at retail, the statute requires that any manufacturer of drugs obtain a permit from the State Board of Pharmacy.[201] New York, Pennsylvania, Texas, and Wisconsin similarly require the registration of drug manufacturers.[202] The California statute also states that "Except as otherwise provided in this chapter, it is unlawful for any person to manufacture . . . any drug, poison, medicine or chemical . . . unless he is a regis-

[200] Cal. Business & Professions Code §§4000 *et seq.;* Ill. Stat. Ann. c. 91, §§55.1 *et seq.;* Mich. Stat. Ann. §§14.721 *et seq.;* Mo. Stat. Ann. c. 338; N.J. Rev. Stat. (1937) §§45:14-1 *et seq.;* N.Y. Education Law §§6801 *et seq.;* Ohio Rev. Code c. 4729; Pa. Stat. Ann. tit. 63, §§291 *et seq.;* Tex. Civ. Stat. art. 4542a; Wis. Stat. (1957) §§151 *et seq.*

[201] Cal. Business & Professions Code §4084.

[202] N.Y. Education Law §6805(5); Pa. Stat. Ann. tit. 35, §794; Tex. Civ. Stat. art. 4542a, §17; Wis. Stat. (1957) §151.04(4).

tered pharmacist. . . ." [203] However, since a corporation cannot be a registered pharmacist, this provision must mean that a manufacturer of drugs must either be a registered pharmacist or comply with the provision requiring that a manufacturer obtain a permit from the State Board of Pharmacy. Pennsylvania, Texas, and Wisconsin require the supervision of a registered pharmacist "or other qualified person" in the manufacture of drugs.[204] The State Board of Pharmacy is also given broad administrative authority to regulate the manufacture of drugs for the protection of the public.[205] In view of these statutes, it may be necessary for an atomic energy enterprise, if it produces byproduct radioisotopes to be used in medical diagnosis and therapy, to register with the state board of pharmacy and to comply with any applicable statutes or regulations governing the manufacture of drugs.

A second category of statutes which must be taken into consideration are the pure drug acts, many of them patterned after the Federal Food, Drug, and Cosmetic Act. These statutes commonly prohibit "adulteration" and "misbranding" of drugs. Elaborate statutory definitions of these two terms are set forth, and drug manufacturers are required to comply.[206] Another provision found in many of the pure drug acts relates to "new drugs," and typically a new drug may not be sold unless it has been approved under the Federal Food, Drug, and Cosmetic Act or approved by the state board of pharmacy.[207]

A third category of state statutes establishes special regulations for "dangerous drugs." For instance, California statutes define a "dangerous drug" as any drug unsafe for self-medication. Certain specific drugs are listed as dangerous, with power given to the Board of Pharmacy to add others to the list.[208] Certainly many, if not most, radioisotopes would fall within this definition. Manufacturers of dangerous drugs must be registered with the Board of Pharmacy and keep a record of sales of such drugs to wholesalers, pharmacies, and laboratories.[209]

[203] Cal. Business & Professions Code §4030.

[204] Pa. Stat. Ann. tit. 35, §795; Tex. Civ. Stat. art. 4542a, §17; Wis. Stat. (1957) §151.04(4).

[205] See, *e.g.*, the rule-making power granted to the California State Board of Pharmacy, Cal. Business & Professions Code §4009.

[206] Cal. Health & Safety Code §§26200 to 26385; Ill. Stat. Ann. c. 91, §55.11; Mich. Stat. Ann. §14.781; Mo. Stat. Ann. §196.015; N.J. Rev. Stat. (1937) §24:5-1; N.Y. Education Law §6808; Ohio Rev. Code §§3715.08, 3715.11; Pa. Stat. Ann. tit. 35, §§781 to 805; Tex. Civ. Stat. art. 4471; Wis. Stat. (1957) §97.25.

[207] Cal. Health & Safety Code §26288; Mo. Stat. Ann. §196.105; N.J. Rev. Stat. §24:6A-1; N.Y. Education Law §6809.

[208] Cal. Business & Professions Code §§4211, 4240.

[209] *Id.*, §§4217, 4227. Wisconsin also has a statute regulating the sale of dangerous drugs. Wis. Stat. (1957) §151.07.

The fourth type of state statute which may have some significance to producers of radioisotopes is that relating to poisons. The California statute lists compounds and preparations which are deemed poisonous, and gives power to the Board of Pharmacy to add others to the schedule when required in the interest of public health.[210] Other statutes define a poison as any drug, chemical, or preparation which is likely to be destructive to human life in quantities of sixty grains or less,[211] or for some purposes any substance likely to be destructive of human life in quantities of five grains or less.[212] These statutes typically require that specified labels be attached to the container containing the poisonous substances and that records be kept of their sale. The probable applicability of these statutes should be taken into account by concerns intending to market radioisotopes.

D. Transportation of Radioactive Materials

The transportation of radioactive materials may also be regulated by several federal, state, and local agencies. Although the Atomic Energy Commission apparently has power to regulate the transfer of radioactive materials, the Commission has subordinated its authority to the federal agencies having jurisdiction over the various types of carriers.[213] As a result, the Interstate Commerce Commission, the Civil Aeronautics Board, the U. S. Coast Guard, and the Post Office Department have issued detailed regulations governing the transportation of radioactive substances under their authority to regulate transportation of "explosives and other dangerous articles." [214] However, the authority of the federal agencies, other than the Post Office, is generally limited to interstate commerce so that matters of intrastate commerce are governed by state and local laws and regulations.

In each of the ten states studied, a state agency has general supervisory powers over the railroad and motor vehicle common carriers. Typically, common carriers are denoted "public utilities" and are subject to the jurisdiction of the public utility commissions. However, in

[210] Cal. Health & Safety Code §§20703, 20800. See also Ill. Stat. Ann. c. 38, §184; Mich. Stat. Ann. §14.745; Mo. Rev. Stat. (1949) §338.090; N.J. Rev. Stat. (1937) §45:14-19; N.Y. Education Law §6813; Ohio Rev. Code §3719.32; Tex. Penal Code art. 726; Wis. Stat. (1957) §151.10(1).

[211] Mich. Stat. Ann. §14.745; N.Y. Education Law §6801(16); Ohio Rev. Code §4729.02(D); Pa. Stat. Ann. tit. 35, §901.

[212] N.J. Rev. Stat. (1937) §45:14-19; Pa. Stat. Ann. tit. 35, §902.

[213] BNA, Atomic Industry Reporter 281.1.

[214] For a compilation of the federal regulations, see AEC, Handbook of Federal Regulations Applying to Transportation of Radioactive Materials (1955).

some states the trucking industry is regulated by a separate agency. In California, Illinois, Michigan, Missouri, New York, Ohio, and Pennsylvania the public utility commissions have been granted sufficiently broad powers to establish health and safety standards for the transportation of radioactive materials by all types of common carriers.[215] In New Jersey the Public Utilities Board has broad rule-making powers in respect to railroad safety,[216] but the Commissioner of Motor Vehicles is given only a limited power in respect to the trucking industry to regulate the construction and equipment of vehicles.[217] In Texas only the State Highway Commission seems to have sufficiently broad powers to issue regulations covering transportation of radioactive materials.[218] In Wisconsin the Public Service Commission has jurisdiction over both railroads and motor vehicles, but its power to make rules and regulations covering procedures to be followed in transporting radioactive substances is not clear. For example, the commission is vested with power and authority to "supervise and regulate such common motor carriers in all matters affecting their relationship with the public . . . to the end that adequate service at reasonable rates shall be afforded." [219] The power to regulate health and safety matters is thus not expressly granted, but probably is implicit since it is made the duty of every common motor carrier to "furnish reasonable, safe and adequate service and facilities." [220] Similarly, in respect to railroads in Wisconsin, every railroad is directed to adopt "reasonably adequate safety measures and install, operate and maintain reasonably adequate safety devices for the protection of life and property." [221] But this general terminology is followed by a sentence authorizing the commission to require the installation of a block system. This probably limits the authority of the commission to regulate only those safety matters connected with equipment and practices in moving freight; the authority apparently does not extend to regulation of such matters as amount of material, packaging, warnings, etc.

Two statutes,[222] enacted in New York and Pennsylvania, which are

[215] Cal. Public Utilities Code §761; Ill. Stat. Ann. c. 111 2/3, §§32, 49, 61; *id.*, c. 95 1/2, §§282.4, 282.14; Mich. Stat. Ann. §§22.53, 22.543; Mo. Rev. Stat. (1949) §386.310; N.Y. Public Service Law §49(2); Ohio Rev. Code §§4905.04, 4921.04; Pa. Stat. Ann. tit. 66, §§1183, 1186.

[216] N.J. Rev. Stat. (1937) §48:2-23.

[217] *Id.*, §39:3-43.

[218] Tex. Civ. Stat. Ann. art. 911b, §4(a).

[219] Wis. Stat. (1957) §194.18(9).

[220] *Id.*, §194.29.

[221] *Id.*, §195.26.

[222] N.Y. Vehicle and Traffic Law §16-c; Pa. Stat. Ann. tit. 75, §715.

substantially identical in nature and regulate the transportation of dangerous articles by motor vehicle, should also be mentioned. It is made unlawful to transport by motor vehicle over the highways of the state any dangerous article (which is defined to include radioactive materials) in a manner that will unreasonably endanger persons or property. The transporting motor vehicle must be conspicuously marked to indicate the danger, but an exemption is granted when applicable regulations of the Interstate Commerce Commission have been followed.

In addition to the authority of state agencies having direct jurisdiction over common carriers, it should be noted that the labor departments and health departments typically are granted such broad powers in respect to the health and safety of employees and the public that they may also attempt to regulate the transportation of radioactive materials.[223] Furthermore, local governmental units may also have authority to regulate transportation of radioactive substances. Therefore, we find once again an imposing array of state and local agencies potentially capable of exercising jurisdiction in respect to the same activity.

E. Regulation by Interstate Compact

The interstate compact was little used until the 1920's,[224] but recent years have seen a great increase in the application of this device in various regulatory fields, including conservation of natural resources, control and improvement of navigation, civil defense, education, flood control, labor legislation, and stream pollution.[225] Both Congress and the Supreme Court have encouraged the use of the interstate compact as a means of solving problems essentially regional in character [226] which do not readily lend themselves to solution by the states acting individually.

Several compacts recently entered into by two or more states have established interstate administrative agencies. The compacts of greatest significance with respect to the development of atomic energy for industrial uses are those relating to water pollution. However, the interstate compact may conceivably be used to regulate other activities affecting the use of atomic energy in the future. Therefore, in addition to consulting and obtaining the necessary permission from appropriate

[223] See discussion of general powers of the labor and health departments, *supra*, Part III, Chapter III.

[224] Zimmerman, The Interstate Compact Since 1925, 3 (1951).

[225] Note, 100 U. of Pa. L. Rev. 130, 131 (1951); Book of the States 20 (1952-53).

[226] See, *e.g.*, New York v. New Jersey, 256 U.S. 296, 313, 41 S.Ct. 492 (1921); Dyer v. Sims, 341 U.S. 22, 71 S.Ct. 557 (1951); Water Pollution Control Act of 1948, 33 U.S.C.A. §466a(c); 36 Stat. 961 (1911).

state agencies, an industry planning a venture into this new field of activity should also investigate the existence of interstate agencies as another possible instrumentality of governmental regulation.

Since the landmark Colorado River Compact, approved by Congress in 1928,[227] the compact has been employed extensively in regard to water problems common to several states. In the western states, including Colorado, New Mexico, Texas, Wyoming, Idaho, Nebraska, North Dakota, South Dakota, and Kansas, numerous compacts have been formed relating to matters of water allocation since scarcity of water is a crucial problem in these states.[228] These compacts would assume significance if a nuclear reactor employing large quantities of water as a coolant were built in any of these states.

In the eastern and midwestern states, a number of compacts directed toward the problem of pollution of interstate streams have been negotiated between states and approved by Congress. Various factors have accounted for the increasing use of the interstate compact in this area, including especially the increasing number of instances of pollution of interstate waters and the reluctance of the Supreme Court to enjoin pollution at the instance of one state suing another.[229]

Some of the more significant water pollution compacts merit discussion. Compacts to be examined will be primarily those involving the states selected for this study in connection with regulation at the state level. These compacts may be divided into two principal categories: (1) compacts which create administrative agencies, some of which have enforcement powers; and (2) compacts which create committees to collect and disseminate information and to make recommendations to the states. Since the second type does not involve regulatory powers, they are of little significance for present purposes, although action taken as a result of recommendations of the committees may have importance in the future.

1. Compacts Creating Joint Administrative Commissions

a. Commissions with Enforcement Powers

The following are representative interstate compacts pursuant to which enforcement powers are conferred upon administrative commissions:

(1) *Ohio River Valley Water Sanitation Compact.* The Ohio River

[227] 45 Stat. 1057 (1928).

[228] Zimmerman, *supra* note 224 at 16, contains citations to many of these compacts.

[229] Missouri v. Illinois, 200 U.S. 496, 26 S.Ct. 268 (1906); New York v. New Jersey, *supra* note 226.

Valley Water Sanitation Compact, drawn in 1936, became effective in 1948 when the requisite number of states ratified it.[230] The signatory states are Illinois, Indiana, Kentucky, New York, Ohio, Pennsylvania, Tennessee, Virginia, and West Virginia. The compact creates the Ohio River Valley Water Sanitation Commission, which is authorized to adopt, prescribe, and promulgate rules, regulations, and standards for administering and enforcing provisions of the compact. All industrial wastes discharged into the Ohio River or its tributaries must be modified or treated to protect the public health or to preserve the waters for other legitimate purposes as determined to be necessary by the commission after investigation, due notice, and hearing. The commission is empowered to order a person to discontinue, modify, or treat any discharge of industrial waste, and the orders are enforceable in any court of general jurisdiction. In addition, the commission is ordered to make surveys and recommendations and reports to the various signatory states.[231]

(2) *Tennessee River Basin Water Pollution Control Compact.* The purpose of the Tennessee River Basin Water Pollution Control Compact is to promote the effective control and reduction of pollution in the waters of the Tennessee River basin.[232] The signatory states are Alabama, Georgia, Kentucky, Mississippi, North Carolina, Tennessee, and Virginia. The compact has not yet come into effect for it still requires enactments by certain state legislatures and approval by the Congress. When it comes into operation,[233] it will give the commission established under the compact [234] powers in respect to the Tennessee River basin somewhat similar to those possessed by the Ohio River Valley Water Sanitation Commission over the Ohio River basin.

(3) *Delaware River Basin Water Commission Compact.* The Delaware River Basin Water Commission Compact involves New York, New Jersey, Delaware, and Pennsylvania. Apparently, all states have approved except Pennsylvania.[235] According to its terms, it is not to

[230] Zimmerman, *supra* note 224 at 7, n. 33. Dyer v. Sims, *supra* note 226, concerned the validity of this compact, and the court's opinion contains background material as well as some of the provisions of the compact.

[231] The text of this compact may be found in Ohio Rev. Code §6113.01; Pa. Stat. Ann. tit. 32, §816.1; 54 Stat. 752 (1940).

[232] For text of the compact, see Tenn. Laws 1955, c. 151.

[233] It enters into force when enacted into law by Tennessee and one other of the signatory states and approved by Congress. *Id.*, art. XII.

[234] *Id.*, art. II.

[235] See 11 Del. Code Ann. (1953) tit. 23, §901-904, annotation to §902. See also N.Y. Unconsolidated Laws §1581.

become effective until approved by all four states;[236] moreover, Congress has not yet approved the compact.

When it becomes effective, the Delaware River Basin Water Commission will have power, among other things, to "exercise an essential governmental function of each of the signatory states, for the purposes of developing, utilizing, controlling, and conserving the water resources of the Delaware River Basin in order to insure an adequate water supply. . . ." Among the primary purposes is the assurance of an "adequate minimum flow in the Delaware River for the protection of public health, for the benefit of industry and of fisheries . . . , for recreation, for general sanitary conditions, for the dilution and abatement of pollution, and for the prevention of undue salinity. . . ."

It would seem imperative that an industry contemplating the use of large quantities of water consult this commission if and when the compact goes into effect.

(4) *Interstate Sanitation Commission.* The Interstate Sanitation Commission was created by a tri-state compact, negotiated in 1935 between New York, New Jersey, and Connecticut.[237] The boundaries of the Interstate Sanitation District established by the compact and the waters embraced by it are defined rather precisely in the agreement. In general, the compact is aimed at abating and reducing the pollution of harbor, coastal, and tidal waters and tributaries of tidal waters.

The commission is given power to classify and establish standards of purity for the various bodies of water embraced within the district. Unless properly treated, sewage or other polluting matters may not be discharged into the waters in the district. Enforcement powers are granted to the commission, as well as authority to issue orders. These powers have been exercised in at least one instance, and a New Jersey court has enforced the commission order by a mandatory injunction directed against the discharge of sewage by a municipality.[238]

The commission must be consulted in the event that coastal, estuarial, or tidal waters of any of the signatory states are considered for use by an atomic energy establishment. Moreover, the commission has recently been authorized to study air pollution in the New York-New Jersey area.[239]

[236] *Ibid.*

[237] N.J. Rev. Stat. (1937), §§32:18-1 *et seq.* See also, 49 Stat. 932 (1935).

[238] Interstate Sanitation Commission v. Weehawken, 141 N. J. Eq. 536, 58 A.2d 530 (1948).

[239] N.Y. Laws 1954, c. 321.

b. Commissions without Enforcement Powers

The following are representative interstate compacts conferring advisory authority but not granting administrative enforcement powers:

(1) *New England Interstate Water Pollution Control Compact.* The New England Interstate Water Pollution Control Compact embraces the states of Maine, Massachusetts, Connecticut, Rhode Island, Vermont, New Hampshire, and New York. Congress and all of the states have approved the compact.[240] According to Article I, the compact shall apply to:

> . . . [S]treams, ponds and lakes which are contiguous to two or more signatory states or which flow through two or more signatory states or which have a tributary contiguous to two or more signatory states or flowing through two or more signatory states, and also shall apply to tidal waters ebbing and flowing past the boundaries of two states.

The New England Interstate Water Pollution Control Commission is given rule-making authority and is required to "establish reasonable physical, chemical and bacteriological standards of water quality satisfactory for various classifications of use." [241] The commission is not authorized to issue permits or orders. However, appropriate state agencies (*i.e.*, agencies regulating health and water pollution) are charged with establishing treatment programs to meet these standards. Each signatory state pledges itself to provide for the abatement of existing pollution and for the control of future pollution of the waters concerned.[242] Hence, all enforcement powers are retained by the individual signatory states. Of course, there is a possibility that the United States Supreme Court may enforce the compact obligations.

(2) *Bi-State Development District.* The Bi-State Development District is the result of a compact between Illinois and Missouri. It was approved by Congress in 1950.[243] The purpose of the compact is to establish a metropolitan development district, consisting of the city of St. Louis and several surrounding counties. The Bi-State Development Agency created pursuant to this interstate agreement is given power to "plan, construct, maintain, own and operate bridges, tunnels, airports and terminal facilities and to plan and establish policies for sewage and

[240] 61 Stat. 682 (1947).
[241] *Id.*, art. V.
[242] *Id.*, art. VI.
[243] 64 Stat. 568 (1950); see also, Ill. Stat. Ann. c. 127, §63r-1; Mo. Stat. Ann. §70.370.

drainage facilities." [244] Apparently, this agency will act as a general planning agency for this area.[245]

While the agency has no direct powers of enforcement with respect to matters of water pollution and use, nevertheless as a planning and rule-making agency it has policy-forming authority, and it would seem advisable to consult it should an industry contemplate the use of waters in the area covered by the compact.

(3) *Interstate Commission on the Delaware River Basin.* The Interstate Commission on the Delaware River Basin might be termed a "joint advisory commission," created pursuant to a compact between New York, New Jersey, Delaware, and Pennsylvania.[246] The compact outlines detailed requirements for the disposal of wastes in the Delaware River basin. The basin is divided into four zones, and it has been said: "For the industry operating in one of these zones or planning to build there, the agreement provides an exact picture of what will be required." [247] No enforcement powers are given to the commission, its powers being purely advisory. The Delaware River Basin Water Commission Compact, discussed above, now in the process of being adopted by the same four states, will have enforcement powers and is a product of the recommendations of this older commission.

(4) *Columbia Interstate Compact.* The Columbia Interstate Compact was signed in 1955 by the states of Idaho, Montana, Oregon, Washington, Nevada, Utah, and Wyoming. It will become effective when ratified by the first four states listed above and approved by Congress.[248] Under the compact, the Columbia Interstate Compact Commission will have advisory powers in respect to the utilization of the water and other related resources of the Columbia River basin. It is of particular interest for the purposes of this study to note that specific power is given the commission to prepare and recommend plans for achieving the most efficient use of the hydroelectric power resources in the basin and for controlling pollution of waters of the Columbia River system.[249]

2. Compacts Creating Informal Advisory Commissions

Several compacts establishing purely advisory commissions on water pollution have been entered into by different groups of states. These

[244] 64 Stat. 569 (art. III) (1950).

[245] See Zimmerman, *supra* note 224 at 12.

[246] For test, see Pa. Stat. Ann. tit. 32, §815.31.

[247] Comment, "Statutory Stream Pollution Control," 100 U. of Pa. L. Rev. 225, 237 (1951).

[248] For the text of the compact, see Idaho Laws 1955, c. 185.

[249] Art. V, §C(3) and art. VIII, §B of the compact respectively.

compacts are of little significance at present, except insofar as they may lead to future compacts or statutes which may be recommended by the respective commissions. These compacts typically embrace a particular river basin, and give the commission authority to make investigations, disseminate information, and make recommendations to their respective signatory states. The signatory states typically agree to cooperate in the abatement of existing pollution, to prevent future pollution, and to enact uniform legislation for the abatement and prevention of water pollution.[250]

Another type of agreement, even more informal, provides simply that departments of health of several states agree to cooperate with each other and with the United States Health Service in abating and preventing water pollution. Apparently these agreements create a committee which meets periodically, discusses mutual problems of water pollution, and makes suggestions. Beyond this the committee cannot go.[251]

Illustrative of such agreements and the corresponding signatory states are: Upper Mississippi River Drainage Basin Sanitation Agreement (Minn., Ind., Iowa, Wis., Ill., Mo.); Missouri River Basin Sanitation Agreement (Colo., Kan., Mo., Neb., Iowa, Minn., Mont., N. D., S. D., Wyo.); The Great Lakes Drainage Basin Sanitation Agreement (Minn., Wis., Ill., N. Y., Pa., Ohio, Mich., Ind.).

Also to be mentioned are joint resolutions between water pollution commissions of two or more states. For example, Minnesota has joined with Wisconsin in at least two joint resolutions, one in 1952 and the other in 1953. By the terms of these resolutions each signatory state agrees to require certain minimum treatment of wastes to prevent water pollution. Another joint resolution was entered into by the states of Illinois, Iowa, and Wisconsin in 1952, with essentially the same provisions as the resolutions between Wisconsin and Minnesota.

3. Conclusion

It will be important for any private industry contemplating the establishment of a plant utilizing nuclear power or otherwise using nuclear energy in such manner as to affect interstate streams to take into consideration any interstate compacts that may be applicable and to consult with the interstate commissions whether the commissions have enforce-

[250] See, *e.g.*, Interstate Commission on the Potomac River Basin, 54 Stat. 748 (1940), Pa. Stat. Ann. tit. 32, §741.

[251] These compacts do not ordinarily get into the state statute books, but are matters of informal public record.

ment or merely advisory powers. If the particular commission has enforcement powers, then clearly an industry will be subject to them. In the case of a commission with only advisory powers, a private industry would nevertheless be well advised to follow its recommendations. The commission's proposals may be implemented by statutes of the states party to the compact. Moreover, good public relations will demand that the industry adopt the health and safety standards recommended by the interstate commission. Furthermore, a failure to adopt the recommended standards may serve as evidence of negligence, if persons or property are injured, and actions are brought in the courts to recover damages.

Chapter V

RECENT STATE ATOMIC ENERGY LEGISLATION AND REGULATION

In recent years a number of states have recognized some of the problems inherent in the peaceful uses of atomic energy and have enacted legislation, promulgated regulations, or taken other executive action. Although this legislation and regulation cannot be easily classified, basically state action expressly concerned with atomic energy problems seems to fall into three categories: (1) legislation or executive action creating study commissions to investigate the problems involved and recommend solutions; (2) legislation to encourage atomic energy activities and establish education programs; and (3) legislation and regulations to control radiation hazards.

A. Study Commissions

Before a state invokes any of its powers, reason suggests that it first determine what problems are involved and in what directions solutions are most likely to lie. This is especially true where the state proposes to anticipate the development and effect of a new scientific, industrial, agricultural, and medical instrument and source of energy. Investigations of this magnitude require the concerted efforts of representatives of a number of disciplines.

Recognizing the dimensions and complexity of the problem posed by the peaceful uses of atomic energy, many states, either individually or as members of a geographic region with similar interests, have established special investigating, study, and planning commissions to determine the scope and purpose of any state program. These commissions have been established by both legislative and executive action. All of them have sought to focus the minds of a representative group of experts upon the problems of promoting and integrating the utilization of atomic energy into the activities of the state or region. Most of them are of a temporary character, existing until such time as their recommendations are tendered to the governor or to the legislature.

Typical of this approach are the actions of Georgia, Illinois, New Jersey, and South Carolina. In 1955 the Illinois legislature established the Atomic Power Investigating Commission by statute.[1] The commis-

[1] Ill. Laws 1955, S.B. 577.

sion consists of the directors of public health, civil defense, and public welfare (who are members ex officio), three members from the General Assembly, three from labor, three from industry, and three from science. The commission was charged with the duty of making a thorough investigation and study of the economic and social impact of the peaceful uses of atomic energy upon the state and submitting a report of the results and recommendations to the governor and the General Assembly within two years. In 1957 another statute was passed to continue this organization for another two years.[2]

A permanent Nuclear Advisory Commission, consisting of not less than twenty, nor more than forty, members (representing agriculture, power, medicine, public health, education, industry, labor, banking, insurance, law, government, and such other fields as the governor deemed advisable), was created by a resolution of the Georgia legislature in 1957.[3] Its duties include making a study as to the best possible means of achieving the social and economic benefits of nuclear energy, keeping itself advised on all phases of nuclear energy development, keeping the governor informed and advised, and determining whether additional legislation is necessary. By virtue of a recommendation in the resolution that no legislation relating to nuclear energy be introduced or enacted unless first approved by the commission, it has been made, in effect, a clearing house for legislation.

A fifteen member Atomic Energy Commission was authorized by a joint resolution of the New Jersey legislature in 1956 for the purpose of conducting a similar study.[4] And in 1956 the New York legislature created the Joint Committee on State's Economy, which is authorized to make a thorough study of the effect of the advance in the civilian use of atomic energy upon the economy of the state and of the measures to be taken in relation thereto. The South Carolina Senate, by resolution, amended its rules to create a Committee on Atomic and Nuclear Energy for purposes similar to those of New York.[5]

The governors of Arkansas, Connecticut, Maine, Massachusetts, Michigan, New Hampshire, Ohio, Tennessee, and Washington have revealed an independent concern with atomic energy problems by appointing study committees to assist them.[6]

[2] Ill. Laws 1957, S.B. 650; 2 CCH Atomic Energy Law Rep. ¶17,215.

[3] Ga. Laws 1957, H. Res. 24-50a; 2 CCH Atomic Energy Law Rep. ¶17,191.

[4] N.J. Laws 1956, Jt. Res. 16; 2 CCH Atomic Energy Law Rep. ¶17,337.

[5] S.C. Laws 1957, S. Res. 455; 2 CCH Atomic Energy Law Rep. ¶17,443.

[6] Atomic Industrial Forum, Inc., "State Activities in Atomic Energy," (mimeo. Feb. 1957).

In addition to the above state measures taken independently, several regional organizations have been established to make studies concerning the social and economic impact of atomic energy. Sixteen southern states,[7] through the Southern Regional Education Board, conducted a study program which resulted in the presentation of a report to the Southern Governors' Conference in 1956. The report pointed out two principal areas of state action—to control and to develop the use of atomic energy. The report also recommended (1) that each governor appoint a special assistant for atomic energy matters, (2) that existing state agencies continue to exercise existing regulatory authority in their respective areas of activity, (3) that each state study its existing laws and regulations applicable to nuclear energy, and (4) that state development and promotional agencies re-evaluate their practices and programs to include the atom. These recommendations covered the field of agriculture, atomic power, general industrial applications, manpower, education, medicine, and public health.[8]

Having received this report and recommendation, the Southern Governors' Conference, in turn, recommended that individual states create a state nuclear energy advisory committee for the purpose of (1) reviewing the work conference report, (2) recommending state programs, and (3) advising the state governor on atomic energy matters. The Georgia Nuclear Advisory Commission, described above, is an example of the recommended organization. It also was suggested that the chairmen of the various state advisory commissions serve as members to a regional advisory council.[9]

On February 8, 1954, the New England Committee on Atomic Energy was established by a resolution adopted at the New England Governors' Conference. It consisted of twelve members, selected by the chairman of the Conference from nominations submitted by the six New England governors,[10] and was to make a survey concerning:

[7] Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia.

[8] *Supra* note 6, p. 3.

[9] *Ibid.* At the request of the Regional Advisory Council on Nuclear Energy of the Southern Governors Conference, the Southwestern Legal Foundation of Dallas, Texas has undertaken a study to ascertain the feasibility and advisability of an interstate compact pertaining to nuclear energy among the sixteen states represented at the conference. On September 1, 1957 the Foundation published its interim report on "The Feasibility of a Southern Regional Compact on Nuclear Energy." The report contains a general discussion on the areas of state responsibility, plus tentative remarks regarding areas for interstate coordination and separate state action.

[10] Connecticut, Maine, Massachusetts, Rhode Island, New Hampshire, and Vermont.

(1) The interests of New England in the development of atomic energy, present and potential, for peaceful purposes, particularly in the field of power generation;
(2) The extent and effectiveness of present efforts in this field on the part of the New England state governments, educational institutions, private associations, industrial and business firms and individuals;
(3) Measures appropriate for both public and private organizations which would stimulate and enlarge New England's participation in the atomic energy program; and
(4) Such other matters relating to atomic energy as in the judgment of the Committee should be brought to the attention of the Conference.[11]

In July of 1955 the committee submitted an extensive report in which it concluded that the effect of the 1954 Atomic Energy Act was to open a new phase of state and private atomic activity; that such activity called for ". . . an industrial base in which scientific and engineering talent, supported by mechanical skills, is the indispensable element"; that, while atomic power was not then economically competitive, since New England was a high power cost area, it should be in the forefront of atomic power development; that the new phase in atomic activity affects state governments in at least three of their traditional capacities: (1) "The exercise of the police power for the protection of the health, safety, and welfare of the citizen"; (2) ". . . the exercise of . . . [the police] power with respect to financial, insurance, and rate regulation as new atomic industries are financed and come into being"; and (3) ". . . the capability of the state to encourage and enhance the development of new industrial activity through promotion, dedication of resources, and sound tax policy." [12]

Also included in the committee's report were its recommendations (1) to the states—that they undertake a legislative program similar in concept to that contained in a suggested state statute (discussed below in this chapter); (2) to Congress and the AEC—that some federal atomic energy installations, an AEC administrative office, and a library of classified technical information be located in New England; (3) to New England educational institutions—that they should undertake to construct research reactors and to institute appropriate training programs on all phases of atomic energy; and (4) to New England indus-

[11] New England Committee on Atomic Energy, "Atomic Energy and New England," app. (i) (1955).
[12] *Id.* at 2.

trial and business leaders—that atomic energy uses, opportunities, and enterprises should be aggressively pursued.[13]

B. State Promotional Programs

A number of states have acted to establish special administrative agencies charged primarily with the task of encouraging atomic energy development, and, in some instances, secondarily with some minor regulatory functions. In respect to these promotional efforts there is an understandable lack of specificity. It is doubtful if these states regard their actions as anything but tentative, and it is obvious that all of them desire to move with caution. There is a noticeable reluctance to adopt any measures which are as revolutionary in nature as atomic energy itself. None of the states appears much inclined toward fresh experiments in the business of government. Certainly their actions do not manifest anything like the magnitude of concern which caused Congress to establish the Atomic Energy Commission, with its extraordinary powers, in 1946. Of course, in justice to the states, it should be pointed out that this conservatism probably is due in large part to the existence of the AEC as well as to a justifiable perplexity as to just what areas of influence the Atomic Energy Act of 1954 leaves open to them. On the other hand, should the states desire to exercise their traditional prerogatives in the field of atomic energy, they will have to take a bolder line than has been taken thus far.

Unlike Congress, none of the states has vested its promotional and control powers and duties with respect to atomic energy in one agency or treated both aspects of such a program in one statute. For the most part these subjects have been separately provided for, and, especially in regard to regulation, existing state agencies have been utilized.

By far the most popular statutory scheme for state promotion (and some control) of atomic energy is that recommended by the New England Committee on Atomic Energy. This committee's "Model Act to Coordinate Development and Regulatory Activities Relating to the Peaceful Uses of Atomic Energy"[14] has been followed in Arkansas,[15] Connecticut,[16] Maine,[17] Massachusetts,[18] New Hampshire,[19] Ohio,[20]

[13] *Ibid.*
[14] *Id.*, app. (iii); reprinted as Appendix B, Item 1.
[15] Ark. Stat. Ann. §§82-1401 *et seq.*
[16] Conn. Gen. Stat. §§1933d *et seq.*
[17] Me. Rev. Stat. c. 52-A, §§1-7.
[18] Mass. Ann. Laws c. 6, §§85-93.
[19] N.H. Rev. Stat. Ann. c. 162-B, §§1-6.
[20] Ohio Rev. Code §§4163:01 *et seq.*

and Washington.[21] Furthermore, recent enactments of Florida,[22] Rhode Island,[23] South Carolina,[24] and Tennessee [25] indicate that they gave close attention to the recommendations of the New England Committee. Because of the widespread legislative recognition afforded the New England Model Act, a discussion of its significant features is warranted.

In an interim report, published on December 27, 1954, the New England Committee on Atomic Energy recommended to the attention of the member states an act which was designed:

> (1) to provide the basis for a single harmonious system of atomic energy regulatory activity within each state through the exercise of coordinate federal and state regulatory powers,
> (2) to open the way for orderly and intelligent study, within each affected state administrative area, of the new problems posed by privately financed atomic energy enterprise . . . and
> (3) to provide a focus within the state for atomic energy matters—as well as a basis for regional and state coordination—by the creation, on the staff of each governor, of a Coordinator of Atomic Energy Development.[26]

In the first section of this statute the enacting state declares itself to be in accord with ". . . the action of the Congress of the United States in enacting the Atomic Energy Act of 1954," and that it intends to ". . . cooperate actively in the atomic energy program" and exercise its police powers in a manner ". . . so as to conform, as nearly as may be, to the Atomic Energy Act of 1954 and regulations issued thereunder."

Section 3 of the act directs a number of affected state departments and agencies, such as the departments of public health, labor, highways, etc., to ". . . initiate and pursue continuing studies as to the need if any for changes in the laws and regulations administered by . . . [them] . . . that would arise from the presence within the state of special nuclear materials and by-product materials and from operation herein of production or utilization facilities." This section also authorizes the governor to direct other departments and political subdivisions of the state, which are not specified, to initiate similar studies. Pursuant to these

[21] Wash. Rev. Code c. 43.39.
[22] Fla. Stat. Ann. c. 290.
[23] R.I. Gen. Laws tit. 42, c. 27, §§1 *et seq.*
[24] S.C. Code 1952, §§1-391 *et seq.*
[25] Tenn. Code Ann. §§53-3101 *et seq.*
[26] *Supra* note 11 at 5.

studies, each department or agency is ". . . to make such recommendations for the enactment of laws or amendments to laws administered by it, and such proposals for amendments to the regulations issued by it, as may appear necessary and appropriate."

This section reflects the realization that the problems involved are not amenable to any one solution, since conditions may be expected to change rapidly and move in unexpected directions, and that the experience of a number of existing state agencies can be utilized advantageously in this continuing endeavor to maintain a flexible promotional program. Presumably, within the limitations of its budget and the qualifications of its personnel or those it can afford to hire, each department is free to conduct its investigation as it sees fit. It should be noted that all of the states which have enacted this statute apparently have assumed that the existing agencies were adequate to the task. None has expressly authorized the establishment of specialized organizations within the departments and agencies for this purpose. As will be pointed out below, several states have created a special advisory board to which the departments and agencies have access, and a recent amendment to the Maine statute authorizes the advisory board to obtain technical advice from the AEC as well as to cooperate with the federal government in performing functions relating to atomic energy.[27]

A significant feature of the act in general, and Section 3 in particular, lies in the fact that none of the departments and agencies mentioned are given any new authority to promulgate regulations concerning atomic energy matters or to institute anything except a study program. However, the act apparently contemplates the issuance of regulations by state departments and agencies, under existing statutory authority, for, in Section 4(c), it provides that:

> No regulation or amendment to a regulation applying specifically to an atomic energy matter which any such department or agency may propose to issue shall become effective until 30 days after it has been submitted to the Coordinator [of Atomic Development Activities]. . . .

It should be noted, however, that whatever implication this provision carries with it is obscured by a noticeable absence of standards. The only thing offered by way of a guide is that the state intends to exercise its powers in such a manner as ". . . to conform, as nearly as may be, to the Atomic Energy Act of 1954 and regulations issued thereunder." Although this standard will assist departments and agencies concerned

[27] Me. Rev. Stat. c. 52-A, §7.

with radiation safety regulation, it is not much help to those agencies which are charged with other types of regulatory activities.

Section 4 of the act provides for the establishment in the state's administrative hierarchy of the office of Coordinator of Atomic Development Activities. The only qualifications for this officer are that he be a "citizen of this state." In New Hampshire he also must be selected from among the commissioners of the various departments and agencies.[28] Under the Model Act he is to be appointed by the "Governor and Council," while in Arkansas,[29] Connecticut,[30] and Washington,[31] the governor alone may appoint, and in Ohio the advice and consent of the Senate is required.[32]

The duties of this official are: (1) to coordinate the studies, recommendations, and proposals of the several departments and agencies ". . . with each other and also with the programs and activities of the Department of Industrial Development of the State," and like activities in other states and with the policies and regulations of the AEC; (2) to ". . . keep the Governor and Council and the several interested departments and agencies informed as to private and public activities affecting atomic industrial development"; (3) to further such atomic industrial development ". . . as is consistent with the health, safety, and general welfare" of the people of the state; and (4) to represent the state's interest in regional atomic activities and in cooperation with the federal government.

Essentially, the coordinator has no appreciable powers unless he could be said to derive some as ". . . deputy to the Governor in matters relating to atomic energy." Quite obviously, the success of this office largely depends upon the personal persuasiveness of the individual appointed. In this connection, the provision in Section 4(c), requiring submission of all proposed regulations to the coordinator thirty days prior to their effective date (". . . unless, upon a finding of emergency need, the Governor by order waives all or any part of this 30 day period"), may prove of some assistance to the coordinator. Also, it should be noted that the several departments and agencies are directed to keep the coordinator fully and currently informed as to their activities relating to atomic energy. The New England Committee has likened these provisions to those contained in the 1954 Atomic Energy Act

[28] N.H. Rev. Stat. Ann. c. 162-B, §4.
[29] Ark. Stat. Ann. §82-1404.
[30] Conn. Gen. Stat. §1938d.
[31] Wash. Rev. Code §43.39.050.
[32] Ohio Rev. Code §4163.04.

requiring advance notice of proposed AEC action to the Joint Committee on Atomic Energy in Congress.

According to the New England Committee, Section 4 ". . . is premised on the proposition that what is everybody's business is nobody's business and therefore seeks to make sure that atomic development and regulation is somebody's business." [33] One wonders just how much of a "somebody" this coordinator is in the states listed. None of the enacting states has seen fit to provide compensation for him on a full-time basis.

Sections 2 and 5 combine to form the only direct regulatory provisions of this act. Section 2 simply provides that no persons within the state shall carry on any activity with respect to "special nuclear material, byproduct material, production facility or utilization facility," for which type of activity an AEC license or permit is required by federal law, without first obtaining the license or permit. Section 5 authorizes the state attorney general to apply to an appropriate court for an order enjoining any person who is violating, or is about to violate, Section 2. No criminal penalties for violation of Section 2 are provided.

The drafters of this act have indicated that there may be some doubt as to whether, in the absence of a war emergency, the AEC's authority reaches as far as the licensing requirements of the 1954 Atomic Energy Act would extend it. Therefore, Section 2 is intended to remove the possibility of a jurisdictional "no-man's land," without imposing licensing burdens and expenses upon the states, and, also, to discourage possible challenges of the federal licensing power.[34] There may be some question as to whether a user of byproduct material (material not owned by the federal government), who is not in interstate commerce or in an activity affecting interstate commerce (assuming that this is possible any longer), is within the regulatory jurisdiction of the AEC. The fact cannot be ignored, however, that since the AEC is the principal supplier of byproduct materials today and practically all other sources of supply clearly come under federal regulation, should this intrastate user fail to comply with federal regulations, further supply of byproduct material could be denied to him.[35] Thus, it is doubtful if Section 2

[33] *Supra* note 11 at 66.

[34] *Id.* at 64. On the extent of the congressional power to regulate in the atomic energy field see Estep, "Federal Control of Health and Safety Standards in Peacetime Private Atomic Energy Activities," 52 Mich. L. Rev. 333 (1955).

[35] The Radiation Products Company of Dallas, Texas, a licensed user of radioisotopes, has been ordered by the AEC to cease temporarily operations involving radioactive materials, pending a public hearing on possible modification, suspension or revocation of the company's license. AEC Release No. A-28, Feb. 10, 1958, indicated that

is necessary to sustain the federal licensing and regulatory provisions in even the shadow areas of federal jurisdiction. Nevertheless, it is useful in that it authorizes a state authority, which is closer to the scene, to enforce a state law and thus to act directly in protecting the interests of the state and its citizens.

If the combination of Sections 2 and 5 should ultimately prove necessary, the question may arise as to whether Section 2 is an unconstitutional delegation of state legislative power because the licensing requirements are subject to future changes by Congress and the AEC, thereby automatically effecting a change in state law. The drafters of the act have pointed out that "Section 2 seems reasonably safe from attack, however, since it merely uses the possession of a federal license as a fact indicating that the possessor is a fit person to engage in the activity to which the license applies." [36]

The federal constitutional question as to whether a state, in effect, can enforce in this fashion a federal regulatory program where Congress may have pre-empted the field will be considered at a later point in this chapter.

The key terms used in Section 2—"special nuclear material, by-product material, production facility . . . [and] . . . utilization facility"—are defined in Section 7 in such a way as to keep their meaning consistent with federal definitions under the 1954 Atomic Energy Act. The scope of the act and the radiation hazard with which it manifests some concern is no broader than the federal program. Several sources of radiation, which are fairly abundant, are not covered by the act: X-ray machines, various types of particle accelerators, radium, and source material. It was felt that source material does not present a significant radiation hazard and that its inclusion might embarrass activities involving ores containing small quantities of uranium. Recently, however, the Maine legislature amended its act to include source material.[37]

Commission inspectors had discovered that the company had transferred at least two radioactive cobalt 60 sources, of approximately one curie each, to persons not licensed by the AEC to receive them. The hearing was scheduled for 10:00 a.m., Feb. 24, 1958, in Dallas, but was postponed by the AEC. 2 CCH Atomic Energy Law Rep. ¶9517.

[36] *Ibid.* Regarding the question of state constitutional law, the New England Committee said: "Section 2 is like a statute conferring certain privileges on persons who have been admitted to the bars of other states. Statutes of this sort are not considered unconstitutional by the fact that the requirements for admission to the bar may be changed by other states in the future. And a state may condition the transport of intoxicating liquor through its territory on the fact that the consignee in another state may lawfully receive it. Carter v. Virginia, 321 U.S. 131, [64 S. Ct. 464] (1944)."

[37] Me. Rev. Stat. c. 52-A, §§1-7. The term "source material" is defined and inserted between the terms "special nuclear material" and "byproduct material" wherever they occur in the Maine statute.

Several of the states which have followed the recommendations of the New England Committee have made significant additions to the Model Act. While creating the position of coordinator, Massachusetts, Ohio, and Washington have also established atomic energy advisory boards. Massachusetts' "Commission on Atomic Energy" consists of seven members (one of whom is the coordinator, who is also the chairman) appointed by the governor with the advice and consent of the Council for five year terms. They are to be representative of industry, labor, and science. The duties of this commission are: (1) to keep fully and currently informed as to atomic energy developments and activities; (2) to consult with and advise the coordinator; and (3) to render an annual report. There are to be at least four meetings of the commission annually.[38]

Ohio's Atomic Energy Advisory Board consists of eleven members, appointed by and serving at the pleasure of the governor. The coordinator is a member; labor, management, and medicine are represented by one member each; two members are persons with scientific training in the atomic energy field; and the five remaining members need not have any particular qualifications. This board is: (1) to review the studies, policies, and activities of the state departments and agencies; (2) to review atomic developments within the United States and elsewhere; (3) to make recommendations to the governor; and (4) to furnish the coordinator, or any state department, such technical advice as may be required upon all matters relating to the production or use of atomic energy and the protection and welfare of persons employed in industries so engaged.[39]

The Washington Atomic Energy Advisory Council consists of five members, appointed by the governor. No qualifications for these persons nor duties for the council are stipulated. The coordinator is to act as executive secretary to the council.[40]

In Maine, in addition to being entitled to a thirty day notice of proposed regulations, the coordinator may (within this time) notify the governor of his objections and reasons therefor. After discussion with the affected department or agency, and within fifteen days after receipt of objections from the coordinator, the governor may declare the proposed regulation valid and effective or invalid and ineffective.[41] This

[38] Mass. Ann. Laws c. 6, §88.
[39] Ohio Rev. Code §4163.05.
[40] Wash Rev. Code §43.39.060.
[41] Me. Rev. Stat. c. 52-A, §51.

provision appears to be something of an improvement over that contained in the Model Act.

The Tennessee statute does not create the position of a coordinator, but establishes a seven to ten member "Advisory Committee on Atomic Energy," with duties identical with those of the coordinator under the Model Act. This committee is authorized to obtain full-time administrative and consultant staff assistance with the concurrence of the governor. The statute also omits the injunction provision.[42]

Promotion commissions have been established in Florida and Rhode Island by statutes which are conceptually similar to the New England Model Act. The Florida Nuclear Development Commission consists of nine members appointed by the governor for terms concurrent with his. It is authorized to appoint a salaried, executive director and to employ such personnel as may be necessary. Essentially, its duties are: (1) to coordinate all local and state nuclear energy activities; (2) to promote and support programs of education, research, and information; (3) to provide for and work with groups in the state relative to problems of regulation, insurance, safety, and public health as related to nuclear energy; (4) to assist and attract nuclear energy industries; and (5) to advise and make legislative recommendations to the governor.[43]

The Rhode Island Atomic Energy Commission consists of five members appointed by the governor for overlapping terms of five years. Basically this commission is to make a study of the need for changes in state laws and regulations, advise and make recommendations to the governor and the General Assembly, coordinate development and regulatory activities relating to industrial and commercial uses of atomic energy, and cooperate with the AEC and similar commissions of other states.[44]

C. State Statutes and Regulations to Control Radiation Hazards

A number of states have recently enacted statutes or promulgated regulations which are specifically designed to control some or all radiation hazards. These warrant extended discussion because of the predominant concern of the states in respect to the health and safety of their citizens. The discussion of state laws in Chapter III of this Part concerned the general powers and duties of the public utility commissions, the labor departments and industrial commissions, and the state

[42] Tenn. Code Ann. §53-3104.
[43] Fla. Stat. Ann. §290.06.
[44] R. I. Gen. Laws tit. 42, c. 27, §§1, 2.

departments of health, as they might affect sources of radiation. That material will be alluded to only when it is necessary to indicate the authority for recent radiation health and safety regulations. It should be noted that where, for example, the departments or agencies of certain states have been granted specific powers under recent radiation hazard legislation, this does not mean that the corresponding departments and agencies of states not mentioned do not have similar powers under general health and safety legislation; it merely means that the legislatures of the other states have not bestowed those powers upon their respective state departments and agencies with radiation health and safety control specifically in mind.

It should also be noted that this discussion is limited to recent state regulatory action concerning radiation health and safety matters. State control of atomic energy matters has broader connotations than mere health and safety regulation; various forms of economic regulation also are likely to be imposed. The fact remains, however, that, to date, no state appears to have invoked its powers so as to regulate specifically the economic aspects of atomic energy activities, with the exception of Massachusetts which recently amended its insurance laws in the matter of issuing and classifying policies insuring against nuclear energy hazards.[45]

The actions on the part of the states with respect to radiation hazards range everywhere from no state action to the issuance and enforcement of very comprehensive regulations by at least one, and in one case, several state agencies. At the present time slightly less than one-half of the states have taken no official action regarding the problem.[46] Some of these states, however, are in the preliminary stages of preparing legislative and administrative solutions.[47]

[45] Mass. Ann. Laws §§175:80, 175:111A.

[46] These states include Alabama, Arizona, Idaho, Indiana, Iowa, Kansas, Louisiana, Maryland, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Mexico, North Carolina, Oklahoma, Vermont, and West Virginia.

[47] Indiana is reported to be regulating exposures to ionizing radiation from shoe-fitting fluoroscopes, and the State Board of Health indicated in December of 1956 that it was revising its hospital licensing regulation on radiation protection. In addition, the board reported that it had made several joint inspections of byproduct users with AEC officials. *Supra* note 6 at 8.

The Kansas State Board of Health has indicated that it is carrying on "a small non-regulatory radiological health program" and that it has been making joint inspections with AEC officials. It also has established a "Radiological Health Advisory Committee," which is reported to be working upon a proposed bill to place control of radiation under the board. This bill is said to be modeled upon the recommendations

Affirmative and official action to protect the public against radiation hazards has been taken by both the legislatures and state agencies, pursuant to existing powers. Where the legislatures have acted, some have vested radiation safety rule-making and enforcing powers in state agencies, while others have acted only to impose certain duties upon radiation source users or possessors in the interests of public health and safety, and a number of legislatures have merely directed that studies be made regarding radiation hazards. As for administrative action, a few state agencies have issued very comprehensive radiation safety regulations, but the majority of those which have acted, have merely concerned themselves with limited aspects of the problem.

1. Legislative Action

a. Legislation Granting Rule-Making and Enforcing Powers

The legislatures of Colorado, Connecticut, Massachusetts, New Jersey, New York, Oregon, and South Dakota have recently enacted statutes to confer upon their respective public health agencies the power to promulgate and enforce radiation health and safety regulations of general application. With maximum economy and minimum guidance the powers and duties of the Colorado State Board of Health were extended so as to authorize it ". . . to establish and enforce standards for exposure to environmental conditions, including radiation, that may be deemed necessary for the protection of the public health." [48]

In a somewhat less obvious fashion the Connecticut State Department of Health appears to have been similarly empowered by a statute which specifies that:

> No person, firm, corporation, town, city or borough shall operate or cause to be operated any source of ionizing radiation or shall produce, transport, store, possess or dispose of radioactive materials except under conditions which comply with

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of the National Committee on Radiation Protection and Measurements, as published in National Bureau of Standards Handbook 61. *Supra* note 6 at 8.

The Minnesota Department of Health has reported its intention to ask the 1957 legislature to grant it specific authority to make and adopt regulations relating to the control of ionizing radiation. *Supra* note 6 at 10.

While the Missouri Division of Health claims authority under existing law, it has not promulgated radiation safety regulations. It has employed, however, a radiological health physicist. *Supra* note 6 at 11.

The New Mexico Department of Public Health has reported that a bill similar to that suggested by the NCRPM will be introduced to the legislature in 1957. *Supra* note 6 at 12.

[48] Colo. Rev. Stat. §66-1-7(21).

> regulations that may be incorporated in the sanitary code or with orders imposed by the state department of health for the protection of the public health.[49]

The standards which are to be followed by the State Department of Health are specified in the succeeding sentence which reads:

> Such regulations or orders shall be based to the extent deemed practicable by the state department of health on the regulations of the United States atomic energy commission, . . . entitled "Standards for Protection Against Radiation," or, if such regulations of the United States atomic energy commission should be deemed inappropriate by the state department of health, on the latest recommendations of the national committee on radiation (protection and measurements), as published by the United States department of commerce, national bureau of standards.[50]

Furthermore, this section specifies that radiation sources shall be utilized at the lowest practical level ". . . consistent with the best use of the radiation facilities or radioactive materials involved." [51] The section also requires that proposed sanitary code regulations pertaining to radiation sources be submitted to the Connecticut Coordinator of Atomic Development Activities thirty days before they are to become effective.[52] The sanitary code regulations which have been issued by the State Department of Health pursuant to this authority are discussed later in this Chapter.

In addition to authorizing the promulgation of radiation safety regulations, the Connecticut statute also provides for registration by ". . . each person, firm, corporation, town, city or borough conducting or planning to conduct any operation within the scope of this Act . . . with the state department of health." [53] The department may require the registrant to state ". . . the qualifications of the supervisory personnel, the protective measures contemplated . . . and such other information as it determines is necessary." [54] Re-registration is required where modifications are made which will increase the amount of radiation. A number of exemptions to the registration requirement are stated, the most significant of which is that for X-ray devices used by or under the supervision of persons licensed to practice the several healing arts.

[49] Conn. Public Acts 1957, Public Act 154, §2.
[50] *Ibid.*
[51] *Ibid.*
[52] *Ibid.* See also Conn. Gen. Stat. §1938d.
[53] *Id.*, §3.
[54] *Ibid.*

It is finally specified that the registration is not intended to imply state approval of the manner in which the radiation activities are carried out. Apparently, Connecticut has no desire to have its registration requirement construed as a licensing procedure; the State Department of Health has no discretionary authority to withhold a registration certificate. In this connection, however, it should be remembered that Connecticut law does necessitate the procurement of an AEC license or permit by those persons intending to carry on atomic energy activities within the state for which licenses are required by federal law.[55]

Shortly after the above statute was enacted the Connecticut General Assembly directed the Commissioner of State Police to make ". . . reasonable regulations concerning the safe storage and transportation of hazardous chemicals," [56] which are so defined by the act as to include "radioactive materials." [57] "In adopting such regulations, said commissioner *may* be guided by recognized national standards for the prevention of damage to property and injury to life." [58] While these regulations are not to apply to "electric companies," [59] the authority, nevertheless, overlaps that of the State Department of Health, thus making for a fruitful area of conflict, especially since this subsequent statute does not mention any requirement that the regulations first be submitted to the State Coordinator of Atomic Development Activities before they can become effective. Inspections to determine if there is compliance with the commissioner's regulations are to be made by the local fire marshal of each town, city, or borough.[60]

In 1955 a somewhat narrower or more limited authority to issue radiation health and safety regulations was conferred upon the Department of Public Health by a Massachusetts statute which provides:

> The department shall, from time to time, after a public hearing and subject to the approval of the governor and council, prescribe and establish rules and regulations to control the transportation, storage, packaging, sale, distribution, production and disposal of radioactive materials which may affect the public health or the health of persons exposed to radioactivity or ionizing radiation. . . . Nothing in these rules and regulations shall be inconsistent with those now or hereafter estab-

[55] Conn. Gen. Stat. §1935d.
[56] Conn. Public Acts 1957, Public Act 353, §2.
[57] *Id.*, §1.
[58] *Id.*, §2.
[59] *Ibid.*
[60] *Id.*, §4.

> lished by the National Bureau of Standards relative to the handling and disposing of radioactive materials.[61]

The omissions of the word "use" among the activities to be regulated and of "radiation installation" or "radiation source" among the objects to be controlled, obviously leaves a great deal uncovered by this regulatory authority. Perhaps it was felt that the hazards not provided for would be regulated by other authority, for the statute further stipulates:

> Nothing in this section shall prevent the department of labor and industries from establishing rules and regulations for the protection of the health and safety of employees against ionizing radiation in any place of employment. . . .[62]

Whatever the rationale, as yet no radiation health and safety regulations have been forthcoming from any Massachusetts agency, and in September of 1957 the Department of Public Health was authorized and directed "to make a study and investigation of regulatory and protective measures pertaining to radioactive materials" with which "related departments and agencies shall cooperate." [63]

Like that of Connecticut, Massachusetts law requires the procurement of an AEC license or permit by those persons intending to carry on atomic energy activities within the state for which licenses or permits are required by federal law.[64]

Under a 1958 act, New Jersey has created a Commission on Radiation Protection within the State Department of Health empowered to formulate such rules and regulations "as may be necessary to prohibit and prevent unnecessary radiation." [64a] "Unnecessary radiation" is defined as the use of gamma rays, X-rays, alpha and beta particles, and other atomic or nuclear particles "in such manner as to be injurious or dangerous to the health of the people or the industrial or agricultural potentials of the State." [64b] Regulations may be adopted by the commission only after a public hearing preceded by thirty days notice and may not become effective until sixty days following adoption.[64c] No regulation concerning unnecessary radiation adopted by any local government agency shall be effective until submitted to the commission for

[61] Mass. Ann. Laws c. 111, §5B.
[62] *Ibid.*
[63] Mass. Acts and Resolves 1957, c. 106.
[64] Mass. Ann. Laws c. 6, §92.
[64a] N.J. Laws 1958, c. 116, §7.
[64b] *Id.*, §2(c).
[64c] *Id.*, §7.

approval.[64d] The Commission on Radiation Protection is limited to the rule-making function, and the duties of administration and enforcement of rules promulgated by it are delegated to the Department of Health. The statute directs that the department, among other things, "Require registration of sources of radiation," and "Inspect radiation sources, their shielding and immediate surroundings and records concerning their operation for the determination of any possible radiation hazard." [64e] The department is also invested with broad powers to issue general and emergency orders to prevent violations of any regulations of the commission and to obtain injunctions against violations of such orders.[64f]

As was mentioned in Chapter III of this Part, the New York Public Health Law was amended in 1955 so as to add to the functions, powers, and duties of the Department of Public Health the supervision and regulation of the ". . . public health aspects of the use of ionizing radiation and the handling and disposal of radioactive wastes." [65] Pursuant to this authorization, the department has issued comprehensive regulations, which will also be discussed later. Apparently, this grant of power was not intended to preclude regulation by other agencies of the state having health and safety responsibilities, for, without any express authority to issue radiation health and safety regulations specifically, the New York Department of Labor also has incorporated such regulations in its Industrial Code. These regulations, and the manner in which they conflict with those of the Department of Public Health, will be discussed under the heading of "Administrative Regulation."

In July of 1957 the Oregon legislature directed the State Board of Health to promulgate regulations and standards for the safe use, handling, disposal, and control of all radiation sources within the state,[66] except those ". . . emitting nonhazardous quantities of radiation." [67] To this authority, however, is added the rather curious condition that the board is to promulgate these regulations and standards only ". . . after making a two-year study of the problem." [68]

In the matter of standards, it is indicated that ". . . the public policy of this state [is] to encourage the constructive uses of radiation and

[64d] *Id.*, §17.
[64e] *Id.*, §9.
[64f] *Id.*, §§11-13.
[65] N.Y. Public Health Law §201(1)(s).
[66] Ore. Laws 1957, c. 399, §3.
[67] *Id.*, §4.
[68] *Id.*, §3.

to control any associate harmful effects." [69] Any regulations promulgated must conform with this policy.[70] Furthermore, the act directs the board to appoint a Radiation Advisory Committee to advise it upon ". . . matters relating to radiological health and radiation protection." [71] The committee is to consist of five persons who, by training and experience, are qualified to advise the board on such matters.

No regulations have been or could be made effective, as yet, by the Oregon State Board of Health pursuant to this authority, but certain standards and regulations were recommended before the statute was enacted.[72]

Pursuing a declared policy nearly identical to that of Oregon,[73] the South Dakota legislature has directed the State Department of Health to

> . . . develop comprehensive policies and programs for the evaluation and determination of hazards associated with the use of radiation, and for their amelioration,[74]

and to

> . . . adopt, promulgate, and enforce such rules and regulations as may be necessary to implement or effectuate the powers and duties of the [Department] . . . under this Act.[75]

Other duties of the Department under this act are: (1) to ". . . advise, consult, and cooperate" with local, state, interstate, and federal agencies and with affected groups and industries; [76] (2) to ". . . collect and disseminate information relating to the determination and control of radiation exposure hazards"; [77] and (3) upon request, to ". . . render opinions concerning such plans and specifications on the design and shielding for radiation sources as may be submitted before or after construction, for the purpose of determining the possible radiation hazard." [78] Furthermore, the department has the power: (1) to ". . . encourage, participate in, or conduct studies, investigations, training, research, and demonstrations relating to the control of radiation haz-

[69] *Id.*, §1.
[70] *Id.*, §3.
[71] *Id.*, §5.
[72] Recommended Standards and Regulations for Occupational Health, Ore. Bd. of Health, Jan. 1956, c. II, §2.9 and app. 1.
[73] S.D. Laws 1957, H.B. 826, §1; 2 CCH Atomic Energy Law Rep. ¶17,557.
[74] *Id.*, §4(1).
[75] *Id.*, §4(6).
[76] *Id.*, §4(2).
[77] *Id.*, §4(5).
[78] *Id.*, §4(8).

ards";[79] (2) to ". . . issue, modify, or revoke orders prohibiting or abating the discharge of radioactive material or waste into ground, air, or waters of the state";[80] and (3) to ". . . make inspections of radiation sources, shielding and immediate surroundings for the determination of any possible radiation hazard."[81]

Like the Connecticut law discussed above, and the suggested act of the National Committee on Radiation Protection and Measurement,[82] from which much of its language was taken, the South Dakota statute makes it unlawful for any person: (1) ". . . to produce radiation, or to produce, use, store, or dispose of radioactive materials, unless he registers in writing with the . . . [Department]"; (2) ". . . to modify, extend, or alter programs involving the production of radiation or the production, use, storage, or disposal of radioactive materials unless he notifies the . . . [Department]"; or (3) to do any of the forementioned ". . . except in accordance with the provision of this Act and rules and regulations promulgated thereunder."[83] It also is unlawful ". . . for any person to expose any other person to diagnostic or therapeutic radiation" unless he is, or is under the direction of, a person licensed to practice the "healing arts" or dentistry in South Dakota.[84] Apparently, the Department of Health may prescribe methods and amounts of diagnostic and therapeutic radiation even as to persons so licensed since the act does not contain any limitation which would prohibit it from doing so.

Violations of the South Dakota statute, or orders or rules promulgated pursuant to it, are deemed misdemeanors upon each day in which they occur, and the Attorney General, at the request of the department, is directed to seek injunctions against such violations.[85] While this statute does not specifically so provide, it nevertheless implies that the State Department of Health is to have exclusive jurisdiction over radiation hazards in South Dakota.

While no general rule-making authority as to radiation hazards appears to have been bestowed specifically upon any state agency of Wis-

[79] *Id.*, §4(4).
[80] *Id.*, §4(7).
[81] *Id.*, §§4(9), 7, 8.
[82] See National Bureau of Standards Handbook 61, "Regulation of Radiation Exposure by Legislative Means," at 27 (Dec. 9, 1955).
[83] S.D. Laws 1957, H.B. 826, §5.
[84] *Id.*, §6.
[85] *Id.*, §9.

consin, a recent enactment of that state authorizes the county board of each county, having a population of 500,000 or more, to

> . . . regulate by ordinance within the territorial limits of such county the ejection, discharge or emission into the open air of smoke, and solids, liquids, gases, fumes, acids, burning embers, sparks, cinders, soot, particulate wastes or dusts, including their radioactive fractions or counterparts, from any chimney, smokestack, vest, fuel burning equipment, open fire, apparatus, device, mechanism, substance, material or premises; . . . prescribe rules and standards in aid of such regulations; . . . provide for commencing actions to enjoin acts, threats of acts and the procuring or suffering of acts to be done in violation of such ordinance.[86]

b. Legislation Imposing Certain Duties upon Radiation Source Users or Possessors but Not Conferring Rule-Making Authority upon State Agencies

State legislation imposing a bare minimum of regulation is to be found in the laws of Arkansas,[87] Maine,[88] New Hampshire,[89] Ohio,[90] South Carolina,[91] Tennessee,[92] and Washington,[93] which, following the New England Model Act, provide:

> No person shall manufacture, construct, produce, transfer, acquire or possess any special nuclear material, by-product material, production facility, or utilization facility, or act as an operator of a production or utilization facility wholly within this State unless he shall have first obtained a license or permit for the activity in which he proposes to engage from the United States Atomic Energy Commission if, pursuant to the Atomic Energy Act of 1954, the Commission requires a license or permit to be obtained by persons proposing to engage in activities of the same type over which it has jurisdiction.[94]

These statutes, as well as similar laws in Connecticut and Massachusetts, have been discussed above.

In addition to the previously discussed laws of Connecticut and South

[86] Wis. Stat. (1957) §59.07(53).
[87] Ark. Stat. Ann. §82.1402.
[88] Me. Rev. Stat. c. 52-A, §3.
[89] N.H. Rev. Stat. Ann. c. 162-B, §2.
[90] Ohio Rev. Code §4163.02.
[91] S.C. Code §1-394.
[92] Tenn. Code Ann. §53-3102.
[93] Wash. Rev. Code §43.39.030.
[94] *Supra* note 14 at 64.

Dakota, statutes of Illinois, North Dakota, and Wyoming also impose upon the radiation source user or possessor the duty to register the source with a state agency.

The effect of two recently enacted Illinois statutes is to authorize the Department of Public Health:

> To register and inspect locations or facilities where radiation machines are used or where radioactive material is being produced, transported, stored, disposed or used for any purpose. . . .[95]

and to require:

> Every operator of a radiation installation . . . [to] . . . register such installation with the Director of the Department of Public Health . . . before said installation is placed in operation.[96]

Re-registration is required in the event that there is ". . . any change in such installation which might increase or decrease the number of sources, source strength, output or energy of radiation produced."[97] Registration forms are prescribed by the department and are to contain the following information: "the name of the operator; the location and a designation of the confines of the installation; a statement of the type and strength of the sources of radiation expected to be produced, used, operated, stored or disposed of within the installation and the approximate total number of each type; and such other information as the Department may deem necessary."[98] Registration is not intended to imply approval of the installation. Operators of registered installations are required to notify the director within thirty days after discontinuance of operations.[99] Specific provision is made for a number of exemptions from the registration requirements for non-hazardous sources of radiation.[100]

The Illinois Department of Health is authorized to inspect and investigate ". . . the premises and operations of all radiation installations in . . . [the] state, whether or not such installations are required to be registered."[101] The operation of an unregistered radiation source is enjoinable, and is made a misdemeanor on each day such offense con-

[95] Ill. Ann. Stat. c. 127, §55.32.
[96] Ill. Ann. Stat. c. 111 1/2, §§194-200.
[97] *Id.*, §195.
[98] *Ibid.*
[99] *Ibid.*
[100] *Id.*, §196.
[101] *Id.*, §197.

tinues.[102] The only express purpose of these Illinois statutes is to aid the Department of Public Health in ". . . studying and evaluating the potential hazard to the health of the people of this state caused by the increasing use and operation of . . . [radiation] machines and installations." [103] No new authority is granted to the Department to promulgate radiation protection rules and standards, nor is it authorized to refuse acceptance of registration by any source of which it does not approve.

As for North Dakota and Wyoming, it is not entirely clear what was intended by the legislatures of those states, for, while they speak of registration, they appear to have provided for licensing. The North Dakota statute designates the State Department of Health as the "registration" agency,[104] and further requires:

> Each manufacturer, processor, and refiner of radioactive isotopes and each hospital, clinic, manufacturing establishment, research or educational institution, experiment station, processing mill, or other institution or place of business or process where radiation is produced or radioactive materials are used, manufactured, processed, packaged, refined, produced, disposed or concentrated shall register.[105]

The State Health Officer is directed to issue a certificate of registration to the applicant, but it appears that he is only required to do so

> . . . upon satisfactory completion and submission of the registration form supplying the required information to determine whether the health of the public or persons working in such establishments may be adversely affected by using, manufacturing, processing, packing, refining, disposing, producing, or concentrating of such radioactive isotopes and materials.[106]

Apparently, if the information supplied by the registrant does not indicate that the installation will be safe, the State Health Officer is under no obligation to issue a certificate. Since the act makes it a misdemeanor to operate without a certificate, it would appear that this statute has all the indicia of a licensing law. Notice, however, that the above provision only applies to ". . . establishments . . . using, manufacturing, . . . [etc.] radioactive isotopes and materials." It does not speak of sources of radiation involving no radioactive materials, and presumably, the State Health Officer has no discretionary authority to withhold a regis-

[102] *Id.*, §§198, 199.
[103] Ill. Ann. Stat. c. 127, §55.32.
[104] N.D. Laws 1957, c. 185, §3.
[105] *Id.*, §4.
[106] *Id.*, §5.

tration certificate regarding such sources. It seems doubtful that the distinction was made intentionally.

The Wyoming statute appears to effect a licensing law in the same fashion as does that of North Dakota; however, it clearly applies only to places connected with radioactive materials, as distinguished from those producing radiation. The statute reads:

> Each hospital, clinic, manufacturing establishment, research or educational institution, experiment station, processing mill, or other institution or place of business or process where radioactive isotopes or materials are used, manufactured, processed, packaged, refined, produced, disposed or concentrated shall be registered with the State Department of Public Health.[107]

The statute further provides:

> The Director of the Department of Public Health, upon receipt of a properly executed application for registration and upon satisfactory compliance by such applicant with regulations and limits that are or shall be in effect governing the same exposure to such isotope or material, shall issue to the applicant a certificate of registration.[108]

Operation of the above mentioned installations without a certificate of registration is deemed to be a misdemeanor;[109] therefore, the person can be prohibited very effectively from operating should his registration form fail to satisfy the director as to the safety of the operation.

It is possible to argue that, in a rather backhanded way, the above statute authorizes the Wyoming Department of Public Health to issue regulations governing the exposure to radioactive isotopes and materials, though it would be difficult to conceive of a less precise manner of doing so. Apparently, none has been promulgated.

c Legislation Directing That Studies Be Made as to Radiation Hazards

In addition to the above considered statutes of Arkansas,[110] Connecticut,[111] Florida,[112] Illinois,[113] Maine,[114] Massachusetts,[115] New Hamp-

[107] Wyo. Comp. Stat. §63.1301.
[108] *Id.*, §63.1302.
[109] *Id.*, §63.1303.
[110] Ark. Stat. Ann. §82-1403(a).
[111] Conn. Gen. Stat. §1937d(a).
[112] Fla. Stat. Ann. §290.06(5).
[113] Ill. Ann. Stat. c. 127, §55.32.
[114] Me. Rev. Stat. c. 52-A, §4(I).
[115] Mass. Ann. Laws c. 6, §91(1) and Mass. Acts and Resolves 1957, c. 106.

shire,[116] North Dakota,[117] Ohio,[118] Rhode Island,[119] South Carolina,[120] Tennessee,[121] and Wyoming,[122] legislative action in Georgia, New Jersey, and Virginia indicates that these states are concerned at the present time with the problems of protecting persons and property against radiation hazards, at least to the extent that the problems are being studied. While the Georgia Nuclear Advisory Commission seems to be more in the nature of an economic development commission, the resolution by which it has been established contains language which indicates that the governor and the General Assembly wish to be informed upon this subject ". . . with a view toward determining whether any legislation is necessary or advisable for Georgia." [123] Similarly, the New Jersey Commission for Atomic Energy Study has been directed ". . . to make studies of the need for changes in the laws and regulations administered by any department of the State that would arise from the presence within the State of special nuclear material and by-product material and from the operation in the State of production or utilization facilities," [124] and the Virginia Advisory Legislative Council also has received similar orders and authority.[125]

2. Administrative Action

a. Comprehensive Radiation Health and Safety Regulation

Government agencies of California, Connecticut, Michigan, New York, Pennsylvania, and Texas have issued comprehensive regulations to protect employees or both employees and the public from radiation hazards. It is interesting to notice that those of the California Division of Industrial Safety,[126] the Michigan Department of Health,[127] the New York Department of Labor,[128] the Pennsylvania State Department of

[116] N.H. Rev. Stat. Ann. c. 162-B, §3(I).
[117] N.D. Laws 1957, c. 185.
[118] Ohio Rev. Code §4163.03.
[119] R.I. Gen. Laws tit. 42, c. 27, §2.
[120] S.C. Code §1-395(1).
[121] Tenn. Code Ann. §53-3103.
[122] Wyo. Comp. Stat. §63.1301.
[123] Ga. Laws 1957, H. Res. 24-50a; 2 CCH Atomic Energy Law Rep. ¶17,191.
[124] N.J. Laws 1956, Jt. Res. 16; 2 CCH Atomic Energy Law Rep. ¶17,337.
[125] Va. Laws 1958, S. Res. 29.
[126] Cal. Adm. Code tit. 8, §§3800-3861; 2 CCH Atomic Energy Law Rep. ¶¶ 17,751-17,766. Reproduced in Appendix A, Item 2.
[127] Supplement No. 13 to 1954 Mich. Adm. Code, pp. 41-70 (Feb. 14, 1958); 2 CCH Atomic Energy Law Rep. ¶¶17,871-17,891. Reproduced in Appendix A, Item 5.
[128] N.Y. Industrial Code, Rule No. 38; 2 CCH Atomic Energy Law Rep. ¶¶17,901-17,973. Reproduced in Appendix A, Item 3.

Health,[129] and the Texas Department of Health [130] were issued pursuant to the general authority of these organizations, while only those of the Connecticut State Department of Health [131] and the New York Department of Public Health [132] were promulgated pursuant to legislation authorizing them to regulate radiation hazards specifically. In none of these states, nor in any others for that matter, has a new agency been created for the purpose of enforcing radiation safety standards and regulations, and only in New Jersey has a new agency been created to promulgate such regulations. With the exception of New Jersey, in each of the above mentioned states the radiation regulations have been issued, and are being enforced, by existing agencies whose principal concern is health and safety. However, especially in New York, it does not appear that these agencies have exclusive authority within their respective states to regulate radiation hazards. Moreover, with the possible exception of Connecticut,[133] none of these states has established a system whereby the regulations of different agencies within the same state are to be made uniform and consistent with one another. Again with the exception of Connecticut,[134] none of these states requires by statute conformity with the standards of the AEC, although a measure of conformity has been achieved nevertheless, especially in Connecticut and Michigan which have issued regulations most recently. This matter of conformity with AEC standards is mentioned (and considered in greater detail below) for two reasons: (1) most of the state radiation regulations (and all of the comprehensive ones) apply to persons and activities licensed by the AEC, and (2) this assertion of state powers in a federally regulated area obviously raises a constitutional question upon which the conformity of state standards with those of the AEC will have some effect. Conflicts and inconsistencies between state and federal regulations, as they apply to atomic energy activities, should be avoided as much as possible since they cannot help but have an adverse effect on the industry, and, except in the rare case, there is no

[129] Regulation 433, Radiation Protection, Pa. Dept. of Health; 2 CCH Atomic Energy Law Rep. ¶¶18,001-18,018.

[130] Regulations on Radiation Exposure, Tex. Dept. of Health; 2 CCH Atomic Energy Law Rep. ¶¶18,351-18,373.

[131] Conn. Sanitary Code c. III, §181-1-287; 2 CCH Atomic Energy Law Rep. ¶¶17,791-17,809.

[132] N.Y. Public Health Law, State Sanitary Code c. XVI; BNA, Atomic Industry Reporter 265:611-619. Reproduced in Appendix A, Item 4.

[133] Conn. Gen. Laws §1938d creates the position of coordinator of atomic development activities.

[134] *Supra* note 49.

scientific or practical justification for them. Moreover, lack of uniformity between the states and variance from federal standards will tend to increase the possibility that the United States Supreme Court will declare an inconsistent state regulation to be an unconstitutional invasion of a federally pre-empted area of activity.[185]

All of the comprehensive state regulations are a blend (in varying proportions, as between states) of "performance" and "specification" type provisions.[186] As might reasonably be expected, these regulations tend to be of the performance type as to matters about which the least is known. For example, none of them attempts to specify how a nuclear reactor is to be shielded. This considerable problem is avoided by the simple expedient of establishing maximum permissible exposures of persons near the reactor and requiring that personnel and work areas be monitored to determine the extent of actual exposure. Thus, the physical arrangements by which radiation is to be kept below the maximum limits are left to the discretion of the owner or user under penalty of violating the law should those arrangements prove insufficient. This burden, however, is preferable to premature regulations that attempt the incredibly complex (if not impossible) task of specifying the dimensions and design of containment barriers for all sizes and types of nuclear reactors under all conditions of operation and in all sorts of locations.

Other matters, about which considerably more is known or about which no doubt could exist, are covered by specification type provisions. All of these comprehensive regulations, for example, contain detailed sections concerning standard warning labels, signs, and signals, except those of California. Some of them, especially those of Michigan which were published most recently, are fairly specific in connection with the use and installation of sources of radiation, such as X-ray machines, which are relatively less complex than nuclear reactors and have been exhaustively studied over a longer period of time.

[185] The problem of federal pre-emption of atomic energy health and safety regulations is discussed in the last part of this chapter.

[186] For a detailed discussion of performance and specification type regulations in the atomic energy field, see: Blatz, "State and Federal Radiation Safety Regulations," an address delivered at the Nuclear Engineering and Science Congress at Cleveland, Ohio in December 1955, mimeographed by the Atomic Industrial Forum, Inc.; Tabershaw and Harris, "Administrative Problems in Radiation Protection," Nucleonics, Vol. 12, No. 12, pp. 8-13 (December 1954); Taylor, "State Control of Protection Against Ionizing Radiation," American Journal of Roentgenology, Radium Therapy and Nuclear Medicine, Vol. LXXI, No. 4, pp. 691-702 (April 1954); Taylor, "The Achievement of Radiation Protection by Legislative and Other Means," Progress in Nuclear Power, Series VIII—The Economics of Nuclear Power, pp. 418-429 (1957).

A comparison of the regulations of California, which were last revised in January of 1955, and of Michigan, which became effective on February 14, 1958, and those of the other states which were issued during the interim period, may justify the observation that there appears to be a trend toward greater specificity. Certainly, those of Michigan are considerably more detailed and comprehensive than are the regulations of California. Moreover, if the regulations of Connecticut and Michigan are any indication, the recent tendency appears to be toward adopting the general standards of the AEC, at least where the state regulations affect federal licensees.[137]

To give some indication of these trends, the comprehensive state radiation health and safety regulations are discussed in the order in which they have made their appearance—starting with California and ending with Michigan.

(1) California

The California General Industry Safety Orders on "Radiation and Radioactivity" were promulgated to establish minimum standards for the protection of employees from injurious levels of ionizing radiation.[138] The general scheme of these regulations is to provide maximum permissible exposure limits for employees; to require radiation safety supervision by competent technical personnel and safety instruction of employees regularly or frequently exposed; to require radiation monitoring of exposed employees and work locations containing sources of radiation and records of these surveys and measurements; and to provide certain operating rules relative to maintenance of protective devices, handling and disposition of radioactive materials, and warning signs or signals.

The California regulations contain repeated references to National Bureau of Standards handbooks and reflect an obvious desire to conform to the standards of the National Committee on Radiation Protection and Measurement.[139] However, in this they are not altogether

[137] A recently proposed, but as yet ineffective, set of regulations for New York City would simply define "maximum permissible dose" as that "dose rate recommended by the National Committee on Radiation Protection and Measurement." 2 CCH Atomic Energy Law Rep. ¶17,974, §213.01(d).

[138] *Supra* note 126, §3800.

[139] The National Committee on Radiation Protection and Measurement (NCRPM) was formed in 1929 as the Advisory Committee on X-ray and Radium Protection upon the recommendation of the International Commission on Radiological Protection. It

successful, nor do they conform with AEC standards in all respects. Maximum permissible exposures are expressed in rads, whereas the AEC and the NCRPM use the rem (or millirem) as the unit of measurement.[140] Relative biological effect factors are included, however, so that conversion from rads to rems may be made. Such a conversion indicates that California may have been anticipating the apparent trend in the direction of lower permissible limits, for its weekly exposure standards are lower than the current weekly standards of the AEC and the

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has since expanded the scope of its concern to include all known sources and types of ionizing radiation. The NCRPM is sponsored by the National Bureau of Standards and governed by representatives of participating organizations. The reports and recommendations of the NCRPM are published in National Bureau of Standards handbooks.

[140] The reader will recall, from the discussion in Part I, Chapter I, that there are a number of units in which quantities of various kinds of radiation may be expressed: the roentgen, the rep, the rad, and the rem. The roentgen is the quantity of X or gamma radiation such that the associated corpuscular emission per 0.001293 grams of air produces, in air, ions carrying one electrostatic unit of quantity of electricity of either sign. (National Bureau of Standards Handbook 59 at 6.) It is not a unit of absorbed dose, but will result in the absorption of 83 ergs of energy in one gram of dry air at standard temperature and pressure or about 94 ergs of energy in one gram of soft tissue. The limitations of this unit are that it applies only to X and gamma radiation and it does not express the amount of energy absorbed by various types of target material.

The rep, or roentgen-equivalent-physical, is a unit of any nuclear radiation (alpha or beta particles, neutrons, protons, etc.) that results in 93 ergs of energy being absorbed in one gram of soft tissue, and thus it is comparable to the roentgen. (National Bureau of Standards Handbook 59 at 6.) It shares one of the limitations of the roentgen in that it does not indicate the amount of energy absorbed by substances with a greater density than soft tissues.

The rad was adopted in 1953 to signify the unit quantity of absorbed dose due to any kind of ionizing radiation that would cause one gram of any target material to absorb 100 ergs of energy. It is a measure of the energy imparted to matter by ionizing particles per unit mass of irradiated material at the place of interest. (National Bureau of Standards Handbook 59 at 6; National Bureau of Standards Handbook 61 at 38.)

All three of the above units are subject to a third limitation: they do not express the unit of radiation in terms of its biological effect upon the target material or, what is more important, in terms of its effect on various types of human tissue. While all kinds of ionizing radiation are capable of producing the same kinds of biological effect, their ability to do so is not the same. In producing some effects, certain radiations are more effective than others, in the sense that a smaller absorbed dose of these radiations is required to produce a given degree of effect. This "biological effectiveness" depends upon the type of result under consideration, the specific ionization of the particular type of radiation, the type of cell or tissue, the organism studied, the conditions of exposure, the time distribution of the dose, etc. Insofar as possible, "relative biological effectiveness" factors (relative to that of lightly filtered X-rays generated at potentials of 200 to 300 kilovolts) have been determined empirically, or estimated, for particular biological systems and for various types and energies of radiation.

In the protection problem it is sufficient to consider the effects of radiation on certain

NCRPM.[141] Dose limits are prescribed for the "whole body" and the "hands," as measured in the basal layer of the epidermis, instead of following the more elaborate anatomical breakdown of the federal regulations.[142] As for allowed concentrations of radioactive materials in the atmospheres of workrooms, the California regulations express the maximum limits in much less precise terms than do the AEC regulations or the NCRPM recommendations.[143] Unlike the AEC, California makes no distinction as to employees under eighteen years of age,[144] nor is the NCRPM recommendation allowing double doses for persons over

critical organs, which are generally taken by the AEC and the NCRPM as the skin, blood-forming organs, gonads, and lenses of the eyes, and for certain potential effects on these organs under specified modes of exposure.

The combination of RBE factors and the rad unit of absorbed dose (the rep before 1953) has resulted in a fourth unit—the rem or roentgen-equivalent-man. The rem is defined as the quantity of any radiation such that the energy imparted to a biological system (cell, tissue, organ, or organism) per gram of living matter by the ionizing particles present in the region of interest, has the same biological effectiveness as an absorbed dose of 1 rad from lightly filtered X-rays generated at potentials of 200 to 300 kilovolts. (National Bureau of Standards Handbook 61 at 39.) Therefore, a dose in rems is equal to the dose in rads multiplied by the appropriate RBE factor, or, conversely, a dose in rads equals the dose in rems divided by the appropriate RBE factor.

For particulate ionizing radiation, such as alpha and beta particles, neutrons, protons, and deutrons, both the AEC and the NCRPM have elected to express exposure limits in rems or millirems (a one-thousandth part of a rem). As for X- and gamma radiation, the NCRPM continues to express exposure limits in millirads. Due to the inaccuracies implicit in arriving at a particular RBE factor, many scientists feel that it is best to do as the California Division of Industrial Safety has done, and specify exposure limits in rads and indicate the estimated RBE factor on which the particular limit is based.

[141] For example, conversion (from rads to rems) of the California exposure limits, where the entire body is exposed and the absorbed dose is measured in the skin, indicates that no more than 500 millirems is permitted. Under the same conditions, the regulations of the AEC and the recommended standards of the NCRPM would allow 600 millirems of any radiation to the skin and 1500 millirems of any low penetrating radiation (with a half-value-layer of less than one millimeter of soft tissue.) 10 Code Fed. Regs. §20.101. National Bureau of Standards Handbook 61 at 52.

[142] The regulations of the AEC and the recommendations of the NCRPM break down weekly dose limits into three conditions: (1) type of radiation, (2) conditions of exposure, and (3) critical organs affected. Conditions of exposure include exposure of the whole body, the hands and forearms, feet and ankles, and head and neck. Under these conditions of exposure permissible doses are given for the skin, the blood-forming organs, the gonads, and the lenses of the eyes. 10 Code Fed. Regs. Pt. 20, App. "A" and National Bureau of Standards Handbook 61 at 56.

[143] In the California regulations permissible concentrations of radioactive materials in the air of workrooms is expressed in the form of only two classes: alpha emitters and beta and gamma emitters. In the NCRPM recommendations such concentrations are expressed for each radioisotope. National Bureau of Standards Handbook 61 at 56.

[144] 10 Code Fed. Regs. §20.101(c).

forty-five followed.[145] Finally, the California regulations do not limit the exposure of non-employees or regulate the amount of radiation in areas other than employment locations.

To insure that the exposure standards are met, the California regulations require that all radiation operations are to be under the supervision of competent technical personnel, who are described as persons capable of evaluating radiation hazards and specifying protection techniques. Furthermore, employees must be under the supervision of a competent medical expert, and those who are regularly exposed must be instructed in radiation hazards and methods of protection.[146]

To determine whether radiation is being kept within the prescribed limits, workrooms and other locations containing radiation machines or radioactive materials are to be monitored and inspected periodically or according to a schedule established by the Division of Industrial Safety. Exposed employees are to wear monitoring devices as well, and permanent records of dosage measurements are to be kept.[147]

Also included in the California regulations are certain general operating rules. If monitoring indicates that protective devices are defective, operations are to be terminated until the defects are remedied, and employees who have been exposed to excessive radiation are to be referred immediately to the medical supervisor.[148] Wherever unsealed radioactive materials are handled, adequate ventilation must be provided, radioactive wastes are not to be allowed to accumulate, immediate decontamination is to be undertaken in the event of accident, eating is forbidden, and adequate protective clothing is to be worn.[149] Radioactive materials stored in workrooms are to be enclosed and shielded, and other storage areas are to be isolated by construction or location and ventilated if the material is not contained.[150] General orders regarding the placement of warning signs at locations where radiation may be encountered and on containers of radioactive materials are provided.[151] Special orders for radium dial painting are provided which prohibit dry application and require ventilation hoods. Also included are specifications as to radium compound containers and brushes as well as rules regarding their use.[152]

[145] National Bureau of Standards Handbook 61 at 52.
[146] *Supra* note 126, §§3802(a) and (b), 3811, 3812.
[147] *Id.*, §3804.
[148] *Id.*, §3805.
[149] *Id.*, §3806.
[150] *Id.*, §3807(a) and (b).
[151] *Id.*, §§3807(c), 3808.
[152] *Id.*, §3810.

The California regulations prohibit the operation of "totally protective installations" while employees are within the confines of the barrier. Automatic interlocks are required on the entrances, at least one of which must operate from the inside, and visible or audible signals are required while ionizing radiation is being produced.[153]

(2) New York

New York is the only state which at the present time has more than one set of comprehensive radiation health and safety regulations. In September of 1955 Chapter XVI of the New York State Department of Health's Sanitary Code became effective. The following December Rule Number 38 of the New York Department of Labor Industrial Code also became effective; it applies "to every place where any employee in the course of his work may be exposed to radiation in excess of one tenth the permissible weekly dose" except medical, dental, veterinary, and educational institutions, clinics, and offices, which are subject to the provisions of the Sanitary Code.[154] Unfortunately, it is not entirely clear whether the Sanitary Code may be applied to installations subject to the Industrial Code. (This matter is considered in more detail below.)

The scheme of both sets of New York regulations is to establish performance standards, in the form of maximum permissible doses of radiation to persons (other than persons receiving radiation diagnosis or treatment), and then to provide a system of safety and medical supervision, registration and reporting, monitoring and inspection, and operating rules and specifications to insure that the exposure standards are met.

In essential respects the maximum permissible radiation dose limits of the two New York regulations are similar; however, sufficient difference does exist to cause difficulty. Both the Sanitary and the Industrial Codes establish limits to radiation from sources which are outside and inside the body. The limits of radiation exposure to sources outside the body are very nearly identical with the current permissible exposure standards of the AEC[155] in that the same unit (millirems), time period (week), conditions of exposure (whole body, hands and forearms, etc.), anatomical scheme (skin, blood-forming organs, gon-

[153] *Id.*, §§3801(d), 3809.

[154] *Supra* note 128, §38-1. See also the definition of "radiation installation" in the Sanitary Code, *supra* note 132, Reg. 1(g).

[155] 10 Code Fed. Regs. §20.101 and App. "A".

ads, and the lenses of the eyes), and amounts are specified.[156] The Industrial Code, however, does appear to contain a drafting error or oversight. Under the heading "Permissible Weekly Dose Limit" it is provided that:

> For employees whose entire body or major portion thereof is exposed to radiation of very low penetrating power from external sources: 300 mrem in the lenses of the eyes; 1500 mrem *in any other part of the body.*[157]

It seems doubtful that this means what it says, for such a dose to the gonads or the blood-forming organs is not recommended. The provision probably was intended to read like that of the Sanitary Code: "1500 mrems *in the skin*" (of any other part of the body).[158]

Both sets of New York regulations limit the exposure to sources of radiation inside the body by specifying the allowable concentrations of radioactive materials in air and water ingested by the persons to be protected. Included in the Industrial Code is a table which sets forth the maximum permissible average concentrations of inhaled or ingested radioactive materials in microcuries per unit of air or water,[159] which is identical with a table found in the federal regulations.[160] No such table is included in the Sanitary Code, which simply refers to "nationally recognized limits" and, more specifically, to National Bureau of Standards handbooks, in stating permissible concentrations.[161] Presumably, a change in these nationally recognized standards is expected to produce an automatic and corresponding change in the permissible concentration limits of the Sanitary Code.

The Sanitary Code also differentiates between the exposure of persons inside and persons outside of the radiation installation. Operations are to be carried on so that persons outside shall receive no more than one tenth the dose to which persons inside the installation may be subjected. Persons under eighteen years of age are to receive no more than one tenth of "inside" dose no matter where they are located.[162] The Industrial Code also observes this AEC rule[163] of limiting the dose to minors, and while theoretically these exposure limits are designed to

[156] *Supra* note 128, §38-6; *Supra* note 132, Reg. 4.
[157] *Supra* note 128, §38-6.1(2).
[158] *Supra* note 132, Reg. 4(b)(2).
[159] *Supra* note 128, §38-6.1(7) and Table I.
[160] 10 Code Fed. Regs. Pt. 20, App. "B", Table I.
[161] *Supra* note 132, Reg. 4(c).
[162] *Id.*, Reg. 4(e) and (i).
[163] 10 Code Fed. Regs. §20.101(c).

protect employees only, the AEC distinction between dose levels in "restricted" and "unrestricted" areas is observed as well by a provision that commands the owners of all radiation sources so to shield, isolate, protect, or otherwise arrange and control them as to avoid exposure of their own or another's employees outside the installation to radiation in excess of ten per cent of the permissible inside dose.[164]

Both the Sanitary and the Industrial Codes follow the AEC and the NCRPM practice of allowing weekly doses up to three times the basic limits if during the thirteen week period the total dose does not exceed ten times the general weekly limits.[165] Only the Sanitary Code, however, is in accord with the NCRPM practice of authorizing double doses to persons forty-five and older in special cases.[166]

Both New York codes require the registration of radiation installations, and the Industrial Code requires registration of "mobile sources" as well.[167] By virtue of the fashion in which the term "installation" is defined by the two sets of regulations, however, double registration should not be required of any source. Registration under the Sanitary Code must include a summary of the radiation safety program, while the Industrial Commissioner merely need be informed as to the name and qualifications of the person in charge of radiation protection. A change in the character of the radiation installation which might increase exposure is considered a new installation and requires re-registration under the Sanitary Code, while, under the Industrial Code, the Commissioner is to be advised of such changes.[168]

Radiation safety supervision, in the form of a person or persons responsible for all necessary precautions, is required by both sets of New York regulations. The Sanitary Code merely requires that "all radiation installations shall be operated by or under the direction of a competent person who shall be responsible for all necessary safety precautions."[169] No qualifications are stated. The Industrial Code, on the other hand, contemplates more elaborate supervision: a "radiation safety supervisor" for each source and a "radiation safety officer" for sources creating a "high radiation area or a high airborne concentration area." High standards of technical competence are specified for the

[164] *Supra* note 128, §38-5.4.

[165] *Id.*, §38-6.2; *supra* note 132, Reg. 4(b)(4); 10 Code Fed. Regs. §20.101(a)(2); National Bureau of Standards Handbook 61 at 55.

[166] *Supra* note 132, Reg. 4(h); National Bureau of Standards Handbook 61 at 52.

[167] *Supra* note 128, §38-4; *supra* note 132, Reg. 2.

[168] *Ibid.*

[169] *Supra* note 132, Reg. 5.

radiation safety officer, while the radiation safety supervisor only need be instructed and trained by an officer.[170]

Radiation safety instruction of all persons working with radiation equipment or radioactive materials is required by both New York codes.[171] The Industrial Code also requires that employees who work in radiation areas be informed of the presence of radiation and instructed in necessary measures for protection.[172]

Monitoring of radiation installations is required by the Sanitary and Industrial Codes, as is personnel monitoring; however, the details of these surveys are treated somewhat differently under the two codes. The Sanitary Code requires surveys of radiation installations where radioactive material is present, but not contained in a sealed source, at least once a month. Other installations, where radiation equipment or sealed containers of radioactive materials are used, must be surveyed upon original establishment and whenever changes are made or physical conditions may cause changes. Records of these surveys and measurements must be kept for a period of five years, and must be open to inspection by health officials.[173] The Industrial Code does not specify when radiation surveys are to be made; however, the records of those which are made must be maintained indefinitely and may be inspected by the "attending physician of any person who may have undergone exposure" as well as by the Labor Commissioner.[174] The personnel monitoring required by both sets of regulations applies to all persons who may possibly receive routinely a weekly radiation dose in excess of one fourth the maximum permissible dose.[175] In high radiation areas, the Industrial Code also requires personnel monitoring of any employees when the dose rate may exceed 100 mrems in any one hour. Individuals may obtain a summary statement of their exposure records under either set of regulations.

The Sanitary Code requires annual physical examinations of all persons who might regularly ingest or inhale radioactive materials in concentrations exceeding one quarter of the maximum permissible amounts, and persons subject to external radiation are to be examined too, but the code does not specify how often.[176] The Industrial Code apparently

[170] *Supra* note 128, §§38-5.2, 38-5.3.
[171] *Id.*, §38-5.11; *supra* note 132, Reg. 5(a) and (b).
[172] *Supra* note 128, §38-5.10.
[173] *Supra* note 132, Reg. 12.
[174] *Supra* note 128, §§38-7.1, 38-8.3.
[175] *Id.*, §38-9; *supra* note 132, Reg. 6.
[176] *Supra* note 132, Reg. 7.

assumes that physical examinations will be given, since records of them must be maintained,[177] but the regulations do not specifically require such examinations.

Reporting to appropriate officials in the event of excessive exposures to individuals is necessary under both sets of New York regulations, although the conditions are somewhat different. Under the Sanitary Code doses in excess of five times the maximum permissible weekly dose must be reported within three days to the health officer having jurisdiction,[178] whereas ingestion of "an excessive amount of radioactive material" or total thirteen week doses in excess of ten times the permissible weekly dose must be reported to the Labor Commissioner within seven days of discovery under the Industrial Code.[179] The Sanitary Code also requires reporting, by telephone or telegraph, to the health officer having jurisdiction of the following events: the discharge of excessive amounts of radioactive wastes; the spillage, loss, or theft of radioactive materials; incidents affecting the security of storage places; and other circumstances giving rise to radiation hazards. This requirement must be observed by the person in charge of any radiation installation, irrespective of whether it is registered with the Department of Health. Furthermore, physicians are required to report all cases of radiation injury or illness, caused by non-therapy radiation, to the New York State Department of Health.[180] Presumably, radiation injury or illness caused by diagnostic procedures do have to be reported.

The Industrial Code contains a brief directive as to storage of radioactive materials not in use, requiring that they "be stored in properly shielded and secured containers." [181] Such a requirement is only implicit in the Sanitary Code, but the operator of a radiation installation is directed to maintain an accurate account of all radioactive materials.[182] On the other hand, control of radioactive waste disposal is only implicit in the Industrial Code,[183] whereas the Sanitary Code contains specific provisions on this subject.[184] Neither the standards of the AEC nor the recommendations of the NCRPM have been followed, however, for the provision of the Industrial Code merely prohibits the

[177] *Supra* note 128, §38-8.
[178] *Supra* note 132, Reg. 6.
[179] *Supra* note 128, §38-6.3.
[180] *Supra* note 132, Reg. 16.
[181] *Supra* note 128, §38-11.
[182] *Supra* note 132, Reg. 15.
[183] *Supra* note 128, §38-5.4.
[184] *Supra* note 132, Reg. 9.

discharge of radioactive wastes into the environment in a manner that will lead any person to receive a dose in excess of one tenth the occupational dose. Where waste discharges of two or more users into the same environment are additive, they must either enter into a mutual agreement, "each to limit his release, so that the total comes within the permissible limit specified," or the State Commissioner of Health will make the determination as to each. This provision of the Sanitary Code is not directed simply to radiation installations required to register under Regulation 2. The question is whether it applies to installations subject to the Industrial Code. In view of the broad grant of authority to the New York State Department of Health to supervise and regulate the "public health aspects of the use of ionizing radiation and the handling and disposal of radioactive wastes," [185] and the all inclusive phrasing of Regulation 9, the implication is that disposal of radioactive wastes by all users in New York comes under the Sanitary Code.

Other provisions included in the Sanitary Code, but not in the Industrial Code, are those which require the filtration equivalent of at least two millimeters of aluminum and automatic, four minute, shutoff timers on diagnostic X-ray equipment,[186] automatic interlocks and signs or signals on radiation therapy rooms,[187] and prescribe installation and operation specifications for shoe-fitting fluoroscopes.[188] Instead of simply banning shoe-fitting fluoroscopes (which seems to be the most sensible course), the New York State Department of Health has chosen so to burden and restrict their use and operation that it is difficult to see how anyone would find it profitable to use one. Finally, the Sanitary Code requires the identification of cadavers containing radioisotopes, specifying that a report accompany every cadaver containing more than five millicuries of radioactive material. Autopsies of such cadavers are not to be commenced without the consultation and advice of a hospital radiation safety officer.[189]

(3) Pennsylvania and Texas

The radiation health and safety regulations of Pennsylvania and Texas became effective in October and September of 1956, respectively. The departments of health of both these states closely followed the

[185] *Supra* note 65.
[186] *Supra* note 132, Reg. 8.
[187] *Id.*, Reg. 13.
[188] *Id.*, Reg. 19.
[189] *Id.*, Reg. 11.

suggested regulations of the NCRPM [190] with the result that their regulations are very nearly identical. These regulations are applied to "the use of all radiation, radiation machines, and radioactive materials," and are intended "to insure the maximum safety to all persons at, or in the vicinity of, the place of use, storage, or disposal thereof." [191] The regulations, however, are not intended "to limit the kind and amount of radiation that may be intentionally applied to a person for diagnostic or therapeutic purposes by, or under the direction of, a physician or dentist," nor do they apply to radiation machines not in use and certain specified quantities of radioactive materials which are considered to be harmless.[192]

The general plans of these regulations are similar to those previously discussed in that they prescribe maximum permissible doses; impose responsibility for radiation safety upon a designated person; require area and personnel monitoring, registration, keeping of survey and dosage records; and include operating rules relative to the storage of radioactive materials, disposal of radioactive wastes, radioactive contamination controls, and information labeling.

The maximum permissible doses allowed by the Pennsylvania and Texas regulations are identical with those suggested by the NCRPM in December of 1955.[193] Exposures to external sources of radiation are specified according to type of radiation, conditions of exposure, and critical organs affected.[194] Internal radiation exposures are controlled by limiting concentrations of radioactive materials in air and water used by individuals to those prescribed for each radioisotope.[195] Maximum permissible radioisotope concentrations in air and water are given for occupational areas, in terms of an eight and a twenty-four hour work day, and for non-occupational environments into which radioactive wastes are discharged.[196] These concentrations are nearly the same as those required by AEC regulations.[197] Unlike the AEC standards, no distinction is made as to minors in occupation areas and double exposures are allowed for persons over forty-five in certain situations. Like the AEC standards, however, exposures up to three times the basic

[190] National Bureau of Standards Handbook 61 at 36.
[191] *Supra* notes 129 and 130, §1.
[192] *Id.*, §4.
[193] National Bureau of Standards Handbook 61 at 41, 51-59.
[194] *Supra* notes 129 and 130, §§7b, 15d, and Table 2.
[195] *Id.*, §7e and Table 5.
[196] *Id.*, §§14d(1), 15g, and Table 5.
[197] 10 Code Fed. Regs. Pt. 20, App. "B", Tables I and II.

weekly dose are allowed provided the total quarter-year dose does not exceed ten times the basic weekly limit.[198] No yearly limits are specified.

Sections entitled "Responsibility" require that "all work performed in an installation where radiation may be present shall be under the direction of a person responsible for the radiation safety therein." Imposed upon this person are the duties of: informing himself and persons who may be exposed as to radiation hazards, safe working practices, and necessary safeguards; accounting for radioactive materials; insuring adequate shielding; and conducting exposure surveys.[199] It is interesting to notice that in the NCRPM recommendations and the Texas regulations the person responsible for radiation safety "shall insure beyond reasonable doubt" that certain things are done, while those of Pennsylvania require that he "shall take all necessary precautions" that the same things are done.[200] A second change and an addition found in the Pennsylvania regulations regarding "responsibility" indicate that a higher duty of care is imposed in this state. It is there provided that the person responsible for radiation safety

> . . . shall take all necessary precautions that every employee and authorized visitor shall use such safety devices as are furnished for his protection and carry out all radiation safety rules that concern or affect his conduct.[201]

Under the NCRPM recommendations and the Texas regulations, this is the responsibility of "every employee and authorized visitor" and not the safety officer alone. Furthermore, to this section the Pennsylvania Department of Health has appended the statement:

> The designation of a person responsible for radiation safety shall in no way relieve the owner, management, or user from responsibility for compliance with the provisions of this regulation.[202]

"Any person using or operating any radiation machine, or storing, manufacturing, using, or handling any radioactive material" in Pennsylvania or Texas must register with the state health department. In New York the installation or mobile source is to be registered by the owner or the organization conducting the business or activities carried on within the radiation installation. Obviously the Pennsylvania and

[198] *Id.*, §20.101(a)(2); *supra* notes 129 and 130, §15d.
[199] *Supra* notes 129 and 130, §10.
[200] *Ibid.*
[201] *Supra* note 129, §10b(10).
[202] *Id.*, §10b(11).

Texas regulations impose the duty to register on a considerably broader group of persons. The registration must include an estimate of further acquisitions during the year, and acquisitions causing radiation in excess of the estimate must be registered promptly. Acknowledgement of registration does not imply state approval of any feature of the radiation operation.[203]

Regularly scheduled radiation surveys are required for all accessible areas in the vicinity of a radiation-producing source where there is a reasonable possibility that a person could receive more than one quarter of the maximum permissible dose. Personnel monitoring is required for all persons who may possibly receive a dose in excess of the same amount.[204] Records of these measurements are to be kept available indefinitely for health department inspection, and, upon termination of a person's employment, and at the request of the department, a summary record of the person's exposure is to be forwarded to the health department. In addition, accidental exposures in excess of five times the permissible amounts must be reported within seven days of their discovery.[205]

The provisions of the Pennsylvania and Texas regulations which concern the storage and handling of radioactive materials and the disposal of radioactive wastes are more elaborate than those of California and New York. They are, nevertheless, performance type rules in that they establish operation and construction standards and do not specify dimensions or details of design.[206]

(4) Connecticut

The Connecticut radiation health and safety regulations were adopted by the State Department of Health in October of 1957, and were the first set of comprehensive state regulations that became effective after the AEC issued its "Standards for Protection Against Radiation." [207] Under these regulations, "when the source of radiation is outside the body, the maximum permissible doses for persons occupationally engaged in radiation work" are not to exceed "those established for the purpose by the United States Atomic Energy Commission." Similarly, "when the source of radiation is within the body, radiation dosages"

[203] *Supra* notes 129 and 130, §6.
[204] *Id.*, §8.
[205] *Id.*, §9.
[206] *Id.*, §§11, 12, 14.
[207] 10 Code Fed. Regs. Pt. 20 became effective on Feb. 28, 1957.

are to be controlled "by limiting the average rates at which radioactive materials are taken into the body by inhalation or by ingestions" and the average concentrations of radioisotopes are not to exceed "the maximum permissible concentration established by the United States Atomic Energy Commission." Persons under eighteen years of age and persons not occupationally engaged in radiation work are not to receive more than ten per cent of occupational dose.[208] Although it can be seen that the Connecticut Department of Health intended to follow the standards of the AEC, some variance exists, for they have applied a different distinction. Prescribing "occupational" and "non-occupational" doses (as the NCRPM has done) is not the same as prescribing, as does the AEC, doses for "restricted" and "unrestricted" areas. The term "restricted area means any area access to which is controlled by the licensee," except residential space.[209] The AEC, therefore, applies the same limits to all persons in the restricted area, whereas Connecticut applies two different limits depending upon whether or not the person exposed is "occupationally engaged in radiation work." The Connecticut standards also differ from those of the AEC in that they do not appear to allow any weekly doses in excess of the basic limits.

Subsequent modification of the Connecticut standards, so as to conform with changes in AEC and NCRPM standards, is contemplated in a section which provides:

> Whenever the United States Atomic Energy Commission or the National Committee on Radiation Protection [and Measurement] publish modifications in their respective standards or recommendations, such modifications shall be operative within the scope of this regulation immediately upon the issuance of an emergency order by the department to interested parties including registrants.[210]

Annual registration of radiation installations and mobile sources is required in Connecticut, as well as re-registration "when any increase is contemplated in the number of sources, the source strength, the output or the types of radiation energy involved." [211] Only the owner of the installation or mobile source, however, is required to register.[212]

The Connecticut regulations require personnel monitoring and regularly scheduled area radiation surveys under conditions similar to those

[208] *Supra* note 131, §E.
[209] 10 Code Fed. Regs. §20.3,(a)(12).
[210] *Supra* note 131, §N.
[211] *Id.*, §C.
[212] *Supra* note 131, §F.

imposed by the Pennsylvania and Texas regulations.[213] Individual personnel exposure records and records of radioactive materials released into the environment must be maintained.[214] "Any exposure of twenty-five rems or more" is to be reported to the State Department of Health within twenty-four hours, and "an accidental exposure of a person to three rems or more" is to be "promptly reported." Loss or theft of radioactive materials is to be "immediately reported." [215] Supervision of all radiation installations and mobile sources, by a "person qualified to evaluate radiation hazards and to advise with respect thereto," is required, as is medical consultation service by a qualified, licensed physician.[216]

The operating rules of the Connecticut regulations are, for the most part, of the performance type. Storage of radioactive materials, for example, must be done in such a manner that "no person will inadvertently receive a dose in excess of the limits" specified in the section on maximum permissible doses.[217] No specifications are provided regarding storage places or containers. Similarly, "all work with radioactive materials" is to be "carried out under such conditions as to minimize the possibility of any contamination that would result in any person's being subjected to radiation levels exceeding those specified" in the section on maximum permissible doses. More specifically, however, where contamination of a person or his clothing is possible, "(1) both shall be monitored, (2) persons' bodies shall be decontaminated, [and] (3) clothing shall either be decontaminated or disposed of in a manner approved by the department." [218]

The section of the Connecticut regulations on "disposal of radioactive wastes" is similar to the provisions of the AEC regulations [219] and allows the discharge of radioactive wastes into the air, water, or sewage systems and the burial of radioactive wastes under virtually the same conditions as does the AEC. Where two or more owners are discharging radioactive wastes into the same environment, they must file a statement of their agreed prorated releases for approval of the State Department of Health, or the Department may arbitrarily assign quantities to them severally.

[213] *Supra* notes 129 and 130 at §6. National Bureau of Standards Handbook 61 at 41.
[214] *Id.*, §G(a) and (b).
[215] *Id.*, §G(c) and (d).
[216] *Id.*, §§H, I.
[217] *Id.*, §J.
[218] *Id.*, §K.
[219] *Id.*, §M. 10 Code Fed. Regs. §§20.301-20.304.

(5) Michigan

In November of 1957 the Michigan Department of Health adopted a comprehensive set of radiation health and safety regulations which became effective on February 14, 1958. While the Michigan regulations are not to be construed as limiting "the intentional exposure of patients to radiation for the purpose of medical diagnosis, medical therapy, or medical research conducted by duly licensed members of the healing professions," they apply "to all persons who receive, possess, or use materials or devices capable of emitting ionizing radiation," except certain exempted sources which have no significant effect on health.[220]

By virtue of Part I of the Michigan regulations the State Health Commissioner is to appoint the members of the Commissioner's Radiation Committee, which is to consist of nine members, each of whom is to be selected on the basis of his "recognized knowledge in the field of radiation." The purpose of this committee is to review "these regulations at least once annually and at such other times, not to exceed four times a year, as may seem necessary." The Commissioner acts as chairman of the committee.[221]

These regulations are to be enforced by personnel of the Michigan Department of Health, but the "Commissioner may delegate authority to county, city or district health departments to enforce" them.[222]

Following the method of the AEC, the Michigan regulations establish permissive dose levels and concentrations in "controlled" and "uncontrolled" areas as well as allowed concentrations of radioactive effluents in "uncontrolled" areas. The permissible weekly exposure standards for persons in controlled areas are identical with the current standards of the AEC for "restricted" areas as to units, amounts, conditions of exposure, and critical organs affected. Also authorized are exposures up to three times the basic weekly dose if the quarter year dose does not exceed ten times the permissible weekly limit. Exposures of persons under eighteen in controlled areas must be kept to ten per cent of the basic dose. The AEC limits for allowed concentrations of airborne radioactive materials in controlled areas are followed. This

[220] *Supra* note 127, R. 325.1305.

[221] The function of the committee is advisory only. Committee approval of radiation health and safety regulations is not a condition precedent to effectiveness, however prior approval of a majority of the members of the State Council of Health is required. See Mich. Stat. Ann. §14.7.

[222] *Supra* note 127, R. 325.1304. It might be added that the local boards of health appear to have ample authority to issue their own regulations concerning radiation. See Mich. Stat. Ann. §§14.63, 14.64.

section also contains a rule limiting the "maximum permissible accumulated dose, in rems . . . [to] 5 times the number of years beyond the age of 18." Moreover, no annual increment is to exceed fifteen rems.[223] Michigan, therefore, apparently is the first state to follow the recent recommendations of the NCRPM and the cumulative dose standard which the AEC is now applying in its own installations.[224]

Permissible levels of radiation in uncontrolled areas in Michigan are also identical with the current standards of the AEC.[225] Registration of a radiation source is to include information on "anticipated average radiation levels and anticipated occupancy times for each uncontrolled area involved," and *may* include "proposed limits on levels of radiation in uncontrolled areas." Should it be demonstrated "that the proposed limits are not likely to cause any individual to receive a dose in any period of 7 consecutive days in excess of 10%" of the basic dose for controlled areas, "the state health commissioner *may* approve the proposed limits." [226] The succeeding subsection imposes limits on concentrations of radioactive materials released into the atmosphere of uncontrolled areas which are identical with AEC requirements.[227] Here, again, the registrant must include "information as to anticipated average concentrations and anticipated occupancy time for each uncontrolled area," and he also *must* include "proposed limits of concentrations . . . released into the air in uncontrolled areas." Curiously enough, "if the registrant demonstrates that it is not probable that any individual will be exposed to concentrations in excess of the limits specified," the Commissioner *"will* approve the proposed limits." [228] The reasons for this distinction are obscure.

[223] *Id.*, R. 325.1309.1.

[224] The NCRPM proposal to limit the maximum permissible accumulated dose to five rems per year for any age beyond eighteen was announced in a preliminary statement dated January 8, 1957. 1 CCH Atomic Energy Law Rep. ¶4034. This rule was subsequently incorporated into the National Bureau of Standards Handbook 63, "Protection Against Neutron Radiation Up to 30 Million Electron Volts." A statement of the AEC, issued December 10, 1957, announced the approval for use in its own facilities and those of its contractors the new maximum permissible accumulated doses of the NCRPM. It also announced that it was currently considering amending 10 Code Fed. Regs. 20 to make this regulation consistent with the new recommendations. 1 CCH Atomic Energy Law Rep. ¶4050.

[225] *Supra* note 127, R. 325.1309.2.2.

[226] *Id.*, R. 325.1309.2.1. The language of this provision is nearly identical with that of 10 Code Fed. Regs. §20.102 except that the AEC *"will* approve the proposed limits" if the conditions are met.

[227] *Id.*, R. 325.1309.3.

[228] *Id.*, R. 325.1309.3.1. Under the federal regulations "there *may* be included in any application for a license or for amendment of a license proposed limits upon concen-

While the Michigan Department of Health has taken practically all of the language of Section 9 on "basic standards" from the AEC regulations, it also has deemed it necessary to add a paragraph which contains rules and packaging specifications for radioactive materials which are transferred or moved through uncontrolled areas.[229]

Registration of "all sources of ionizing radiation" with the State Health Commissioner "by the legal owner, user or an authorized representative" is required in Michigan. In addition to the name and address of the person registering, and the above mentioned items, the name, training, and qualifications of the individual responsible for safety, and the location, type, and capacity of the radiation source is to be included in the registration. Installation changes which materially increase the potential health hazard must receive the prior approval of the Commissioner.[230]

Except for the above reference in the registration section to the "individual who will be appointed by the owner or user to see that the radiation source is safely used and stored," the Michigan regulations are silent on the subject of radiation safety personnel. Neither do these regulations mention medical supervision or required physical examinations.

In the event of excessive exposures, the rule of the AEC is followed,[231] and the subsequent exposure of the individual must be reduced to ten per cent of the basic limit until such time as the average dose over the period is within acceptable limits again.[232] In addition, the following incidents must be reported to the State Health Department by phone and telegraph: (1) within six hours—exposures of individuals to twenty-five rems or more or "the release of radioactive materials which, if averaged over a period of 24 hours, would exceed 5,000 times" the limits specified for uncontrolled areas; (2) within twenty-four hours—exposure of an individual to three rems or more, or the release of radioactive materials which would exceed 500 times the limits specified for uncontrolled areas. Written reports of all incidents involving exposures in excess of the specified limits are required within thirty days.[233]

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trations of licensed and other radioactive material released into air or water in unrestricted areas as a result of the applicant's proposed activities." 10 Code Fed. Regs. §20.103(a).

[229] *Id.*, R. 325.1309.2.3.

[230] *Id.*, R. 325.1306.

[231] 10 Code Fed. Regs. §20.105.

[232] *Supra* note 127, R. 325.1310.1.

[233] *Id.*, R. 325.1310.2.

By way of precautionary procedures, the Michigan regulations require that "each registrant shall make or cause to be made such surveys as may be necessary for him to comply with the regulations"; and that "each individual who enters a high radiation area" or "who enters a controlled area under such circumstances that he receives, or is likely to receive, a dose in excess of 25% of the limits specified in . . . these regulations," shall have and use personnel monitoring equipment.[234] Radiation safety instruction is required for any "individual working in or frequenting any portion of a controlled area." [235] Registered materials stored in uncontrolled areas must be secured against unauthorized removal, and unattended X-ray apparatus must be secured against unauthorized use.[236] Caution signs, labels, and signals, which are virtually identical with those employed by the AEC, are required.[237]

Radioactive waste disposal into sanitary sewage systems or by burial in the soil is allowed in Michigan under conditions identical with those imposed by the AEC. Registrants also may apply to the State Health Commissioner for approval of proposed disposal procedures which are not otherwise authorized in the regulations except for disposal to surface waters.[238]

Parts VII through XI of the Michigan regulations establish operating procedures and detailed specifications for industrial radiographic installations, medical radiographic installations, dental radiographic installations, fluoroscopic shoe machines, and miscellaneous types of X-ray installations. Industrial radiographic installations are subdivided into four classes depending upon their capacity and amount of use. While the term "industrial radiographic installation" refers primarily to X-ray devices, it also includes those "utilizing high intensity sealed sources of radioactive materials" (in other words, "byproduct materials" which are licensed by the AEC). The most curious feature of these provisions regarding industrial radiographic installations is that they contain

[234] *Id.*, R. 325.1311.1 and .2. Except for "personnel occupationally exposed to ionizing radiation from diagnostic equipment," who must wear film badges "for at least 13 consecutive weeks during each calendar year" and for whom records must be kept in a permanent file (R. 325.1318.1.8), the Michigan regulations are silent as to whether records must be kept of radiation surveys and personnel monitoring.

[235] *Id.*, R. 325.1311.5.

[236] *Id.*, R. 325.1311.6 and .7.

[237] *Id.*, R. 325.1311.3.

[238] *Id.*, R. 325.1312. Due to the fact that the Michigan Water Resources Commission controls the dumping of contaminants into the surface waters of the state (Mich. Stat. Ann. §§3.521-3.533), the State Health Commissioner does not have the authority to allow a system which contemplates such disposition.

their own permissible dose levels for personnel working in or adjacent to the enclosure area. This dose level is 100 milliroentgens per week, which is considerably lower than the basic standards of Section 9.1 and the current standards of the AEC for licensed byproduct material users. No distinction is made as to conditions of exposure or critical organs affected. It would appear that in Michigan, commercial users of byproduct materials in sealed containers (but not unsealed sources) must limit exposures of employees to one third the amounts allowed by the AEC.

b. Partial Radiation Health and Safety Regulation

Government agencies of Colorado, Florida, Kentucky, New Hampshire, New Jersey, Ohio, Oregon, Utah, West Virginia, and Wisconsin have issued regulations which impose some sort of radiation exposure limits. These regulations are characterized as partial since they cover only this limited aspect of radiation health and safety and are not concerned with such problems as waste disposal, personnel monitoring, area radiation surveys, etc. Most of them are confined to industrial radiation hazards from X-rays, gamma rays, and atmospheric concentrations of radon and thorium. In addition to the above, regulations of Arkansas, Delaware, and Indiana indicate an intention by those states to control some phase of radiation hazards.

Of the states having partial regulations concerning exposure limits, only those of Colorado and New Jersey purport to cover all forms of radiation. Colorado regulations limit exposures to X-rays, gamma rays, alpha and beta rays, and thermal neutrons to 0.05 rems per day.[239] By using the day, instead of the week, as the exposure period, and by failing to make appropriate refinements regarding conditions of exposure, critical organs affected, and the location or employment status of the person exposed, these regulations are, in general, at variance with the standards of the AEC and the current recommendations of the NCRPM. New Jersey, on the other hand, avoids the embarrassment of such variance by using a standard which is all but meaningless. The regulations of the New Jersey Health Department specify:

> . . . [All] sources of radiation shall be sealed, transported, handled, used and kept in such manner as to prevent all users thereof and all persons within effective range thereof from being exposed to excessive dosage of radiation.[240]

[239] Regulations—Occupational Diseases Reportable in Colorado, Colo. Dept. of Public Health, Reg. 3.

[240] Chap. VI—Radiation Regulations, New Jersey Public Health Council, eff. Dec. 15, 1952.

"Excessive dosage" is not defined. However, in view of the fact that New Jersey has created a new rule-making commission, discussed earlier, the likelihood is great that more definite standards will soon be forthcoming.

General variance from the current standards of the NCRPM is found in the regulations of Florida,[241] New Hampshire,[242] Oregon,[243] West Virginia,[244] and Wisconsin,[245] which simply limit exposures to X-rays and gamma rays, under all industrial conditions, to 0.3 roentgens per week, as well as in Ohio, where the general exposure limit is 0.1 roentgens per day.[246] Greater conformity with NCRPM standards is found in the regulations of the Kentucky Department of Health, which limit the occupational exposure to X-rays and gamma rays to 300 milliroentgens for the whole body, 450 milliroentgens to the lenses of the eyes, and 1500 milliroentgens to the skin of the hands, forearms, feet, ankles, head and neck.[247] The only Utah regulation which purports to regulate exposures limits the ". . . atmospheric concentration of the immediate daughters of radon . . . [to] 300 micro-microcuries per liter," [248] which differs from the standard of the AEC.

While the environmental sanitation regulations of Arkansas do not limit exposure to radiation, it is required that:

> In all places of employment where recognized health hazards exist from . . . radiation . . . [and] radioactive materials, . . . the employer shall provide pre-employment medical examination and periodic medical examination thereafter. The employer shall also provide warning signs . . . in prominent sites around the plant and shall periodically instruct all employees regarding the health hazards connected with their

[241] Regulation for Control and Prevention of Occupational Diseases, Fla. Industrial Commission, Reg. 8, revised 1957.

[242] Reg. 2—Maximum Allowable Concentrations of Toxic Materials, N.H. Dept. of Health, adopted July 16, 1954.

[243] Recommended Standards and Regulations for Occupational Health, Ore. Bd. of Health, issued Jan. 1956.

[244] Regulations of the W.Va. Bd. of Health, c. 6, Industrial Hygiene.

[245] Wis. Adm. Industrial Code §20.02(4).

[246] Regulations for the Prevention and Control of Diseases Resulting from Exposure to Toxic Fumes, Vapors, Mists, Gases and Dusts in Order to Preserve and Protect the Public Health, Ohio Dept. of Health, Reg. 254-47, adopted Feb. 16, 1946.

[247] Regulations for Control of Occupational Environments and the Prevention of Occupational Diseases, Ky. Bd. of Health, adopted May 1956.

[248] General Safety Orders, Reg. 2, Industrial Commission of Utah, adopted Aug. 25, 1955.

> duties and the best preventative measures and methods to protect themselves therefrom.[249]

In Indiana the only regulations regarding radiation hazards concern the operation of shoe-fitting fluoroscopes.[250]

Pursuant to its general authority[251] the Delaware Board of Health has promulgated a curious regulation which will probably be more hindrance than help, for it specifies:

> No person shall manufacture, distribute, offer for sale, store, keep, install or dispose of any radioactive material or any device containing radioactive material which is capable of causing injury or death to human beings or animals without *first* securing a written permit from the State Board of Health. . . . The State Board of Health reserves the right to deny any permit when there is unsatisfactory proof that the material or device will not be a hazard to health.[252]

This regulation does not apply to hospitals, clinics, physicians, veterinarians, or dentists.

D. Summary of State Atomic Energy Legislation and Regulation

The foregoing examination of recent state atomic energy and radiation hazard legislation and regulation reveals considerable state interest and activity in the field since the Atomic Energy Act was amended in 1954. It is apparent from this examination that many states, after the example of the federal government, regard atomic energy as an appropriate subject for both governmental encouragement and control in the public interest. However, the promotional programs are, for the most part, still in only tentative form. They do little more than indicate a vague policy of encouragement, suggesting the need for further study of the problems involved. Some of the states have created commissions, either temporary or permanent, to conduct these studies and suggest fruitful courses of government action. While none of the states have responded to the impact of atomic energy upon society with anything like the political innovations of Congress, a few have recognized the need for intra- and inter-governmental coordination to assure consistent

[249] Ark. Bd. of Health, Rules and Regulations Pertaining to Environmental Sanitation in Manufacturing Establishments, §3.9.

[250] *Supra* note 6 at 8.

[251] Del. Ann. Code tit. 16, c. 1, §122.

[252] Del. Bd. of Health, Regulations Governing the Manufacture, Distribution, Sale, Storage, Installation, and Disposal of Radioactive Sources, Materials, or Devices, §II, adopted Dec. 5, 1955.

state action, establishing for this purpose the position of coordinator of atomic development activities. Beyond this, however, there is no indication that the states intend to concentrate and centralize state powers to deal with matters affecting the development and utilization of atomic energy in one officer or agency.

As might well be expected, the subject of radiation hazard control has received somewhat more comprehensive treatment by some of the states than has the subject of promotion. The need and the urgency for state action in this area is more obvious and more easily justified in terms of traditional political principles. It is encouraging to observe these states establishing programs to control radiation hazards at a time when significant damage is yet to occur and the privately controlled atomic energy industry is still in its infancy. Not only does this serve to reduce the possibility of future injury, but it also serves the interests of the regulated industries by informing them before their entry into the field as to the design and operational standards which will be imposed upon them, thus avoiding much of the expense of subsequent structural modifications.

It is somewhat less encouraging to observe the failure of the state legislatures to avoid multiple regulation of radiation hazards by several agencies within the state. None of the states has followed the advice of the NCRPM and bestowed exclusive authority to regulate radiation hazards on one agency. Neither has any state expressly subdivided the field among existing agencies or provided a means by which the regulations of all agencies can be made uniform and consistent. Fortunately, the tendency seems to be to adopt the standards of the AEC or the NCRPM regardless of whether directed to or not, so that there probably will be less conflict between the regulations of various state agencies themselves, and between them and the AEC regulations, than might be feared.

This last feature becomes especially important when it is evident that many of the states have every intention of concurrently regulating the activities of AEC licensees. The comprehensive state radiation health and safety regulations make no distinction between sources of radiation licensed and controlled by the AEC and those which are not. By and large, however, they impose no additional burden on licensed activities other than registration and reporting to designated state officials. If there are some dissimilarities between state and federal regulations, they are not of the sort which makes simultaneous observance of both standards impossible. It remains to be seen whether concurrent federal-state regulation is authorized.

E. The Problem of Federal Pre-emption

1. Introduction

The comprehensive nature of the powers granted the Atomic Energy Commission under the Atomic Energy Act in the field of radiation health and safety regulation raises the pivotal question of whether all or part of the field has been so occupied by the federal government as to preclude state action. In view of the fact that Congress has failed to clarify the matter of pre-emption and, to date, no court has ruled on the question, considerable uncertainty exists concerning the validity of state radiation health and safety regulations. Therefore the possible solutions to the question of the possibility and extent of federal pre-emption must be sought by recourse to the principles employed by the courts in resolving the same type of question in analogous cases.

If Congress had not asserted national powers and established a federal program to promote and control atomic energy, the states undoubtedly could regulate all radiation hazards created by others than the federal government itself. The mere existence of constitutional power in the federal government does not preclude the exercise of state police powers with respect to all matters which might be made subject to national powers. For example, regarding the commerce power, which is one of the principal powers upon which the Atomic Energy Act is based, the Supreme Court has said:

> Although the commerce clause conferred on the national government power to regulate commerce, its possession of that power does not exclude all state power of regulation.[253]

Where the commerce power is unexercised by Congress, the states may enforce laws for the protection and safety of society, although they affect interstate commerce, except "where the subject matter requires a uniform system as between the States." [254]

Even if Congress undertook the promotion and exclusive control of every phase of atomic energy development and utilization except that of public health and safety, there would be little doubt of the states' authority to protect this interest as long as the regulation did not materially interfere with the federal program. It scarcely could be asserted that the national interest in promoting the development and utilization of atomic energy by private persons is so great as to preclude state regulation of the very substantial hazards to life and property involved.

[253] Southern Pacific Co. v. Arizona, 325 U.S. 761, 766, 65 S. Ct. 1515 (1945).
[254] Leisy v. Hardin, 135 U.S. 100, 108-109, 10 S. Ct. 681 (1890).

The situation with respect to atomic energy hazards, however, is not as posed above. Congress, in the Atomic Energy Act of 1954,[255] has definitely asserted its powers to control atomic energy in the interest (among others) of public health and safety. As indicated in Section 2 of the act, the constitutional bases of the federal health and safety program are the powers of Congress: (1) to provide for the common defense and security,[256] (2) to regulate interstate and foreign commerce,[257] and (3) to make all needful rules and regulations respecting the territory or other property belonging to the United States.[258] The phrase "health and safety of the public" and terms of similar import are used repeatedly throughout the act.[259] Of greater significance, however, is the elaborate and comprehensive program of radiation hazards control which Congress has created, for it raises the problem: to what extent has Congress pre-empted the field of health and safety regulation in connection with atomic energy activities?

In exercising any one of the above mentioned powers, Congress, if it so desires, may pre-empt state regulation of matters within the scope of the national power. In discussing federal supremacy and the commerce power, the Supreme Court has said:

> Congress has undoubted power to redefine the distribution of power over interstate commerce. It may either permit the states to regulate the commerce in a manner which would otherwise not be permissible . . . or exclude state regulation even of matters of peculiarly local concern which nevertheless affect interstate commerce.[260]

Similarly, where Congress has undertaken to legislate pursuant to its defense powers, the Supreme Court has declared that state law in conflict therewith, which would be valid but for the congressional act, must give way to federal supremacy.[261] Again, where a state has attempted

[255] Pub. L. 703, 83d Cong., 2d Sess. (1954), 42 U.S.C.A. §§2011 *et seq.*

[256] U.S. Const., Art. I, §8, cls. 11-14.

[257] *Id.*, Art. I, §8, cl. 3.

[258] *Id.*, Art. IV, §3, cl. 8.

[259] The phrase "health and safety of the public," or phrases of similar import, may be found in the Atomic Energy Act of 1954 at §§2b, 2d, 2e, 3d, 11p, 11v, 31a(5), 31c, 41b, 53b, 53e(7), 63b, 81, 103b, 103d, 104a, 104b, 104c, 104d, 144(a)(4), 161b, 161e, 161i, 182a, and 186c, 42 U.S.C.A. §§2012(b), 2012(d), 2012(e), 2013(d), 2014(t), 2014(aa), 2051a(5), 2051(c), 2061(b), 2073(b), 2111, 2133(b), 2133(d), 2134(a), 2134(b), 2134(c), 2164(a)(4), 2201(b), 2201(e), 2201(i), 2232(a), and 2236(c).

[260] Southern Pacific Co. v. Arizona, *supra* note 253 at 769.

[261] In Case v. Bowles, 327 U.S. 92, 66 S.Ct. 438 (1946), the sale by the State of Washington of timber from school lands was held subject to the maximum price prescribed by the OPA under the authority of the Emergency Price Control Act of World War II. *Cf.* Hulbert v. Twin Falls County, 327 U.S. 103, 66 S.Ct. 444 (1946).

to regulate the distribution of federally owned chattels to private persons and exact the payment of inspection fees, the court has said:

> . . . [W]here, as here, the governmental action is carried on by the United States itself and Congress does not affirmatively declare its instrumentalities or property subject to [state] regulation or taxation, the inherent freedom continues.[262]

It is clear that Congress has the power to regulate many aspects of radiation health and safety [263] and, when it desires to do so, may pre-empt the field as to these matters. Our question is, therefore, twofold: (1) to what extent did Congress intend exclusive federal regulation, and (2) to what extent are there any limits to the exclusiveness of federal regulation? In the light of analogous cases there is considerable uncertainty as to pre-emption of regulation of non-federal activities. The bulk of this study, therefore, is devoted to pre-emption in this area. There are a few areas, however, where regardless of congressional intent there may be no power to pre-empt, and these will be discussed at the end of the chapter. The one matter that warrants no discussion is the question of the power of the states to regulate the activities of federal agencies or of contractors carrying out the work of such agencies because the answer is clearly that no such power exists.[264]

2. The Permissible Limits of State Health and Safety Regulation of Atomic Energy Activities

a. Explicit Provision Allowing State Regulation

The Atomic Energy Act of 1954 contains only one express reference to the problem of pre-emption. Section 271 provides:

> Nothing in this Act shall be construed to affect the authority or regulations of any Federal, State, or local agency with respect to the generation, sale, or transmission of electric power.[265]

[262] Mayo v. United States, 319 U.S. 441, 448, 63 S. Ct. 1137 (1943). In this case federal officers shipped federally owned fertilizer into Florida for distribution to farmers there under the Soil Conservation and Domestic Allotment Act. The Supreme Court held that Florida could not enforce its statute requiring inspection of fertilizers, labeling, and payment of inspection fees.

[263] On the power of the federal government to control radiation health and safety see Estep, "Federal Control of Health and Safety Standards in Peacetime Private Atomic Energy Activities," 52 Mich. L. Rev. 333 (1954).

[264] In re Neagle, 135 U.S. 1, 10 S. Ct. 658 (1890); Johnson v. Maryland, 254 U.S. 51, 41 S. Ct. 16 (1920); Pittman v. Home Owners' Loan Corp., 308 U.S. 21, 60 S. Ct. 15 (1939); Alabama v. King & Boozer, 314 U.S. 1, 62 S. Ct. 43 (1941); City of Cleveland v. United States, 323 U.S. 329, 65 S. Ct. 280 (1945).

[265] §271, 42 U.S.C.A. §2018.

It might be argued from this explicit, but limited, recognition of state regulatory power that Congress intended to exclude every other form of state action. Such an argument, however, would ignore the real basis of the provision. There appears to have been considerable concern in Congress lest the AEC become a super power administration.[266] The provision was clearly intended to avoid such an event. Senator Clinton P. Anderson, a member of the Joint Committee on Atomic Energy and a principal author of the act, pointed out to the Senate that:

> The Commission has no special competence in the field of electric energy distribution and seeks no responsibility in the field. Its functions should be limited, as the bill contemplates, to those areas in which the Commission does have special competence or responsibility. These areas include the review of design criteria, the supervision of construction, and decisions on the technical qualifications of applications to operate nuclear plants, on health and safety standards, and on security safeguards.[267]

Thus Section 271 apparently was intended as a limitation upon the powers of the Commission and not as the single exception to federal pre-emption. It may also be noted that the Senator did not specify exclusive Commission control within the areas of "special competence." There is nothing in the Congressional Record to suggest that his attention was directed in any way to the pre-emptive question.

The whole pre-enactment legislative history of the 1954 act in fact is barren of any indication that Congress was even aware of the pre-emption problem with respect to health and safety regulation. For what it is worth in determining the intent of Congress when the act was passed, however, there have been several subsequent manifestations of congressional concern with the problem in the form of bills or recommendations to amend the act. On January 23, 1956, Representative Carl T. Durham introduced a bill to amend the act which would (1) authorize and direct the Commission "to cooperate with the States in the formulation of standards for regulating the health and safety aspects of the atomic energy field"; and (2) direct the Commission "to relinquish the jurisdiction of health and safety in the areas specified in the certificate" six months after the date upon which the "Commission receives from the governor of any State a certificate to the effect that

[266] See the Congressional Record for July of 1954 for debates on this subject.

[267] 100 Cong. Rec. 10559 (July 15, 1954), quoting a statement by Chairman Strauss of the Atomic Energy Commission.

the State has an agency competent to exercise jurisdiction" in a specified field of radiation hazard regulation.[268]

A somewhat more cautious solution was offered by Senator Anderson in a bill introduced on July 26, 1956, which would (1) authorize and direct the Commission "to cooperate with the States in the formulation of standards regulating the health and safety aspects and other aspects of the atomic energy field" and (2) authorize the Commission "to negotiate compacts or agreements with the States relating to health and safety aspects . . . of the atomic energy program prior to their submission to the Congress for approval." Pursuant to these compacts, "the Commission (would be) authorized to turn over such areas to the States for regulation as it finds the States are competent to assume such powers." [269]

While the AEC has declined to issue an administrative interpretation or adopt an official position on the extent to which Congress intended that it share its regulatory jurisdiction with the states, it has established a program to advise, consult, and cooperate with state officials.[270] Furthermore, in June of 1957, the Commission transmitted a proposed amendment to the Joint Committee which was intended "to provide clarification of the Commission's authority in dealing with the states in carrying out the Commission's regulatory functions, and, more importantly, to define the role of the states in regulating in those areas of radiation, health and safety protection regarding which Congress has delegated responsibilities to the Commission." [271] This amendment would authorize the AEC "to cooperate with any State or group of States in carrying out the Commission's responsibilities for protecting the health and safety of the public from radiation hazards incident to the processing and utilization of source, byproduct, and special nuclear material." It also provided that:

> Nothing in this Act shall be deemed to prevent the States from adopting, inspecting against, and enforcing standards, not in conflict with those adopted by the Commission, for protecting the health and safety of the public from radiation hazards incident to the processing and utilization of source, byproduct,

[268] H.R. 8676, 84th Cong., 2d Sess. (1956).

[269] S. 4298, 84th Cong., 2d Sess. (1956).

[270] AEC, Twenty-first Semi-Annual Report 128-129 (1957).

[271] Letter dated June 1957 (exact date not known) to Rep. Carl T. Durham, Chairman of the Joint Committee on Atomic Energy, from Chairman Lewis Strauss of the Atomic Energy Commission. The letter was accompanied by a copy of the Commission's "Proposed Amendment to the Atomic Energy Act of 1954, Section 274 Cooperation with the States," and an "Analysis" of the proposed amendment.

> and special nuclear material, *Provided,* that this subsection shall not be deemed to authorize any State to exercise licensing responsibilities concerning those aspects of activities with regard to which the Commission has licensing responsibilities, and *Provided further,* that State radiation standards shall not apply to facilities operated by the Government or facilities operated under contract with and for the account of the Government.[272]

An analysis, which accompanied the proposed amendment, pointed out that:

> By "not in conflict with," we mean that the states cannot relieve anyone from compliance with the Commission's radiation standards, but could impose, if they so chose, more restrictive standards.[273]

To this was appended the pious hope that the states would consult with the AEC before imposing more restrictive standards.

Inasmuch as Congress has not acted on any of these proposed amendments, it may be claimed that pre-emptive effect was intended in the 1954 act and, furthermore, that the inaction indicates that Congress is disinclined to change the situation. On the other hand, it may be claimed that the inaction suggests that no change is necessary, since the 1954 act was not intended to have pre-emptive effect in the first place. Legally, however, the use of either conclusion is not justified because congressional intent should be determined as of the time of enactment of the particular legislation. No more can be claimed for these unsuccessful amendments and congressional inaction than that they may suggest present intent which may be quite different from original intent.[274]

The failure of these amendments to obtain congressional approval, however, does occasion the necessity for a fairly extended study of the pre-emption problem under the 1954 act. Apparently, Congress desires to evaluate more completely state attitudes and programs and the extent of the integration with the health and safety regulations of the AEC

[272] *Id.*, §274(b).

[273] *Id.*, "Analysis" at 2.

[274] Evidence of a failure by Congress to adopt amendments would seem to lack probative value. Moreover, to one concerned with the theory of interpretation, it seems completely unjustified to use such evidence as any indication of the earlier legislative intent and certainly silence is not the way to comply with constitutional methods of passing amendatory laws. See the related suggestion by Justice Rutledge in Cleveland v. United States, 329 U.S. 14, 67 S. Ct. 13 (1946). It is recognized, of course, that use has occasionally been made of such material by the court.

before acting definitively. Meanwhile the states and Commission licensees are faced with uncertainties and must seek guidance from the decisions of the Supreme Court involving the most nearly similar circumstances to determine the implied permissible limits of state regulation. In any event, none of the proposed amendments seems a satisfactory solution, and it is to be hoped that Congress will not take action on the pre-emption problem without considering the many problems and policy questions that necessarily are involved.[275]

b. Implied Pre-emption and State Regulation

Absence of express manifestation of congressional intent does not conclude the matter of federal pre-emption. In numerous situations, where Congress has undertaken to regulate in areas with which the states also are concerned, the Supreme Court has found or, if the reader prefers, has supplied an implied pre-emptive intent. In these situations, however, the court seldom finds complete federal pre-emption. The question of whether there has been implied pre-emption in a general area of regulation simply does not lend itself to categorical yes or no answers. The court has shown itself to be quite painstaking in applying a rather complex rationale to determine whether or not Congress impliedly intended to preclude the *particular* state action under consideration. The purpose of this study is to determine what specific types of state health and safety regulation of radiation hazards and AEC licensees will be allowed under the 1954 act if it is not amended in any of the ways discussed above. In the light of many analogous cases, it appears that, while definite limits may be anticipated, some types of state action will be permitted.

(1) Analogous Cases Involving the Implied Pre-emption Question

For purposes of illustrating the doctrine and methods developed by the Supreme Court to establish pre-emption where congressional intent is buried in the interstices of the statutory language, the following areas of analogy have been chosen: (1) labor-management relations and unfair labor practices in industries affecting interstate commerce; (2) health and safety regulation in connection with vehicles and products in interstate commerce; and (3) several miscellaneous cases having

[275] See Cavers, "Legislative Readjustments in Federal and State Regulatory Powers over Atomic Energy," 46 Cal. L. Rev. 22 (1958), for a critical discussion of the proposals for amendment.

pertinency to the problem. In each of these areas the Supreme Court has found exclusive federal control of some matters and allowed, or indicated that it would allow, concurrent exercise of state police powers with respect to others.

(a) Labor Cases

Over the last twenty years more cases involving the question of implied federal pre-emption have arisen in the field of labor relations and unfair labor practices than in any other. To avoid the industrial strife which was interfering with the normal flow of commerce as well as jeopardizing the "public health, safety, and interest" Congress enacted the National Labor Relations (or Wagner) Act in 1935.[276] The declared purpose of the Wagner Act was to encourage the practice and procedure of collective bargaining and to protect the full freedom of workers to associate, organize, and designate representatives of their own choosing. The act gave the National Labor Relations Board the power to prevent an employer from engaging in certain unfair labor practices, as that term was defined in the act, and the power to promulgate rules and regulations necessary to carry out the provisions of the act. In 1947 Congress enacted the Labor Management Relations (or Taft-Hartley) Act, which re-enacted most of the earlier law and gave to the NLRB additional powers to prevent labor organizations and their agents from committing enumerated unfair labor practices.[277]

Several statements of the Supreme Court found in cases involving federal labor legislation may quite possibly be applicable in solving the problem of congressional intent in adopting the Atomic Energy Act. First, the court has said that the subject matter of federal labor legislation "is not so 'intimately blended and intertwined with responsibilities of the national government' that its nature alone raises an inference of exclusion." [278] This remark seems equally applicable to the non-military aspects of atomic energy. Second, regarding express congressional intent, the Supreme Court has said:

> Congress has not seen fit to lay down even the most general of guides to construction of the [National Labor Relations] Act, as it sometimes does, by saying that its regulation either shall or shall not exclude state action.[279]

[276] 29 U.S.C. §§151 *et seq.* (1946).

[277] 29 U.S.C.A. §§141 *et seq.*

[278] Bethlehem Steel Co. v. State Board, 330 U.S. 767, 772, 67 S. Ct. 1026 (1947), citing Hines v. Davidowitz, 312 U.S. 52, 66, 61 S. Ct. 399 (1941), as authority for the proposition.

[279] Bethlehem Steel Co. v. State Board, *supra* note 278 at 771.

The same may well be said of Congress in enacting the original Atomic Energy Act of 1946 and the subsequent 1954 act. Third, when confronted by this situation, the Supreme Court declared:

> It long has been the rule that exclusion of state action may be implied from the nature of the legislation and the subject matter although express declaration of such result is wanting.[280]

Thus should the Supreme Court be confronted with a case in which an AEC licensee is charged with violating a state health and safety law, the labor cases may be examined as furnishing precedents.

Several distinctions between labor-management regulation and radiation hazard control require comment before the cases are examined. Unlike the federal program of radiation health and safety, which filled a regulatory vacuum and anticipated both the events it was designed to prevent and the growth of activities subject to its standards, the federal program of labor-management regulation entered a field of national chaos, characterized by conflicting and anachronistic state laws and consequent labor unrest. It may be argued that the historical background of labor legislation gives greater force to an assertion of pre-emption than do the circumstances out of which the AEC program arose. While it appears that federal labor legislation became necessary, in large part, because of state laws, it was partly because of the absence of effective controls and the scarcity of qualified personnel at the state level that the federal radiation health and safety program became necessary. Perhaps the Supreme Court will find it more difficult to ascribe pre-emptive effect to an act of Congress, where, at the time of passage, there were no state regulations in competition or conflict with congressional policies.[281] Contrawise, it may be argued that, since governmental action was urgently needed and the states had taken no action with respect to radiation hazards arising out of atomic energy activities prior to the 1954 act, Congress felt compelled to pre-empt the field in its entirety.

As a further cautionary note, it should be pointed out that the type and purpose of federal regulation of these two subjects are not the same. Federal labor legislation and the cases arising under it are concerned primarily with rights and obligations of employers and employees.[282] Only occasionally does public health and safety become a central issue in this area; when it does, as is pointed out below, the court is inclined to treat state action with exceptional solicitude. In the

[280] *Id.* at 772.

[281] See California v. Zook, 336 U.S. 725, 736, 69 S. Ct. 841 (1949).

[282] See Automobile Workers v. Russell, 356 U.S. 634, 78 S. Ct. 932 (1958).

protection and enforcement of economic rights and obligations, it may be argued that the national interests in uniformity and consistency demand centralized administration. Where the public health and safety are in jeopardy, however, it may be argued that the national interests in uniformity and consistency are subordinate to the local interest in swift and effective action to eliminate the hazard. Furthermore, labor disputes and unfair labor practices have a way of advertising themselves which assists centralized administration, whereas radiation hazards are far from obvious to either the persons who are causing them or those who are injured. To exclude the states entirely from seeking out and eliminating these hazards places a heavy burden upon the AEC, a burden which scarcely seems justified by the advantages of exclusive federal control, absent affirmative showing of state incompetence and obstruction. It must be recognized to the contrary, however, that in the labor field Congress was not really concerned with physical health and safety, while in the Atomic Energy Act of 1954 it was very much concerned with this very matter. This difference is discussed below.

(i) Labor Cases Finding Federal Pre-emption

The fundamental concern of the Supreme Court in considering state action within the labor-management relations regulation area is with conflict—conflict with federal standards, whether established by Congress or the NLRB, and conflict with their application to a particular labor dispute. To illustrate, in *Hill* v. *Florida* [283] a state law provided that business agents of labor unions must be licensed, and no person was eligible for a license who had not been a citizen of the United States for more than ten years, who had been convicted of a felony, or who was not a person of good moral character. Violation of the statute was deemed a misdemeanor. The Florida Attorney General invoked the statute against Hill and the union he represented since Hill had not applied for a license. In reversing the judgment of the state court against Hill and the union, the Supreme Court stated:

> The declared purpose of the Wagner Act . . . is to encourage collective bargaining, and to protect the "full freedom" of workers in the selection of bargaining representatives of their own choice. . . . Congress attached no conditions whatsoever to their freedom of choice in this respect. Their own best judgment, not that of someone else, was to be their guide. "Full freedom" to choose an agent means freedom to pass upon that agent's qualifications.[284]

[283] 325 U.S. 538, 65 S. Ct. 1373 (1945).
[284] *Id.* at 541.

Accordingly, since the state act imposed on the "full freedom" of employees to bargain collectively limitations which were in excess of those Congress thought necessary, the state law was found to be an obstacle to the accomplishment and execution of the full purposes and objectives of Congress. The court also pointed out that:

> . . . Congress did not intend to subject the "full freedom" of employees to the eroding process of "varied and perhaps conflicting provisions of state enactments." [285]

The court found the "intent" of Congress not from any language dealing with pre-emption but from this very general policy of freedom to choose.

A conflict between state and federal law was held to be fatal to a Michigan statute in *Automobile Workers* v. *O'Brien.*[286] Here the union struck against the Chrysler Corporation without conforming with pre-strike procedures imposed by state law. The strike, which was called to obtain higher wages, was conducted peacefully. Michigan law, in effect, delayed the time when a strike could be called beyond the time specified by the Taft-Hartley Act and, unlike the federal law, required majority authorization for any strike. These conflicts, plus the fact that the matter clearly was within the jurisdiction of the NLRB and was covered by federal law, caused the court to decide that Congress had occupied the field and closed it to this type of state regulation although the federal act said nothing about its provisions excluding state action.

Where Congress has provided certain procedures to deal with particular emergency situations, state attempts to deal with local emergencies for which no special provision is made by federal law may also be held to conflict with federal policy. In *Bus Employees* v. *Wisconsin Board*[287] the validity of the Wisconsin Public Utility Anti-Strike Law, which prohibited any group of public utility employees from engaging in a strike that would interrupt essential public services, was at issue. Although the Taft-Hartley Act contains special procedures to deal with strikes that might create national emergencies, it does not prohibit strikes by public utility employees for higher wages and says nothing about local emergencies. The Wisconsin statute, however, was held to be in conflict with federal labor legislation.

The general principle illustrated by these three labor cases is that a

[285] *Id.* at 542.
[286] 339 U.S. 454, 70 S. Ct. 781 (1950).
[287] 340 U.S. 383, 71 S. Ct. 359 (1951).

state may not act where its action may constitute an obstacle to the accomplishment and execution of the full purposes and objectives of Congress as stated or implied in a statute, thus conflicting with federal policy. Precise opposition of the state act to the federal act or complete frustration of the purposes and objectives of Congress is not required. The mere fact that it is possible for the person subject to both federal and state controls to comply with the requirements of both does not remove the implication of pre-emptive congressional intent. Apparently state action that conflicts with federal policy will not be allowed even though the state law is not concerned with the same aspects of the regulated subject or even though Congress has not acted to occupy the entire field subject to regulation. The extent to which Congress has occupied a field of regulation, or authorized a federal agency to do so, is significant, however, in deciding if there is implied pre-emption, as we shall see in later cases.

A second group of labor cases illustrates how far the Supreme Court will go to find a conflict and therefore pre-emption where the state acts within the quasi-legislative jurisdiction of a federal agency.

In *Bethlehem Steel Co.* v. *State Board*[288] the New York Labor Relations Board had certified a union as bargaining agent for the company's foremen at a time when the policy of the NLRB was to refuse certification of foremen's unions (even though it had the power to certify them).[289] The NLRB had taken the position that to permit them would obstruct the purposes of the Wagner Act. The union had not petitioned the NLRB for certification as a bargaining agent. The court held the state action invalid since the federal statute was general and inclusive on the subject of union certification and, pursuant to its delegated powers, the NLRB had promulgated comprehensive regulations effectively governing the subject. The failure of the NLRB to exercise affirmatively their full authority and certify foremen's unions was said to take on "the character of a ruling that no such regulation is appropriate or approved pursuant to the policy of the statute."[290] The matter was within the rule-making jurisdiction of the NLRB. Thus the state could not act to authorize bargaining agents which the NLRB could, but did not, recognize.

The *Bethlehem* rule is applicable even where the NLRB has not established a standard at all if the choice of standards is left to its dis-

[288] *Supra* note 278.
[289] Packard Motor Car Co. v. NLRB, 330 U.S. 485, 67 S. Ct. 789 (1947).
[290] *Supra* note 278 at 774.

cretion. In *La Crosse Telephone Corp.* v. *Wisconsin Board* [291] the state law, under which the Wisconsin board acted, provided that a majority of the employees in a single craft, division, department, or plant of an employer might elect to constitute that group a separate bargaining unit. Since the Wagner Act left the matter of bargaining units to the discretion of the NLRB, enforcement of the state law was not allowed even though the NLRB had not authorized different bargaining units for the company's employees. The court decided that Congress intended that the NLRB have exclusive authority to determine the nature of bargaining units.

A third group of labor cases illustrates another refinement of the bases of federal pre-emption and demonstrates the Supreme Court's reluctance to allow the states to act within the quasi-judicial jurisdiction of a federal agency. The NLRB has been authorized to conduct investigations and hearings to determine whether certain "unfair labor practices" have been committed and to issue appropriate orders. Furthermore, the board may petition any United States Court of Appeals for the enforcement of its order or for an appropriate temporary relief or restraining order. As a result of the pre-emptive effect found to be implicit in this grant of power in *Garner* v. *Teamsters Union,*[292] a state court was not authorized to issue an injunction, on the petition of an interstate trucking firm, against a union attempting to coerce the petitioner into compelling or influencing his employees to join the union. The petitioner's grievance was clearly within the quasi-judicial jurisdiction of the NLRB under the Taft-Hartley Act and, therefore, was impliedly outside state power. Similarly, a strike by a union as a result of a jurisdictional dispute with another union over competing work claims for their respective members could not be enjoined by a state court as a "restraint of trade" in *Weber* v. *Anheuser-Busch, Inc.*[293] because the activity amounted to an unfair labor practice under the Taft-Hartley Act and jurisdiction over such matters had been, though only by implication, pre-empted by the authority vested in the NLRB. The *Weber* case controlled in *Teamsters Union* v. *N.Y., N.H. & H.R. Co.*[294] where respondent railroad brought an action in a state court to enjoin the union from interfering with its "piggy back" truck-trailer operations by persuading employees of trucking companies to refrain from

[291] 336 U.S. 18, 69 S. Ct. 379 (1949).
[292] 346 U.S. 485, 74 S. Ct. 161 (1953).
[293] 348 U.S. 468, 75 S. Ct. 480 (1955).
[294] 350 U.S. 155, 76 S. Ct. 227 (1956).

delivering loaded trailers to respondent's railroad yards. While respondent's own labor relations were not subject to the provisions of the Taft-Hartley Act, the case was held to be within the exclusive jurisdiction of the NLRB since the union's activities might be an unfair labor practice or protected by the act. In either case, it was for the NLRB, and not the state, to decide. Each of these cases was concerned with possible conflict—that is, the possibility that the state would enjoin a union act with respect to which the NLRB might take a different view, even though it had not done so yet.

The recent case of *Guss* v. *Utah Labor Board* [295] shows the lengths to which the Supreme Court will go in finding pre-emption where a general and inclusive statute grants quasi-judicial power to a federal agency to decide specific cases. In that case the employer was doing interstate business but in an amount less than the jurisdictional minimum required by the rules of the NLRB.[296] The union filed a complaint with the NLRB's regional director, alleging an unfair labor practice covered by federal law. Jurisdiction was declined on the ground that the employer's operations were predominantly local in character. The union thereupon filed the same complaint with the Utah board which granted relief. Section 10(a) of the Taft-Hartley Act, which authorizes the NLRB "to prevent any person from engaging in any unfair labor practice . . . affecting commerce," provides:

> . . . [T]he Board is empowered by agreement with any agency of any State or Territory to cede to such agency jurisdiction over any cases in any industry (other than mining, manufacturing, communications, and transportation except where predominantly local in character) even though such cases may involve labor disputes affecting commerce, unless the provision of the State or Territorial statute applicable to the determination of such cases by such agency is inconsistent with the corresponding provision of this subchapter or has received a construction inconsistent therewith.[297]

Noting that the use of the term "affecting commerce" indicated that "Congress meant to reach the full extent of its power under the com-

[295] 353 U.S. 1, 77 S. Ct. 598 (1957).

[296] Budgetary limitations and other considerations have prevented the NLRB from exercising jurisdiction over all cases in which interstate commerce is affected. In 1950 the Board published standards, largely in terms of yearly dollar amounts of interstate inflow and outflow, that had to be met before jurisdiction would be assumed (26 L.R.R.M. 50). These jurisdictional standards were revised upwards in 1954 (34 L.R.R.M. 75).

[297] §10a, 29 U.S.C.A. §160(a).

merce clause," [298] the Supreme Court emphasized the following uncontroverted facts: (1) the employer's business affected commerce within the meaning of the act, and the NLRB had jurisdiction even though it had declined the exercise of its authority; (2) the act expressly covered the alleged unfair labor practice; and (3) the NLRB had not ceded jurisdiction over the matter to the Utah Labor Board in the manner authorized by Section 10(a). In the *Bethlehem Steel* case the separate opinion of Justice Frankfurter had pointed out that the effect of the majority opinion was to deny that the NLRB could cede jurisdiction to the states under the Wagner Act to decide labor disputes. Since that decision immediately preceded passage of the Taft-Hartley Act, the court concluded that Congress must have known of this limitation. Therefore, it also concluded that Section 10(a) provided the exclusive means by which the states could be given jurisdiction over labor cases falling within the quasi-judicial power of the NLRB. While regretting the creation of this jurisdictional "no-man's-land," the court nevertheless set aside the action of the Utah board.

In *Meat Cutters* v. *Fairlawn Meats* [299] and *San Diego Building Trades Council* v. *Garmon* [300] the same result was reached in similar fact situations. In the *Fairlawn* case, however, the court refrained from deciding whether a state might possibly frame and enforce an injunction aimed narrowly at a trespass by union pickets on land owned or leased by the employer. The Ohio court had based its injunction on the erroneous premise that it had the power to reach the union's conduct in its entirety, but this power was impliedly precluded by the provisions of the federal statute.

From these three cases we might fairly say that, where a general and inclusive federal statute delegates quasi-judicial power to a federal agency and contains a provision which specifies the manner in which the states can be given jurisdiction over matters falling within that of the federal agency, the state may not act unless jurisdiction is expressly ceded to it, even though the federal agency decides not to exercise its full authority.

(ii) Labor Cases Finding No Federal Preemption

Assuming that a state act affecting interstate labor matters is authorized in the absence of any federal regulation, the first determination

[298] *Supra* note 295 at 3.
[299] 353 U.S. 20, 77 S. Ct. 604 (1957).
[300] 353 U.S. 26, 77 S. Ct. 607 (1957).

made by the Supreme Court, in a dispute in which pre-emption is asserted, is whether or not the specific subject of the state action is regulated under federal law. To illustrate, *in Allen-Bradley Local* v. *Wisconsin Board* [301] the Wisconsin board, pursuant to comprehensive state labor legislation, had ordered the union to cease and desist from mass picketing, threatening employees desiring to work, obstructing entrance to and egress from the employer's factory, and picketing the homes of non-striking employees. The Supreme Court refused to invalidate the state action even though many provisions of the Wisconsin labor code were in conflict with the Wagner Act; it looked at only those provisions of the state law that authorized the specific order given. Starting with the initial premise that an "intention of Congress to exclude States from exerting their police power must be clearly manifested," [302] the court determined that: (1) the Wagner Act did not delegate to the NLRB the authority to regulate the particular kind of union conduct in question; (2) the federal scheme of control was not so pervasive as to suggest exclusion of supplemental state regulation; and (2) the board's order did not affect the status of employees, cause forfeiture of collective bargaining rights, or impair other rights protected by the Wagner Act. While the objectives of the union's actions were protected by federal law, its methods were neither protected nor prohibited. Since union violence could scarcely be deemed essential to the assertion of collective bargaining rights, the court concluded that it could be prohibited by state action.

An attitude of congressional indifference, rather than pre-emptive intent, was found in *International Union, United Automobile Workers* v. *Wisconsin Board.*[303] During a period of deadlock in collective bargaining negotiation, the Wisconsin board asserted the power under state law to order the union to cease and desist from its tactic of calling union meetings at irregular times during working hours without advance notice to the employer or informing the employer of the demands or concessions these tactics were meant to obtain. The court pointed out that neither the Wagner Act nor the Taft-Hartley Act permitted or forbade this type of harassing union conduct. The only union methods or tactics made illegal by the Taft-Hartley Act were those which restrained or coerced employees or employers in the exercise of rights protected by the act. Non-coercive union tactics could not be con-

[301] 315 U.S. 740, 62 S. Ct. 820 (1942).
[302] *Id.* at 749.
[303] 336 U.S. 245, 69 S. Ct. 516 (1949).

trolled by the NLRB. Policing of such conduct, therefore, remained with the states.

These two cases illustrate the general proposition that the state may act where the federal statute leaves unregulated some aspects of the general field. The absence of specific federal controls of the particular subject of state action is said to imply a policy of congressional indifference to the state action even though Congress has brought other subjects in the general field under federal control. Of course, this proposition may not be cited in support of a state action which conflicts, directly or indirectly, actually or potentially, with the federal policies reflected in federal statutes or administrative regulations in the same field.

An exception to the rule of construction applied in the *Garner, Weber,* and *Teamsters Union* cases—that the states may not assert their police powers with respect to matters within the quasi-judicial jurisdiction of a federal agency—is found in *United Automobile, Aircraft & Agricultural Implement Workers* v. *Wisconsin Board.*[304] In this case the union's activities and the Wisconsin board's order were similar to those described in the *Allen-Bradley* decision. Subsequent congressional action, however, had placed a different complexion on the matter, for the Taft-Hartley Act declared it to be "an unfair labor practice for a labor organization or its agents— (1) to restrain or coerce (A) employees in the exercise of the rights guaranteed in section 7." [305] Section 7 protects such rights as that of employees to refrain from joining or assisting a union. Thus, in contrast to the situation in *Allen-Bradley,* "the National Labor Relations Board might have issued an order similar to that of the State Board." [306] It had not done so, however. In holding that Wisconsin, nevertheless, might enjoin violent union conduct, the Supreme Court said:

> As a general matter we have held that a State may not, in the furtherance of its public policy, enjoin conduct "which has been made an 'unfair labor practice' under the federal statutes" . . . But our post-Taft-Hartley opinions have made it clear that this general rule does not take from the States power to prevent mass picketing, violence, and overt threats of violence. The dominant interest of the State in preventing violence and property damage cannot be questioned. It is a matter of genuine local concern. Nor should the fact that a union commits a federal unfair labor practice while engaging in

[304] 351 U.S. 266, 76 S. Ct. 794 (1956).
[305] §8(b), 29 U.S.C.A. §158(b).
[306] *Supra* note 304 at 271.

> violent conduct prevent the States from taking steps to stop the violence. . . .
>
> The States are the natural guardians of the public against violence. It is the local communities that suffer most from the fear and loss occasioned by coercion and destruction. We would not interpret an act of Congress to leave them powerless to avert such emergencies without compelling directions to that effect.[307]

Several facts which may narrow the scope of this exception to the general rule of construction must be mentioned. The old Wagner Act declared the power of the NLRB to prevent the enumerated unfair labor practices to be "exclusive." This term was omitted from the Taft-Hartley Act although the old language, to the effect that the power of the NLRB to prevent unfair labor practices "shall not be affected by any other means of adjustment or prevention that has been or may be established by agreement, law, or otherwise," [308] was retained in the new act. Moreover, Senator Taft had explained to the Senate that state action to prevent threats to public health and safety was not disturbed by the NLRB's authority to control coercive union methods.[309] While these matters were mentioned by the court, the decision appeared to rest primarily upon considerations of the "dominant interest of the State" under the circumstances.

To summarize, even where the federal labor act is general and inclusive and delegates quasi-judicial power to a federal agency to prohibit labor activities which seriously threaten the public health and safety, the state also may act to prevent violent conduct in labor disputes which may cause personal injury or property damage. The court has thus demonstrated a greater reluctance to find implication of federal preemption where matters of public health and safety assume significant proportions. How significant must the threat to public health and safety be? A comparison of the *United Automobile Workers* and *Bus Employees* [310] cases suggests that the threat of damage to person or property must be of immediate and violent nature—that is, a situation calling for quick intervention by officials close to the scene. The public inconvenience, discomfort, and more remote threat to health and safety occasioned by the strike of public utility employees in the *Bus Employees* case did not justify a similar exception.

[307] *Id.* at 274-275.
[308] §10(a), 29 U.S.C.A. §160(a).
[309] 93 Cong. Rec. 4437 (May 2, 1947).
[310] *Supra* note 287.

Lest the *United Automobile Workers* case be given greater significance than it may be entitled to, one further thought needs to be mentioned. The federal labor laws are not primarily intended to protect public health and safety. They do so collaterally, of course, but other considerations—principally economic, political, and social—are paramount. This feature may have caused the court to reach the conclusion that Congress did not intend to pre-empt state regulation of matters where the public health and safety are central. Faced with a federal act like the Atomic Energy Act, where health and safety is of central concern to Congress, the court may not feel justified in carving out a similar exception.

A recent labor case, *Automobile Workers* v. *Russell*,[311] helps to explain the criteria of implied pre-emption in this area of federal action. In this case Russell, a non-union electrician, had been prevented from working for a period of five weeks by the striking union. Mass union pickets, by force of numbers and by threats of bodily injury to Russell and of damage to his property, denied him entrance to the employer's plant. The union conduct was clearly an unfair labor practice under the Taft-Hartley Act. Alleging that the union wilfully and maliciously prevented him from working, Russell brought suit in an Alabama court for compensatory damages for his loss of earnings and mental suffering, plus punitive damages. He obtained a judgment in the amount of $10,000, of which roughly $500 was for lost wages. On appeal the union asserted that the jurisdiction of the state court had been preempted by Congress and vested exclusively in the NLRB inasmuch as the union acts complained of were unfair labor practices under the Taft-Hartley Act and Section 10(c) of that act authorized the NLRB to award back pay to employees unable to work as a result of union discrimination suffered by them, if the award effectuated the policies of the act.[312] The Supreme Court affirmed the judgment for Russell, pointing out that Section 10(c) power to order affirmative relief was merely incidental to the primary purpose of Congress to stop and to prevent unfair labor practices. The court reasoned that (1) awards for back pay were purely discretionary and not compulsory, (2) only awards which would "effectuate the policies" of the act were authorized, and (3) Congress had not established a general scheme to award full compensatory damages. In response to the union's assertion that pre-

[311] *Supra* note 282. *Cf.* International Assn. of Machinists v. Gonzales, 356 U.S. 617, 78 S. Ct. 923 (1958).

[312] §10(c), 29 U.S.C.A. §160(c).

emption is implied where there is a possible conflict of federal and state remedies, the court said:

> Our cases which hold that state jurisdiction is pre-empted are distinguishable. In them we have been concerned lest one forum would enjoin, as illegal, conduct which the other forum would find legal, or that state courts would restrict the exercise of rights guaranteed by the Federal Acts.
>
> In the instant case, there would be no "conflict" even if one forum awarded back pay and the other did not. There is nothing inconsistent in holding that an employee may recover lost wages as damages in a tort action under state law, and also holding that the award of such is not necessary to effectuate the purposes of the Federal Act.[313]

Certain features of this case are important in considering its significance. The first of these is the distinction drawn by the court between that which Congress directs and that which it merely authorizes a federal agency to do. Apparently the court is more apt to conclude that pre-emption was not intended as to matters which Congress has only authorized a federal agency to control. This distinction and the reasons for it are illustrated more fully in several of the health and safety regulation cases discussed later. The second feature of this case which is important for our purposes is contained in the first of the above-quoted paragraphs. That statement emphasizes the court's apprehension regarding possible federal-state conflict. Moreover, it specifies the type of conflict—that is, the possibility that the state will prevent that which the federal agency allows, and vice versa. Necessarily, the "unfair labor practices," which the Taft-Hartley Act prohibits, cannot be defined or described with sufficient exactitude and precision to make enforcement of the law an automatic and mechanical process. Except in the extreme case, this is not the sort of matter with respect to which no two tribunals could reasonably differ. The carefully framed conditions in the proviso of Section 10(a), which allows the NLRB to cede jurisdiction over some matters to the states (discussed above in connection with the *Guss* case), reflect congressional realization of, and concern with, this fact. It is not surprising, therefore, to find the Supreme Court declaring the jurisdiction of the NLRB to be exclusive, except under circumstances where state action *obviously* does not conflict with congressional policy or impair administration of federal law. Finally, in the second paragraph quoted above we find a distinction which further illuminates the sort of conflict which implied pre-

[313] *Supra* note 282 at 644-645.

emption seeks to avoid. The court has said, in effect, that there is nothing inconsistent in allowing a state to do what a federal agency may, but need not, do if the policies which each seeks to effectuate are different. The NLRB, in a situation such as that in the *Russell* case, could award back pay if this would effectuate the policies of the Taft-Hartley Act—namely, to inhibit the occurrence of an unfair labor practice. The state act, on the other hand, might have been intended to effectuate any one or more of several policies which had little to do with labor peace: (1) to give compensation for wrongful injury; (2) to discourage and penalize intentional tortfeasors; or (3) to protect persons and property from physical harm.

(iii) Summary of Labor Case Pre-emption Principles

The principles applied by the Supreme Court to find by implication a pre-emptive congressional intent in labor legislation are somewhat elusive. Nevertheless, certain conclusions appear to be justified by the cases. The court's central concern has been with conflict, or the possibility of it, between federal policy and state action. That conflict can be one of statutory substance, in the sense that state and federal statutory policies and standards regarding the same matter are not consistent, or it can be a conflict arising out of the exercise of powers granted to an administrative agency. The conflict need not be head-on, and it is not necessary that the state act be definitely incompatible with already formulated federal standards. The court has said that Congress intends to exclude any state action that creates an obstacle to the accomplishment and execution of the full purposes and objectives of Congress, even when the state law or other action will produce results probably incompatible with federal policy. Where Congress has granted quasi-legislative powers to a federal agency, pre-emption is implied on the theory that Congress does not intend the regulated activities to be burdened by any substantive standards in addition to those which the federal agency is authorized to impose. Moreover, the grant to a federal agency of power to decide particular cases implies that in a situation where enforcement of federal standards by a multitude of state tribunals might well produce inconsistent results, Congress has granted an exclusive power to the agency. The mere fact that Congress has established certain controls in a general field, however, does not raise a presumption of pre-emption as to all state action in the same field. Absent express congressional declaration of complete pre-emption,

where the federal statute leaves unregulated some aspects of its subject, Congress is deemed to have been indifferent to state action in the unregulated phases of the general field if the action does not otherwise conflict with federal policies. Even where the federal act is broad and inclusive and delegates quasi-judicial power over matters which affect public health and safety to the federal agency, the Supreme Court is reluctant to declare the state powerless to avert a local, immediate, and substantial hazard to persons and property in the area. If the state action does not make illegal what is legal under the federal act, or vice versa, and if the state acts in a fashion which is entirely consistent with what the federal agency would do under the circumstances, the court will not always find congressional intent to exclude state action to protect public health and safety.

(b) Health and Safety Regulation Cases

Congress has often invoked its commerce powers to regulate products and vehicles in interstate or foreign commerce in the interest of public health and safety. It has done this for any one or more of several reasons: (1) because the mere existence of the commerce power, though unexercised, severely limited the ability of the states to regulate effectively the matter independently; (2) because independent and uncoordinated state regulation would, or had, produced conditions burdening and frustrating commerce; or (3) because the states had not assumed the responsibility to regulate. To these we might well add another reason which appears to be applicable to federal health and safety regulation of atomic energy activities: (4) because, at the time regulation was deemed necessary, most of the activities were being conducted by the federal government, or its contractors, and most of the governmental experience in radiation health and safety regulation had been acquired by the federal government.

In this area of regulation Congress frequently has neglected to specify what effect its statute is to have upon state regulation of the same or similar matters. As a consequence the Supreme Court has been obliged to determine congressional intent from the nature of the legislative subject, the purposes and objectives of Congress, the language, scope, and structure of the statute, the character, powers, and duties of the federal agency having enforcement responsibilities, and the action (or inaction) of the federal agency. Federal pre-emption, however, is not determined merely from consideration of the federal policy and action; the Supreme

Court also considers the nature and effect of the state action upon the federal scheme of regulation.

The cases involving federal health and safety regulation probably furnish the closest analogy to the problems confronting the states in regulating atomic energy hazards, but one difference which may prove significant should be mentioned. All of these cases involve actual interstate movement of products or vehicles. Consequently, when the state attempts to regulate these products or vehicles it may be close to encroaching upon matters which, in the opinion of the Supreme Court, require uniform national regulation if they are to be regulated at all because differing health and safety standards of the various states will unduly burden the interstate flow of goods. Congress has stated that "the processing and utilization of source, byproduct, and special nuclear material *affect* interstate and foreign commerce," [314] but movement of goods across state lines is not an important factor, except in the shipment of radioactive materials and the atmospheric or hydrologic dispersal of radioactive effluents. While it is not asserted here that Congress lacks the power to pre-empt the regulation of matters which only "affect" commerce (indeed, the Supreme Court has stated in one case that, by using this term, "Congress meant to reach the full extent of its power under the Commerce Clause."),[315] it is possible that local interests in assuring adequate protection may be afforded more significance by the Supreme Court where the subjects of health and safety regulation merely "affect" rather than "move in" interstate commerce.

In the health and safety regulation cases the Supreme Court has revealed a special solicitude for state action. In one case it has said:

> The principle is thoroughly established that the exercise by the State of its police power, which would be valid if not superseded by federal action, is superseded only where the repugnance or conflict is so "direct and positive" that the two acts cannot "be reconciled or consistently stand together." [316]
>
> The application of the principle is strongly fortified where the State exercises its power to protect the lives and health of its people.[317]

[314] §2c, 42 U.S.C.A. §2012(c) [Emphasis added].
[315] Guss v. Utah Labor Board, *supra* note 295 at 3.
[316] Kelly v. Washington, 302 U.S. 1, 10, 58 S. Ct. 87 (1937).
[317] *Id.* at 13.

(i) Health and Safety Regulation Cases Finding Federal Pre-emption

As in the labor cases, the fundamental concern of the Supreme Court in the health and safety cases is with actual or possible conflict—that is, conflict with health and safety standards specified by Congress or by a federal agency which is directed or authorized to set standards and conflict with the administration of the federal health and safety program. To illustrate, in *Erie R.R. Co.* v. *New York* [318] the defendant railway had been convicted of violating the New York Labor Law which specified that telegraphers employed to space trains were not to be on duty more than eight hours per day. The violation took place on November 1, 1907. Eight months earlier Congress had approved the "Hours of Service" Act which authorized the employment of telegraphers for nine hours, if employed during the day and night, and for thirteen hours when employed only during the day. The maximum hours prescribed by the federal act, however, were not to take effect until March of 1908. In reversing the conviction, the court concluded:

> . . . [T]he "Hours of Service" law of March 4, 1907, is the Judgment of Congress of the extent of the restriction necessary. It admits of no supplement; it is the prescribed measure of what is necessary and sufficient for the public safety and of the cost and burden which the railroad must endure to secure it.[319]

It should be noted that the state law conflicted with the federal statute in two senses: (1) the state standard was to be imposed during the period which Congress had given to the railroads to make necessary adjustments; and (2) the state standard was more strict than that which Congress felt necessary. The court specifically mentioned the first type of conflict, and the quoted statement seems to imply the second.

At the very least, this case stands for the proposition that, where Congress itself specifies a health and safety standard for a matter affecting interstate commerce, the Supreme Court will not allow the states to impose higher standards concerning the same matter, for the congressional act is said to be accompanied by an intention that no greater burden will attend the matter than Congress has deemed necessary. Furthermore, where Congress has provided a period of grace to the

[318] 233 U.S. 671, 34 S. Ct. 756 (1914). See also Northern Pacific Ry. v. Washington, 222 U.S. 370, 32 S. Ct. 160 (1912).

[319] *Id.* at 683.

affected activity, the states may not act to nullify its effect. Had Congress not acted at all with respect to hours of service, the New York law would have been valid, but, Congress having acted, the states will not be allowed to frustrate the accomplishment and execution of its full purposes and objectives. Unanswered by this case is the question of whether a state "hours of service" law, identical in all respects with the federal law, could have been enforced after the federal standards became effective.

Because of the complexities of health and safety regulation, Congress usually directs or authorizes a federal agency to establish health and safety standards and delegates to it the authority to enforce them rather than set up the standards in the statute itself. Here, also, state action may be pre-empted. For example, the Agricultural Appropriation Act of 1917 directed and authorized the Secretary of Agriculture to impose plant quarantines and to prevent or control the interstate shipment of any class of nursery stock or any other class of plants, fruits, vegetables, roots, bulbs, seeds, or plant products capable of carrying any dangerous plant disease or insect infestation whenever he determined such measures were necessary to prevent the spread of a dangerous plant disease or insect infestation. The Secretary was also authorized to issue rules and regulations providing for inspections, disinfection, certification, and the method and manner of delivery of any article capable of carrying plant diseases and insect infestation. Similar powers and duties were given as to importation of the same articles into the United States, and criminal penalties were specified for violations of the provisions of the act or the Secretary's orders and regulations. In *Oregon-Washington Co.* v. *Washington*[820] the federal act was held to preclude an attempt by the Washington Director of Agriculture to establish a quarantine against alfalfa hay and meal from certain areas of Utah, Wyoming, Colorado, Oregon, and Nevada which were infested with the alfalfa weevil. The court said:

> It is impossible to read this [federal] statute and consider its scope without attributing to Congress the intention to take over to the Agricultral Department of the Federal Government the care of horticulture and agriculture of the States, so far as these may be affected injuriously by the transportation in foreign and interstate commerce of anything which by reason of its character can convey disease to and injure trees, plants, or crops. All the sections look to a complete provision for quarantine against importation into the country and quar-

[820] 270 U.S. 87, 46 S. Ct. 279 (1926).

> antine as between the States under the direction and supervision of the Secretary of Agriculture.[321]

In answer to the suggestion that the states might act in the absence of any action by the Secretary of Agriculture, the court replied:

> The obligation to act without respect to the State is put directly upon the Secretary of Agriculture whenever quarantine, in his judgment is necessary. When he does not act, it must be presumed that it is not necessary.[322]

It might be inferred from the first statement quoted that, from the very pervasiveness of the scheme of federal regulation, the Supreme Court was compelled to reach the conclusion that Congress intended to pre-empt regulation of the matters covered by the federal act. In only one of the cases in this discussion (a recent and highly controversial case involving sedition against the federal government),[323] however, has the Supreme Court appeared to pose this as a separate and complete test of pre-emption. It is submitted that the second statement, rather than the pervasiveness of the federal scheme of regulation, contains the principal basis of the decision. The test implicit in that statement is the familiar one of conflict. The Secretary of Agriculture was *directed* to impose a plant quarantine should he determine that such a measure was necessary to prevent the spread of dangerous plant diseases or insect infestations across state lines. His power in this respect was quasi-legislative. If the Secretary did not impose a quarantine, it followed (in the court's opinion at least) that none was necessary, and, if not necessary, it also followed that the state action was in conflict with federal policy. That being the case, the Supreme Court was compelled to conclude that state action of this sort was precluded.

From this case we may fairly conclude that, where a general and all-inclusive federal statute *directs* (not just authorizes) a federal agency to establish health and safety standards, as circumstances require, the Supreme Court will not allow the states to impose different or higher standards concerning matters within the scope of the federal grant of power. Where the federal agency has acted to establish the appropriate standard, a different or higher state standard constitutes an actual conflict; where the federal agency has not acted, any state standard constitutes a possible conflict. Either situation is fatal to the validity of the state act. It may be worth while to mention that, following the *Oregon-*

[321] *Id.* at 99.
[322] *Id.* at 102-103.
[323] Pennsylvania v. Nelson, 350 U.S. 497, 76 S. Ct. 477 (1956).

Washington case, Congress promptly intervened by further amending the federal statute to permit the states to impose quarantines in situations overlooked by the Secretary of Agriculture.[324] Like the earlier *Erie Railroad* decision, this case did not throw any light upon whether the state might have supplemented federal law by making it a state offense to import the specified articles into the state in violation of a quarantine imposed by the Secretary of Agriculture.

Not only may states be precluded from establishing health and safety standards different from those established by a federal agency pursuant to congressional directive, but they also may be prevented from doing so where the federal agency is only authorized, but not obligated, to establish a particular safety standard. For example, in *Penn. R.R. Co.* v. *Public Service Commission*[325] the laws of Pennsylvania forebade the operation of any train consisting of U.S. mail or express cars without a railed platform, thirty inches in width, attached to the rear end of the rear car. The Postmaster General, with congressional authorization, had issued regulations concerning the construction of mail cars when used as the end car. Furthermore, the ICC, pursuant to the authority granted it by the Safety Appliance Act, had issued elaborate regulations pertaining to "Caboose Cars without Platforms." In reversing the order of the state Public Service Commission requiring compliance with the state law, the Supreme Court noted that the specifications and equipment of the railroad's end cars on mail and baggage runs were: (1) matters calling for uniform laws; (2) covered by detailed and comprehensive federal regulations; and (3) in compliance with those federal regulations. While it would have been possible for the railroad to comply with both federal and state regulations, the Supreme Court inferred from the detailed and comprehensive federal regulations that no more was necessary to assure safety than what the federal regulations required. Therefore, the state requirement indirectly conflicted with federal policy.

A similar question was raised in *Napier* v. *Atlantic Coast Line*[326] where the railroads claimed that the federal Boiler Inspection Act, as amended in 1915 and 1924, had occupied the field as to regulation of locomotive equipment used on interstate railways and therefore precluded enforcement of state laws requiring automatic firebox doors and cab curtains during the winter season. Amendments to the Boiler In-

[324] 44 Stat. 250 (1926).
[325] 250 U.S. 566, 40 S. Ct. 36 (1919).
[326] 272 U.S. 605, 47 S. Ct. 207 (1926).

spection Act gave the ICC authority to establish health and safety standards for the entire locomotive and tender. Pursuant to this authority the ICC required a number of safety devices, but automatic firebox doors and cab curtains were not among them. The Supreme Court held the state laws to be unenforceable against the railroad. It was assumed that the state acts were a proper exercise of the police power, that there was no direct conflict between state and federal requirements, and that the interference with commerce was only incidental. Nevertheless, since Congress had authorized the ICC to establish all safety features for interstate locomotives and tenders, and the ICC had exercised that power *extensively,* the court felt compelled to assume that Congress could not have intended the imposition of *additional* state safety requirements.

The feature that distinguishes these two cases from the *Oregon-Washington* decision is that appropriate action was merely authorized in the two railroad cases while it was obligatory in the quarantine case. The implication of pre-emptive intent becomes quite as strong, however, when the authorized federal agency has effectively exercised its power by establishing comprehensive and detailed safety standards. The significance of this distinction will become more readily apparent when we consider subsequent cases where the states have been allowed to establish safety standards within an area where the quasi-legislative authority delegated to a federal agency has not been exercised as to the particular safety matter.

One case which is apt to prove especially troublesome to a state seeking to establish and enforce a radiation health and safety program is *Cloverleaf Butter Co.* v. *Patterson.*[327] Under federal law the production of renovated butter was taxed and regulated by the federal government. This law authorized the Secretary of Agriculture to inspect places of manufacture and storage of both the ingredients (*i.e.,* packing stock butter) and the renovated butter and to confiscate the finished product should it be found unwholesome or deleterious to health. State law conferred upon the Alabama Board of Agriculture and Industries the power to promulgate and enforce rules and regulations in regard to foods and drugs. Under this authority the Alabama commissioner condemned packing stock butter held by petitioners for renovation. Seventy-five per cent of petitioner's packing stock butter came from outside of the state, and ninety per cent of the renovated butter was shipped in interstate commerce. The action was brought to enjoin

[327] 315 U.S. 148, 62 S. Ct. 491 (1941).

enforcement of the state law on the ground of federal pre-emption. In reversing the judgment of the state court and ruling in petitioner's favor, a divided court (5 to 4) pointed out:

> . . . [The federal Act] left the states free to act on the packing stock supplies prior to the time of their delivery into the hands of the manufacturer and to regulate sales of the finished product within their borders. But, once the material was definitely marked for commerce by acquisition of the manufacturer, it passed into the domain of federal control. . . . Confiscation by the state of material in production nullifies federal discretion over ingredients.[328]

The majority opinion also stated:

> Congress hardly intended the intrusion of another authority during the very preparation of a commodity subject to the surveillance and comprehensive specifications of the Department of Agriculture. To uphold the power of the State of Alabama to condemn the material in the factory, while it was under federal observation and while federal enforcement deemed it wholesome, would not only hamper the administration of the federal act but would be inconsistent with its requirements. Whether the sanction used to enforce the regulation is condemnation of the material or the product is not significant. Since there was federal regulation of the materials, there could not be similar state regulation of the same subject.[329]

While the fact was not cited in support of the majority opinion in this case, Justice Frankfurter acknowledged in his dissenting opinion that in proposing this legislation the Department of Agriculture ". . . did ask Congress to make some restrictions upon the authority which had been exercised by the states in regulating the manufacture and sale of butter for the protection of their citizens." [330] It is not unreasonable to assume that this legislative history and the attitude of the Department of Agriculture influenced the decision. Several cases considered later suggest that an intention upon the part of a federal agency to exclude or allow state action may affect the court's decision.

Several other features of this case require comment. There was nothing hazardous, to either the employees or the public generally, in the renovated butter manufacturing process itself. Thus there was little local interest in the safety of the manufacturing process since the prod-

[328] *Id.* at 168.
[329] *Id.* at 169.
[330] *Id.* at 177.

uct was only dangerous when consumed, and, by express limitation, the court's decision did not prevent the state from condemning unwholesome raw materials prior to the time they were acquired by an interstate manufacturer. Moreover, the decision did not prevent the state from regulating the sale of the finished product within the state's borders. It was not necessary, therefore, for the court to hold the state powerless to protect the health and safety of its people. It was only necessary for the court to conclude that the state could not regulate in a manner that might possible conflict with or impair the administration of a comprehensive federal health and safety program.

(ii) Health and Safety Regulation Cases Finding No Federal Pre-emption

A careful study of the decided cases leads one to conclude that the Supreme Court is somewhat reluctant to declare that an act of Congress has pre-emptive effect, particularly where this would leave the states powerless as to health and safety matters where the local concern is great. Thus the fact that the federal government has entered a field of regulation does not alone lead the court to infer a pre-emptive congressional intent as to the entire field of regulation. To illustrate, in *Reid* v. *Colorado* [331] the defendant had been convicted of violating a state law prohibiting any person from bringing or driving cattle or horses into the state, between April 1 and November 1, from any place south of the 36th parallel, unless they had been held at a place north of the parallel for at least ninety days prior to importation or unless the shipper obtained a certificate from the State Veterinary Sanitary Board indicating that the animals were free from all infectious or contagious diseases and had not been exposed to such diseases during the ninety days prior to inspection. The defendant appealed on the ground that the state law was repugnant to the Federal Animal Industry Act of 1884, alleging that the animals had been inspected, found healthy, and certified by an inspector of the Federal Bureau of Animal Industry. Under the federal act the Secretary of Agriculture was authorized: (1) to conduct a study of livestock diseases and methods of suppression; (2) to frame appropriate rules and regulations for *certification* to the states; and (3) to control the export of diseased livestock from ports of the United States. Furthermore, the act made it unlawful to drive or transport in interstate commerce any livestock

[331] 187 U.S. 137, 23 S. Ct. 92 (1902).

known to be affected with any contagious, infectious, or communicable disease. Pointing out that persons transporting livestock in interstate commerce might not know them to be diseased, the court concluded that the state and federal acts did not cover the same ground and, therefore, that there could be no direct conflict between them. Because the federal act also contemplated state action, the state act did not indirectly conflict with federal policy. Apparently, the inspection and certification by the federal officer was gratuitous since the Animal Industry Act did not give to any agency the authority to issue a certificate that could be considered as authorizing transportation of livestock in interstate commerce. The Supreme Court affirmed the conviction, holding that the state was free to take reasonable steps to control importation of diseased livestock and to determine whether disease was present.

In *Savage* v. *Jones* [332] a Minnesota citizen sought to enjoin the enforcement of an Indiana statute regulating the sale, and requiring a statement of the ingredients formula, of concentrated commercial livestock food on the ground that it was repugnant to the Federal Pure Food and Drugs Act of 1906. The federal act dealt with the subject of adultered and misbranded foods, making it unlawful to misrepresent the ingredients of foods, but did not require a disclosure of ingredients. The court concluded that Congress had not occupied the field and that the state law could be imposed without impairing the administration of the federal act.

The subject of diseased cattle arose again in *Mintz* v. *Baldwin* [333] where the plaintiffs, cattle importers, sought to enjoin the enforcement of an order of the New York Commissioner of Agriculture prohibiting the delivery of certain cattle into New York from Wisconsin. The cattle were accompanied by a Wisconsin certificate indicating freedom from Bang's disease, but, as required by New York law, there was nothing to show that the herd from which the cattle came was similarly free from disease. The plaintiff argued that two federal acts had pre-empted the field of cattle importation regulation. The Cattle Contagious Diseases Act of 1903 authorized and directed the Secretary of Agriculture to establish rules and regulations concerning interstate transportation from any place where he had reason to believe livestock diseases existed. Furthermore, the act specified that whenever an inspector of the Bureau of Animal Industry issued a certificate showing

[332] 225 U.S. 501, 32 S. Ct. 715 (1912).
[333] 289 U.S. 346, 53 S. Ct. 611 (1933).

that he had inspected any cattle from a diseased area and found them free of communicable disease, the cattle might be shipped, driven, or transported in interstate commerce without further inspection or the exaction of any fees. The Cattle Contagious Diseases Act of 1905 authorized the Secretary to establish quarantine districts and to control livestock shipments from such areas. Wisconsin had not been quarantined, and the plaintiff's cattle had not been inspected by a federal officer. The Supreme Court held that Baldwin's order did not conflict with the act of 1905 because the shipments were not made from a federally quarantined area. Moreover, that order did not conflict with the act of 1903 because no federal inspection had been made or certificate issued. Applying the principle of construction that specification of exclusive federal actions negatives pre-emption in areas not specified, and finding that federal inspection and certification under the act of 1903 were only exclusive if actually made, the court concluded that this act did not otherwise limit state powers. The *Oregon-Washington* case [334] was distinguished on the grounds that the Plant Quarantine Act involved in that decision covered the whole field and did not, "by specification of the cases in which action under it [should] be exclusive, disclose the intention of Congress that, subject to the limitations defined, state measures [might] be enforced." [335] In reality the scope and coverage of the two Cattle Contagious Diseases Acts seems no less pervasive than was the Plant Quarantine Act in the earlier case; however, the second basis of distinction appears sound. To this we might add that in the earlier case the state officer ordered a complete prohibition against importation of the offending article into the state, whereas in the *Mintz* case the effect of the New York Commissioner's order was not so drastic; the cattle could be brought into the state if both the individual animals and the herd from which they came were certified to be free from Bang's disease. A further basis of distinction is to be found in the acquiescence of the Department of Agriculture to enforcement of state measures to suppress Bang's disease. This fact was mentioned by the court, and suggests that the administrative agency may make the decision to exclude or allow state action, at least in areas where it is authorized, but not directed, to act.

In *Kelly* v. *Washington* [336] the owner of a fleet of motor-driven (non-steam) tugs sought a writ of prohibition against enforcement of a state

[334] *Supra* note 320.
[335] *Supra* note 333 at 352.
[336] *Supra* note 316.

law providing for the inspection and regulation of every vessel operated by machinery but not subject to inspection under federal law. Federal acts and regulations regarding vessels on the navigable waters of the United States were detailed and elaborate, but they did not provide for inspection of the hulls and machinery of motor-driven tugs that did not carry passengers or freight for hire or had a gross tonnage of less than 300 tons. Therefore, it followed that inspection of the hulls and machinery of the plaintiff's vessels by state officials to insure safety and seaworthiness was not in conflict with any express provision of federal law or regulation. On the question of pre-emption by virtue of the negative implication of elaborate, but less than comprehensive, federal laws, the court said:

> It would hardly be asserted that when Congress set up its elaborate regulations as to steam vessels, it deprived the State of the exercise of its protective powers as to vessels not propelled by steam. The fact that the federal regulations were numerous and elaborate does not extend them beyond the boundary they established.[337]

It should be noted that the state officials were merely inspecting hulls and machinery to determine safety and seaworthiness. The state law was not being applied in such a manner as to require the owners of the vessels to build, modify, or operate the vessels according to state specifications and rules. By way of dictum on this matter, the court said:

> If, however, the State goes farther and attempts to impose particular standards as to structure, design, equipment and operation which in the judgment of the authorities may be desirable but pass beyond what is plainly essential to safety and seaworthiness, the state will encounter the principle that such requirements, if imposed at all, must be through the action of Congress which can establish a uniform rule.[338]

From time to time each of these four cases has been cited to support the proposition or inference that, where federal acts leave some matters in a general field unregulated, a policy of federal indifference to state action is indicated, and the state may regulate if its action does not otherwise constitute an obstacle to the accomplishment and execution of the full purposes and objectives of Congress. In each of these cases the court concluded that no conflict was indicated. And, in the *Reid* and *Mintz* cases, the court demonstrated a willingness to place the state

[337] *Id.* at 13.
[338] *Id.* at 15.

action outside of the scope of rather comprehensive schemes of federal regulation.

Other cases also illustrate this willingness of the court to allow state action in areas covered by a general and inclusive federal statute which delegates quasi-legislative authority to a federal agency. In *Welch* v. *New Hampshire* [339] the State Public Service Commissioner had suspended the appellant's state certificate to use state highways. It was shown that in 1937 the appellant violated a state law which forbade the operation of motor vehicle carriers by a driver who had been continuously on duty for more than twelve hours. The Federal Motor Carrier Act of 1935 imposed upon the ICC the duty to regulate interstate common and contract carriers by motor vehicle. To this end the ICC was expressly authorized to establish reasonable standards with respect to qualifications and maximum hours of service of employees and safety of operation and equipment. Pertinent regulations specifying no more than ten hours of continuous duty were promulgated by the ICC in 1937, but the effective date was postponed until January of 1939. The decision in this case, rejecting the appellant's assertion of federal preemption and affirming the action of the state agency, is in striking contrast to *Erie R.R. Co.* v. *New York* [340] which was distinguished. As in the *Erie* case, the violations occurred after enactment of the federal law and promulgation of the federal hour standards but before those standards became effective. Unlike the situation in the *Erie* case, however, those hours standards were not established by Congress in the statute itself but by the ICC. Moreover, the ICC was authorized, but not directed, to establish the standards. The court stated that if the federal act had imposed a duty on the ICC to prescribe qualifications and hours of service the state law would have been pre-empted in 1935. Since it was only authorized to do so, however, the court would not infer that Congress intended to supersede a state safety measure prior to the taking effect of a federal measure found suitable to put in its place. One further distinction should be noted: the state law allowed more hours of continuous operation than did the deferred federal regulation. In the *Erie* case, the circumstances were reversed.

Pursuant to the authority granted to it by the same statute, the ICC promulgated regulations establishing *minimum* qualifications for drivers of motor vehicles, including taxicabs, operating as carriers in interstate and foreign commerce. A San Diego County ordinance required taxi-

[339] 306 U.S. 79, 59 S. Ct. 438 (1939).
[340] *Supra* note 318.

cab drivers to make written application for an operator's permit to the sheriff and to pay a fee of $1.00. Applicants were examined as to their knowledge of the ordinance, the Vehicle Code, traffic regulations, and county geography. The permit could be denied a person of "bad moral character," a person convicted of a crime involving moral turpitude, an unsuccessful examinee, and a person who had violated any provision of the ordinance. In *Buck* v. *California* [341] the court held that the county ordinance could be applied to drivers of cabs making trips between Mexico and points in the county, pointing out that the ordinance did not conflict with any federal law, that the operation of taxicabs is a local business, and that commerce is affected only indirectly. Since the ICC had established only minimum driver qualifications, the court concluded that:

> This does not prevent the state or a subdivision thereof, in the exercise of its police powers, from providing additional specifications as to qualifications, not inconsistent or in conflict with the regulations of the Interstate Commerce Commission. Especially is this true since the regulations of the Commission are only minimum.[342]

In *Terminal Assn.* v. *Trainmen* [343] the Supreme Court sustained the order of the Illinois Commerce Commission requiring the appellant to provide cabooses on all designated runs within the state in order to protect the lives and health of employees. Appellant was a corporation engaged in performing terminal services for a number of railroads in and around East St. Louis. It operated several yards for the sorting, classification, and interchange of cars. Appellant claimed congressional occupation of the field by virtue of the Boiler Inspection Acts, the Safety Appliance Acts, the Interstate Commerce Act, and the Railway Labor Act, in that they authorized the ICC to prescribe requirements as to the use of cabooses in the type of railroad activities being carried on by appellant. Despite this acknowledged authorization, however, the ICC had not established any requirements respecting the use of cabooses on switching and sorting runs. While the ICC could have regulated the matter and certainly had issued comprehensive regulations concerning other railroad activities, neither the general and inclusive power nor the extensive exercise of that power by the ICC implied pre-emptive intent as to local matters of public safety upon which no action had been taken.

[341] 343 U.S. 99, 72 S. Ct. 502 (1952).
[342] *Id.* at 101-102.
[343] 318 U.S. 1, 63 S. Ct. 420 (1943).

On frequent occasions since the statement was made by Holmes in 1915 in the case of *Charleston & Car. R.R.* v. *Varnville Furniture Co.*,[344] the Supreme Court has said that when "Congress has taken the particular subject-matter in hand coincidence [of state law] is as ineffective as opposition." The statement, however, was dictum in that case, since the state law did not coincide with federal law, and it is believed that a careful study of the health and safety cases will bear out the assertion that it has been no less gratuitous when it has been repeated. In *California* v. *Zook*[345] the Supreme Court was presented with a situation in which state and federal law did coincide. A 1947 California statute prohibited the sale or arrangement of any transportation over the public highways of the state if the carrier did not have an ICC permit. The Motor Carrier Act had substantially the same provision; however, until 1942, the ICC had declined to require permits of persons engaged in "casual, occasional, or reciprocal" transportation. In that year the ICC regulations were amended to require "share-the-expense" passenger carriers to obtain a permit. Respondents operated a travel bureau in Los Angeles and admitted selling and arranging transportation to Arizona on a "share-the-expense" basis in vehicles operated by drivers who did not hold ICC permits, but demurred to the criminal complaint on the ground that the law invaded an exclusive congressional domain. In support thereof they invoked the familiar phrase of the *Varnville* decision. A sharply divided court (5 to 4) refused to be persuaded by the "logic" of this argument and upheld the conviction for violation of state law. While state boundaries had been crossed on the trips for which respondents had made arrangements, the court concluded that the state interest was not outweighed by the national interest. The theory that coincidence is as ineffectual as opposition and that state laws aiding enforcement of federal laws are invalid was specifically rejected. The court pointed out that the *Varnville* principle assumes that Congress has taken the particular subject matter in hand to the exclusion of state law. Where the question to be answered by the court is whether Congress has prohibited state action, application of the principle would be unsound. The court said:

> The "coincidence" rationale is only an application of the first principle of conflict with national policy. The phrase itself simply states the familiar rule. If state laws on commerce are identical with those of Congress, the Court may find congres-

[344] 237 U.S. 597, 35 S. Ct. 715 (1915).
[345] *Supra* note 281.

> sional motive to exclude the states. . . . But the fact of identity does not mean the automatic invalidity of state measures. Coincidence is only one factor in a complicated pattern of facts guiding us to congressional intent.[346]

Several factors appeared to be significant to the majority. (1) The state and federal laws did not collide or conflict, and enforcement of the state law would not impair administration of the federal law. To the contrary, the court said:

> It is difficult to believe that the I.C.C. intended to deprive itself of effective aid from local officers experienced in the kind of enforcement necessary to combat this evil—aid of particular importance in view of the I.C.C.'s small staff.[347]

(2) The state law pertained to a matter of great local interest; a traditional subject of state regulation. (3) No conflicting state laws on this subject existed in 1942 when the ICC amended its regulations. The court felt that "it would be startling to discover congressional intention to 'displace' state laws when there were no state laws to displace when Congress acted." [348] This absence of state law demonstrated the purpose "to provide rather than displace local rules—to fill a void rather than nationalize a single rule." [349] (4) The ICC did not express an intention to supersede state laws. The court pointed out that since the ICC's order requiring permits of "share-the-expense" passenger carriers was issued after the court had determined that California could regulate interstate passenger transportation in a similar fashion,[350] it ". . . would expect the federal agency to be specific if it intended to supersede state laws." [351]

It must be recognized that to the state seeking to regulate the activities of AEC licensees in the interest of public health and safety the *Zook* case offers but a slender and tenuous margin of authority. Of the majority group only Justice Black remains on the court in 1958, whereas two of the minority, Justices Douglas and Frankfurter, still sit. It also must be added that the language in the opinion is in rather striking contrast to that of the court in *Pennsylvania* v. *Nelson*,[352] a later case which is discussed (and distinguished) below.

[346] *Id.* at 730.
[347] *Id.* at 737.
[348] *Id.* at 735.
[349] *Id.* at 736.
[350] California v. Thompson, 313 U.S. 109, 61 S. Ct. 930 (1941).
[351] *Supra* note 281 at 737.
[352] *Supra* note 323.

Through the *Welch, Buck, Terminal Assn.,* and *Zook* cases there appears to run a common thread. In each of them the state had established and enforced a safety standard in an area covered by a general and inclusive federal law which delegated the authority, but did not impose the duty, to regulate the same general area to a federal administrative agency. In each of them federal-state conflict was found to be absent in spite of schemes of federal regulation. On the basis of these four cases we may fairly conclude that the Supreme Court will not find implied congressional intent to exclude state action where a general and inclusive federal statute delegates the power (but does not impose a specific duty) to determine its specific application to a federal agency: (1) if the federal agency has not established a safety standard similar to that which the state is imposing to alleviate a local hazard; (2) if the federal agency has established only minimum safety standards and the local need for additional standards is great; (3) even where extensive, similar, federal regulations have been issued, if the state action relates to what may be considered a separable or distinct segment of the matter which is within the scope of the federal act but which appears to have escaped the attention of the federal agency and is of substantial local interest; and (4) even where federal safety standards have been established, if the state standard is identical and its enforcement will not materially interfere with the administration of the federal act. In every case, of course, the state action must not otherwise conflict with, or stand as an obstacle to, the accomplishment and execution of the full purposes and objectives of Congress. It also is important to note that in several of these cases, in which the federal agency is authorized but not obligated to act, the Supreme Court appears to assume that Congress also authorized the federal agency to determine whether its regulation would be exclusive or not.

(iii) Summary of Health and Safety Case Pre-emption Principles

As in the labor cases, in determining whether Congress intended to exclude state health and safety regulation, the central concern of the Supreme Court is with conflict, or the possibility of it, between federal and state policies and actions. Moreover, in this area there are few substantive rules since the solution is essentially a task of statutory construction. The one clear rule flows from the Supremacy Clause of the Constitution [353] and is manifested in the court's examination of the

[353] U.S. Const., Art. VI, cl. 2.

particular situation for possible conflict. The remaining principles are simply inferences to be drawn from certain factual considerations. Among these considerations are: (1) the pervasiveness of the federal scheme of regulation; (2) the burden on interstate commerce imposed by local regulations as balanced against the local interest in the subject of regulation; (3) whether safety standards are prescribed by Congress in a statute or are to be issued by a federal agency; (4) whether Congress has directed a federal agency to take appropriate action or merely authorized it to do so; (5) the comprehensiveness and effectiveness of federal agency action in the regulatory field generally; (6) whether the federal agency has acted upon the particular subject or, in the event that it has not acted, its reasons for not acting; (7) whether the federal agency, which has been authorized to act by Congress, has indicated that its regulations are to be exclusive; (8) the practical feasibility of exclusive federal control; (9) whether state action preceded or succeeded federal action in the field; (10) whether state safety standards are higher, in addition to, or identical with those imposed by federal law; and (11) whether enforcement of state standards will interfere with administration of federal law.

(c) Other Pre-emption Cases

The question of implied congressional pre-emption also has been considered by the Supreme Court in two cases involving alien regulation and national security and in three cases addressed to the rather narrow problem of the applicability of federal safety standards and licensing procedures for carrying on interstate activity as these affect property or action of a state or a subdivision thereof.

(i) National Security and Alien Regulation Cases

In 1941 the Supreme Court decided the case of *Hines* v. *Davidowitz* [354] where the validity of the Pennsylvania Alien Registration Act of 1939 was challenged. The assertion was made that the Federal Alien Registration Act of 1940 and other federal laws dealing with aliens had pre-empted the field. Under the state act aliens, eighteen years or over, were required to register annually with the Department of Labor and Industry, to carry an alien registration card at all times, to show the card upon demand to any officer of the Department of Police, and to

[354] *Supra* note 278.

exhibit the card when applying for a driver's license or registering a motor vehicle. Discretionary authority to prescribe the information registrants were to supply was given to the department, which was to classify the registrants and furnish a copy of the classification to the Pennsylvania Motor Police. Violations of the state act could be punished by fine or imprisonment, or both. Under the federal act aliens, fourteen years or over, were required to register only once at a local post office. No registration card was issued or required to be carried. The registration and fingerprint records were forwarded to the Department of Justice where the information was kept secret and confidential. It could be made available only to those persons or agencies authorized to receive it by the Commissioner of Immigration and Naturalization, with the approval of the Attorney General. Only wilfull failure to register subjected the alien to criminal penalties. Other federal laws provided a comprehensive program to regulate the admission and deportation of aliens and the means by which they might acquire citizenship. While other issues were raised on the appeal, the case was decided on appellee's contention that "by its adoption of a comprehensive, integrated scheme for regulation of aliens—including its 1940 registration act—Congress [had] precluded state action like that taken by Pennsylvania." [355] The order of the federal district court enjoining enforcement of the state law was affirmed by the Supreme Court.

Two features of this case were pointed out by the court which distinguish it from a case involving the competing interests of the federal and state governments to regulate health and safety matters. Referring to alien control laws, the court said:

> . . . [I]t is also of importance that this legislation deals with the rights, liberties, and personal freedoms of human beings, and is in an entirely different category from state tax statutes or state pure food laws regulating the labels on cans.[356]

Referring to the subject of alien regulation, the court also said:

> . . . [T]he regulation of aliens is so intimately blended and intertwined with responsibilities of the national government that where it acts, and the state also acts on the same subject, "the act of Congress, or the treaty, is supreme; and the law of the State, though enacted in the exercise of powers not controverted, must yield to it." [357]

[355] *Id.* at 61.
[356] *Id.* at 68.
[357] *Id.* at 66.

From the quoted premise it followed that Congress could establish an exclusive system of regulation—not that it had done so merely by acting. The court went on, however, to point out that:

> . . . [W]here the federal government, in the exercise of its superior authority in this field, has enacted a complete scheme of regulation and has therein provided a standard for the registration of aliens, states cannot, inconsistently with the purpose of Congress, conflict or interfere with, curtail or complement, the federal law, or enforce additional or auxiliary regulations.[358]

Thus the court's analysis began with two questions: (1) did Congress establish a standard for the registration of aliens as a part of a complete scheme of alien regulation?; and, (2) did "Pennsylvania's law [stand] as an obstacle to the accomplishment and execution of the full purposes and objectives of Congress?" [359] An examination of the Alien Registration Act of 1940 and the other federal laws mentioned above indicated to the court that Congress had established a uniform system of alien regulation. Congressional history, since repeal of the Alien and Sedition Acts of 1798, revealed a consistent opposition to laws requiring aliens to register annually, to carry identification cards, to exhibit such cards on demand, or to pay a registration fee. Therefore, since the federal act contained a minimum of such requirements, and since those not included had been rejected by Congress from time to time, it followed that the state act was inconsistent with the purposes and objectives of Congress.

In *Pennsylvania* v. *Nelson,*[360] a 1956 case, the respondent, an acknowledged Communist Party member, had been convicted in a state court for violation of the Pennsylvania Sedition Act, in that he knowingly advocated the overthrow of the federal government. Under the state law indictment for sedition could be initiated upon an information made by a private person, and conviction could result in a fine of up to $10,000 or imprisonment up to twenty years or both. Under the Smith Act of 1940, as amended, knowing advocacy of the "duty, necessity, desirability, or propriety of overthrowing or destroying the government of the United States or the government of any State . . . by force or violence," was made a federal crime, punishable by a fine of up to $10,000 or imprisonment up to ten years, or both.[361] A Smith Act

[358] *Ibid.*
[359] *Id.* at 67.
[360] *Supra* note 323.
[361] §1, 18 U.S.C.A. §2385.

indictment could be initiated only by federal officers acting in their official capacity. In addition to the Smith Act Congress had enacted several other laws to meet the Communist conspiracy. The Internal Security Act of 1950 required annual registration and reporting by "Communist-action" and "Communist-front" organizations, and the Communist Control Act of 1954 declared the Communist Party of the United States to be an instrumentality of a conspiracy to overthrow the government of the United States and that its role as an agency of a hostile foreign power rendered its existence a clear, present, and continuing danger to natural security. Knowing members of the Communist Party were made subject to certain provisions and penalties of the Internal Security Act. It should be mentioned that, after his conviction in the state court, Nelson had been indicted, convicted, and sentenced in a federal district court for conspiracy to violate the Smith Act.[362] "The acts proven in the Federal Court to effectuate the alleged conspiracy consisted of practically the same matter as was offered against Nelson in the trial in the State Court."[363] On review the Supreme Court affirmed the decision of the Supreme Court of Pennsylvania, which had reversed the conviction, on the ground that federal law pre-empted the field.

The Supreme Court's analysis of the pre-emption problem in this case is significantly different from that employed in the *Hines* case and other cases discussed above. The court's language appears to establish much more precise and strict criteria of federal pre-emption than had been applied in earlier cases. Before examining these tests of federal pre-emption, however, a word or two is necessary to indicate the limits of the decision. It is to be noted that Nelson was convicted under state law for knowingly advocating the overthrow of the federal government. No evidence was offered to show that he had committed any seditious acts directed against the state or local governments. In view of these facts the Chief Justice in his prefatory remarks carefully pointed out that:

> . . . [The decision in this case does not] limit the right of the State to protect itself at any time against sabotage or attempted violence of all kinds. Nor does it prevent the state from prosecuting where the same act constitutes both a federal offense and a state offense under the police power.[364]

[362] United States v. Mesarosh (Nelson), 116 F. Supp. 345 (1953), *aff'd* 223 F.2d 449 (1955), *cert. granted* 350 U.S. 922, 76 S. Ct. 218 (1955).

[363] Commonwealth v. Nelson, 377 Pa. 58, 71, 104 A.2d 133 (1954).

[364] *Supra* note 323 at 500.

In other words, the holding that the state could not make criminal an act intended to further the overthrow of the federal government when federal law proscribed that act was not intended by the court to mean that the state was prevented from protecting itself from the same act if it was actually directed against the state as well, even though the Smith Act also made it a federal crime to attempt the violent overthrow of state governments.

In the *Nelson* case the court appears to have taken the three factors discussed in the *Hines* case and made separate and self-sufficient tests for pre-emption of each. The court said:

> In this case, we think that each of several tests of supersession is met.
>
> *First,* "the scheme of federal regulation [is] so pervasive as to make reasonable the inference that Congress left no room for the States to supplement it" . . .[365]
>
> *Second,* the federal statutes "touch a field in which the federal interest is so dominant that the federal system [must] be assumed to preclude enforcement of state laws of the same subject" . . .[366]
>
> *Third,* enforcement of state sedition acts presents a serious danger of conflict with the administration of the federal program.[367]

To find the pervasive scheme of federal regulation, upon which an apparently conclusive presumption of pre-emptive congressional intent was based, the court examined the combined scope of the Smith Act, the Internal Security Act of 1950, and the Communist Control Act of 1954. Apparently, where federal laws are *in pari materia,* the Supreme Court may find a pre-emptive effect in the earlier law by virtue of later enactments establishing regulation in the general field if the consecutive increments add up to "pervasiveness." Having found in these three federal statutes ". . . a congressional plan which [made] it reasonable to determine that no room [had] been left for the States to supplement it," [368] the court quoted the familiar phrase of the *Varnville* case to conclude that coincidence was as ineffective as opposition. On its facts this case does not differ from others in which federal pre-emption has been found for the court did find conflict with federal law or impairment of its administration. It does appear to depart from the earlier cases, however, in the conclusively pre-emptive effect which the

[365] *Id.* at 502.
[366] *Id.* at 504.
[367] *Id.* at 505.
[368] *Id.* at 504.

court assigns to pervasiveness of the federal scheme alone. While the congressional plan considered in this case is no more pervasive than that established by the Atomic Energy Act of 1954, it likewise is no more pervasive than the system of laws under which the NLRB or the ICC operate. It is difficult to believe, therefore, that the court, in a situation where its second and third tests are not met, would prohibit state action simply because Congress has been very active in the field.

As authority for the second test applied in the *Nelson* case the court cited *Hines* v. *Davidowitz*. In that case, however, the dominant national interest in the subject of federal regulation was emphasized to support the proposition that the states could not regulate the subject inconsistently with the purposes and objectives of Congress. The mere fact that the federal interest was dominant did not inevitably lead to a conclusion of pre-emption, absent conflict. In any event, the very terms of this test limit its application to matters affecting national sovereignty or, at the least, to matters which require uniform national standards. To modify the court's own phrase, it would be difficult to imagine the court saying, "Congress having thus treated . . . [the radiation hazard] as a matter of vital national concern, it is in no sense a local enforcement problem." [369]

In the third test applied by the court in the *Nelson* case there is found the one clear case for implied federal pre-emption—that based on actual or possible conflict. On the facts of this case there was a serious danger of conflict between the enforcement of the state sedition act and the administration of the federal program. In 1939 the federal government had asked local authorities not to intervene in matters of national security and to turn over information regarding subversive activities immediately and unevaluated. It was recognized that the threat of subversion must be met on a coordinated, nationwide basis and not as isolated incidents within the states. For purposes of broader strategy the federal government might not want to prosecute certain individuals in the hope of catching a larger group spread over a number of states. The laws of forty-two states on this subject were examined, and some of them were found to be vague and without fundamental safeguards. Moreover, the Pennsylvania statute was said to present a peculiar danger of interference in that it allowed initiation of indictment on the information of a private person, thereby presenting the opportunity for the indulgence of personal spite and hatred. The court concluded that Congress, which had provided other means for the initiation of an indictment, could not have intended the defense of the nation to be a private undertaking.

[369] *Id.* at 505.

It is difficult to ascertain the full import of the *Nelson* decision for the future, and it has been severely criticized by the Senate Judiciary Committee.[870] If the court intends to apply the "pervasive federal scheme" test of pre-emption in the manner indicated by Chief Justice Warren's language, little remains to the states in a large number of regulatory areas, including health and safety regulation of atomic energy activities. In view of the limitations recognized by the court in *Nelson* and the enormous difficulties which would attend such a result, however, it seems unlikely that the court will apply such a deceivingly simple rule of construction where the issue is almost always very complex without a showing of actual or possible conflict between federal and state law.

(ii) Vehicle Weight Regulation Cases

The last three cases to be considered are treated separately from the health and safety regulation cases because, while the federal acts or standards concerned health and safety, the state laws were concerned primarily with the conservation of state highways. In *South Carolina Highway Dept.* v. *Barnwell Bros.*[871] the Supreme Court held that, in the absence of national legislation covering the subject in its relation to interstate commerce, a state might adopt regulations limiting the weight and width of vehicles that used its highways in order to conserve them and promote safety thereon if those regulations did not discriminate against interstate motor carriers. No question of federal pre-emption as a result of the Federal Motor Carrier Act of 1935 was raised, but in *Maurer* v. *Hamilton*[872] the interstate motor carrier appealed on the ground that the act impliedly pre-empted regulation of these matters by delegating such power to the ICC. For purposes of this study the case is chiefly interesting for the light it casts upon the question of whether or not Congress constitutionally can pre-empt regulation of a matter where the state has a proprietary interest and the effect of federal action is to deny to the state the power to conserve its

[870] The Nelson decision has inspired a number of bills in Congress which seek to disavow the congressional intent ascribed by the Supreme Court in connection with the Smith Act. Furthermore, many of these proposals would go so far as to prohibit the court from finding implied pre-emptive effect in any federal legislation (past, present, or future) unless such a result is expressly declared by Congress. At the urging of the Justice Department the Senate Judiciary Committee has been persuaded to omit the general pre-emption proposal. N.Y. Times, April 29, 1958, p. 1, col. 3.

[871] 303 U.S. 177, 58 S. Ct. 510 (1938).

[872] 309 U.S. 598, 60 S. Ct. 726 (1940).

property by such regulations as it feels to be necessary. Unfortunately for our purposes the court avoided answering this question by finding that Congress had not intended to pre-empt although it did acknowledge the existence of the problem. One of the reasons for concluding that pre-emption was not intended, however, was that in testifying at the hearing on the act before the Senate Committee on Interstate Commerce, an official had expressed the ICC's doubts as to the power of Congress to authorize it to establish a minimum weight standard, below which the states could not go, in view of the states' ownership of highways and their interests in conserving them.

In *Castle* v. *Hayes Freight Lines*[373] a somewhat different question was presented to the court. The issue was whether Ilinois might bar an interstate motor carrier from using state roads for a specified time as punishment for repeated violations of state highway weight regulations. The respondent held a certificate of convenience and necessity issued by the ICC under authority of the Motor Carrier Act. While it had been determined earlier by the court that a state's regulation of weights and distribution of loads carried on interstate trucks did not conflict with the federal act, it was decided in the *Castle* case that no power remained in the states to determine what carriers could or could not operate in interstate commerce. The Motor Carrier Act authorized the ICC to revoke, suspend, or modify a certificate of convenience and necessity, but only after a hearing and finding that the carrier had willfully failed to comply with the provisions of the act or regulations promulgated under it. Presumably, the ICC could also do this for repeated violations of state laws. "Under these circumstances," the court said, "it would be odd if a state could take action amounting to a suspension or revocation of an interstate carrier's commission-granted right to operate."[374] In response to the claim that without the power of suspension the state was without appropriate remedies to enforce its laws, the court said that the conventional forms of punishment appeared adequate. Furthermore, the state might petition the ICC for appropriate action regarding the carrier's right to operate.

c. The Nature and Scope of the Federal Health and Safety Program

The cases examined above make it clear that, in considering the pre-emptive effect of federal legislation, the Supreme Court looks to the

[373] 348 U.S. 61, 75 S. Ct. 191 (1954).
[374] *Id.* at 64.

purpose, nature, and scope of federal regulation to determine if there is any room left for state action and, if so, whether the state action is within the limits indicated. It is necessary first, therefore, to consider briefly the salient features of the radiation health and safety provisions of the 1954 act and the regulatory scheme adopted pursuant to them.

In creating the AEC, Congress has established a federal agency with broad administrative, quasi-judicial, and quasi-legislative powers, among others, to promote, implement, and control the development and utilization of atomic energy for peaceful purposes to the maximum extent consistent with public health and safety. Congress obviously felt that, under the circumstances, federal regulation of health and safety matters generally was a necessary adjunct to the national atomic energy program. In response to this necessity Congress *directed* the Commission to take certain steps to protect health and safety and *authorized* the Commission to undertake others. For purposes of analyzing the preemption question this program must be separated into its two principal phases: (1) precautions taken to assure safety before operation of a radiation source or commencement of an atomic energy activity; and (2) measures taken to assure safety after construction or installation and during operation or use. Generally speaking, the Commission has been directed to provide the first type of precaution and authorized to provide the second. Also, with respect to the first type of precaution, the Commission has fashioned its standards to the requirements of each proposed activity or installation, whereas the regulations providing for operating safety are of a more general character, applying to all licensees or classes of licensees. There is, perhaps, some justification for finding a third distinction within the federal health and safety program which may prove significant. Congress has manifested greater concern as to the hazards associated with production and utilization facilities, where critical masses of special nuclear material are present, than in the case of hazards arising out of the use of byproduct materials.

(1) Federal Precautions Preceding Operation

To protect health and insure safety Congress has "authorized" the Commission to issue licenses for special nuclear material, source material, byproduct material, production and utilization facilities, and facility operators.[875] The use of the term "authorized" is misleading, however, for the act definitely contemplates the pursuit of atomic energy

[875] §§53a, 63a, 81, 103, 104, 107, 42 U.S.C.A. §§2073(a), 2093(a), 2111, 2133, 2134, 2137.

activities by private persons for their own purposes, and such activities are declared unlawful unless a license has been issued.[876] With minor exceptions, therefore, the net effect of the licensing provisions of the 1954 act is to direct the Commission to license any non-federally owned or conducted atomic energy activity if the Commission decides to allow the activity at all. Furthermore, the act provides that ". . . the Commission shall establish, by rule, minimum criteria for the issuance . . ." of source and special nuclear material licenses ". . . depending upon the degree of importance . . . to the health and safety of the public,"[877] and "shall not permit the distribution of any byproduct material to any licensee . . . who is not equipped to observe . . . such safety standards to protect health as may be established by the Commission."[878] In respect to commercial or research and development licenses to operate production or utilization facilities, ". . . no license may be issued to any person in the United States, if in the opinion of the Commission, the issuance of a license to such person would be inimical . . . to the health and safety of the public."[879] Both commercial facility and research and development facility licenses have received special congressional attention. The Price-Anderson amendment of 1957 gave statutory status to the Advisory Committee on Reactor Safeguards. The Committee is directed to ". . . review safety studies and facility license applications referred to it and . . . make reports thereon, . . . advise the Commission with regard to the hazards of proposed reactor safety standards, and . . . perform such other duties as the Commission may request."[880] The preferred status of research and development facility licenses, as opposed to commercial facility licenses, is illustrated in a provision which directs the Commission ". . . to impose the minimum amount of regulation consistent with its obligations under [the] Act . . . to protect the health and safety of the public."[881] In connection with license applications generally, the Commission may require the applicant to furnish such information as it deems necessary to determine ". . . the technical and financial qualifications of the applicant, the character of the applicant, the citizenship of the applicant, or any other qualification of the applicant . . . [deemed] appropriate for the license."[882] In addition, applicants for facility licenses must ". . .

[876] §§57a, 62, 81, 101, 42 U.S.C.A. §§2073(a), 2092, 2111, 2131.
[877] §§53b, 63b, 42 U.S.C.A. §§2073(b), 2093(b).
[878] §81, 42 U.S.C.A. §2111.
[879] §103d, 42 U.S.C.A. §2133d.
[880] Pub. L. 85-256, §5, 85th Cong., 1st Sess., 42 U.S.C.A. §2039.
[881] §104, 42 U.S.C.A. §2134.
[882] §182a, 42 U.S.C.A. §2232(a).

state such technical specifications, including information of the amount, kind, and source of special nuclear material required, the place of use, the specific characteristics of the facility, and such other information as the Commission may, by rule or regulation, deem necessary in order to enable it to find that the utilization or production of special nuclear material . . . will provide adequate protection to the health and safety of the public. Such technical specifications . . . shall . . . be a part of any license issued." [883]

The above mentioned provisions of the act make it obvious that Congress has charged the Commission with the responsibility of making as certain as is reasonably possible that each proposed private atomic energy activity, especially a production or utilization facility, will not be inimical to the public health and safety before the activity commences or the facility goes into operation. In response to these directives, the Commission has promulgated regulations prescribing general licensing standards.[884] These regulations do not attempt to spell out specific safety criteria. Instead, the burden is on the applicant to prove safety to the Commission's satisfaction. Basically, the licensing regulations require each applicant to furnish information that will enable the Commission to determine that (1) the applicant, or his employees, are qualified by training and experience to use the material or facility for the purposes requested in accordance with the Commission's "Standards for Protection Against Radiation"; [885] (2) the applicant's proposed equipment and facilities are adequate to protect health and minimize danger to life or property; and (3) the applicant's proposed procedures to protect health and minimize danger to life or property are adequate.

In licensing of production and utilization facilities the Commission is especially painstaking. Prior to submission of the application informal discussions may be held to outline the broad objectives of reactor hazards analysis. A preliminary hazard report accompanies the application. This report must be submitted by the Commission to the Advisory Committee on Reactor Safeguards where the application is for a commercial facility, for one leading to the demonstration of the practical value of such a facility for industrial or commercial purposes, or for a testing facility.[886] Before issuance of a construction permit, the Commission must have sufficient information to provide reasonable assurance that a facility of the general type proposed can be constructed and operated safely at the

[883] *Ibid.*
[884] 10 Code Fed. Regs. Pts. 30, 40, 50, 55, 70.
[885] 10 Code Fed. Regs. Pt. 20.
[886] Pub. L. 85-256, §6, 85th Cong., 1st Sess., 42 U.S.C.A. §2232(b).

proposed location. From the time the construction permit is issued until initial operation, inspectors from the AEC's Division of Inspection are supposed to observe details of construction, tests of equipment, and pre-operational integrated test runs. If, after completion of construction and review of the final hazards summary report, including the statement of proposed operating procedures, and only if the Commission finds the facility can operate safely, the construction permit may be converted into an operating license under such safety restrictions as the Commission deems necessary.[387]

Ultimately, the Commission hopes to develop detailed standards, codes, and regulations for facilities, but, while the industry remains in its developmental stage, the Commission feels it undesirable to do so.[388] Under the present procedure, when a license is issued by the Commission, it amounts to a federal determination that the qualifications of the particular licensee, his equipment and facilities and their location, and his operating procedures offer assurance of radiation safety.

(2) Federal Measures to Assure Safety During Operation

The 1954 act does not contain any express directives to the Commission as to how it is to carry out its health and safety program once a license has been issued. In fact, the act does not even state that it must do so, although there is the implication throughout the whole act that Congress expects as much. If the duty is not clear, however, the authority is, for Section 161 provides:

> In the performance of its functions the Commission is authorized to—
>
> b. establish by rule, regulation, or order, such standards and instructions to govern the possession and use of special nuclear material, source material, and byproduct material as the Commission may deem necessary or desirable to promote the common defense and security or to protect health or to minimize danger to life or property:
>
> i. prescribe such regulations or orders as it may deem necessary . . . (3) to govern any activity authorized pur-

[387] AEC, Twenty-first Semi-Annual Report 120-125 (1957). Under §170a of the Atomic Energy Act, 42 U.S.C.A. §2210a, as added by Pub. L. 85-256, 85th Cong., 1st Sess., financial protection may be required for the issuance of licenses for research reactors under §104c. Applications for licenses for research reactors under 104c are not required to be submitted to the Advisory Committee on Reactor Safeguards for review unless so specified by the Commission. §182b, 42 U.S.C.A. §2232b.

[388] AEC, Twenty-first Semi-Annual Report 121-122 (1957).

> suant to this Act, including standards and restrictions governing the design, location, and operation of facilities used in the conduct of such activity, in order to protect health and to minimize danger to life or property.
>
> p. require by rule, regulation, or order, such reports, and the keeping of such records with respect to, and to provide for such inspections of, activities and studies of types specified in section 31 and of activities under licenses issued pursuant to sections 53, 63, 81, 103, and 104, as may be necessary to effectuate the purposes of this Act. . . .[389]

This language makes it clear that the Commission has broad authority to prescribe operating standards and procedures, to require the keeping of records and the submission of reports pertinent to health and safety, and to inspect licensed activities and facilities.

Pursuant to this authority, the Commission has issued performance type regulations on "Standards for Protection Against Radiation," [390] which apply to all persons who receive, possess, use, or transfer source, byproduct, or special nuclear material under a general or specific license from the Commission. The regulations prescribe maximum permissible limits of radiation for persons in "restricted areas" (an area access to which is controlled by the licensee) and "unrestricted areas." Also included are provisions for personnel monitoring and area radiation surveys, protective devices, records and reports, radiation safety instruction, safe handling of radioactive materials, caution signs and signals, and disposal of radioactive wastes.

While the basic responsibility for safety of operation is upon the licensees themselves, all licensees, from those operating major facilities to those using comparatively small quantities of byproduct materials, are subject to periodic inspections to assure compliance with regulatory standards and the terms and conditions of the licenses. Users of uranium, thorium, and byproduct materials are inspected by personnel of the inspection sections of the Commission's Operations Offices. Inspection of licensed production and utilization facilities, however, is made by the Division of Inspection in Washington.[391]

(3) Enforcement of Federal Safety Standards

The 1954 act contains a number of provisions specifying the manner in which its provisions and Commission regulations shall be enforced.

[389] §161, 42 U.S.C.A. §2201.
[390] 10 Code Fed. Regs. Pt. 20.
[391] AEC Rel. No. 1018, April 4, 1957.

The most obvious enforcement mechanism is the Commission's authority (and in some cases, duty) to deny, suspend, and revoke licenses. The Commission may revoke a license (1) "for any material false statement in the application," (2) for any reason that would have justified refusal to issue a license originally, (3) "for failure to construct or operate a facility in accordance with the terms of the construction permit or license or the technical specifications in the application," or (4) "for violation of, or failure to observe any of the terms and provisions of [the] Act or of any regulation of the Commission." [892] Furthermore, upon revocation of the license, the Commission may take possession of all special nuclear material held by the licensee.[893] While the act does not declare byproduct material to be subject to recapture or seizure, this is implied since it does provide that:

> The Commission . . . shall recall or order the recall of any distributed [byproduct] material from any licensee, who is not equipped to observe or who fails to observe such safety standards to protect health as may be established by the Commission. . . .[894]

Apparently, this also is a condition of the byproduct material license.[895]

Acts and practices which, in the judgment of the Commission, constitute or will constitute a violation of the act or any regulation or order of the Commission may be enjoined by an appropriate court on the petition of the Attorney General,[896] and severe criminal punishment may be imposed upon persons who wilfully violate, attempt to violate, or conspire to violate, any provision of the act or any regulation or order issued by the Commission under its general authority.[897]

It is readily apparent that the federal program to protect health and maintain safety in connection with atomic energy activities is as comprehensive and pervasive as any confronting the Supreme Court in the cases considered earlier. What power, then, do the states retain to regulate atomic energy activities with respect to health and safety?

[892] §186a, 42 U.S.C.A. §2236(a).

[893] §186c, 42 U.S.C.A. §2236(c).

[894] §81, 42 U.S.C.A. §2111. Under this section, the Commission has acted to suspend or revoke licenses in two instances involving a Texas company. See "Temporary Order and Order to Show Cause," 23 Fed. Reg. 1100 (Feb. 19, 1958), BNA, Atomic Industry Reporter 4: 60-61; Radiation Products Company, 23 Fed. Reg. 2817 (April 26, 1958). The actions of the Commission in these cases are discussed *infra* at Part IV, note 455.

[895] 10 Code Fed. Regs. §30.52.

[896] §232, 42 U.S.C.A. §2280.

[897] §§222, 223, 42 U.S.C.A. §§2272, 2273.

d. Permissible Limits of State Action

The writers believe that the above question cannot be answered categorically. Because the solution appears to lie in determining what Congress impliedly intended to pre-empt, we submit that the Supreme Court probably will apply those principles of statutory construction which will effect a result in the particular case which is most nearly consistent with the objectives of the 1954 act and with the regulatory scheme adopted under it. In reality there is not one pre-emption question but many—as many as there are types of state health and safety actions affecting federally regulated atomic energy activities. Each of these questions can only be answered by considering the particular state action in relation to the system of federal law and administrative action as well as the nature of the matter regulated.

(1) State Regulation of Radiation Hazards Not Covered by the Atomic Energy Act of 1954

The scope of the 1954 act and the Commission's health and safety program is limited to activities involving "byproduct material," "source material," "special nuclear material," "production facilities," and "utilization facilities," as these terms are defined in the act.[398] Other sources of radiation, such as X-ray and fluoroscopic devices used in medicine, dentistry, and science generally, as well as in commerce and industry, are not controlled by the federal government regardless of whether or not they affect interstate and foreign commerce. Also not covered by the 1954 act are atomic particle accelerators, naturally occurring radioisotopes (other than source materials), and isotopes made radioactive by processes other than exposure to radiation in utilization or production facilities. Since these sources of radiation fall outside the scope of federal regulation established by the 1954 act, it follows that no limit upon the exercise of the state police power to regulate them is implied. We have seen in *Allen-Bradley Local* v. *Wisconsin Board*,[399] *International Union, United Automobile Workers* v. *Wisconsin Board*,[400] *Reid* v. *Colorado*,[401] *Savage* v. *Jones*,[402] *Mintz* v. *Baldwin*,[403] and *Kelly* v. *Washington*,[404] that, where federal law leaves some matters in a gen-

[398] §11, 42 U.S.C.A. §2014.
[399] *Supra* note 301.
[400] *Supra* note 303.
[401] *Supra* note 331.
[402] *Supra* note 332.
[403] *Supra* note 333.
[404] *Supra* note 336.

eral field (*i.e.,* radiation health and safety regulation) unregulated, a policy of indifference to state action is indicated, and the state may act if its action does not otherwise constitute an obstacle to the accomplishment and execution of the full purposes and objectives of Congress or unduly interfere with interstate commerce.

(2) State Regulation of Non-Radiation Health and Safety Hazards Connected with Federally Licensed Activities

Congress has said, "The processing and utilization of source, by-product, and special nuclear material must be regulated . . . to protect the health and safety of the public." [405] In its repeated references to the "health and safety of the public" Congress has not expressly limited the meaning of this term to radiation health and safety. Obviously, non-radiation hazards may be involved in many of the activities and facilities licensed by the Commission. Does the "special competence" of the Commission described by Senator Anderson,[406] and to which the Commission's functions are limited, extend this far? It should not be asserted seriously that the use of a radioactive thickness gauge would give the Commission the power to regulate, for example, the entire process of rolling steel or manufacturing tires in the interests of public health and safety. In contrast, however, it is somewhat more plausible to say that the Commission has the power to control all the health and safety features of a production or utilization facility for the reason that in such a facility nearly all the features ultimately relate to some matter affecting radiation health and safety. In view of the legislative history it is difficult to escape the conclusion that Congress was concerned only with the uniquely hazardous characteristics of the specified materials and facilities.

In any event, since the Commission has not construed its responsibility to extend beyond radiation hazards, the question is largely academic. Cases such as *Welch* v. *New Hampshire,*[407] *Buck* v. *California,*[408] and *Terminal Assn.* v. *Trainmen* [409] indicate that the states may act to control matters within the scope of a broad and inclusive federal statute which delegates to a federal agency the power to determine specific

[405] §2d, 42 U.S.C.A. §2012(d).
[406] *Supra* note 267.
[407] *Supra* note 339.
[408] *Supra* note 341.
[409] *Supra* note 343.

application, if the federal agency has not exercised its powers with respect to the particular subject of state action, unless the federal agency believes the action to be unnecessary. It scarcely could be claimed that the Commission's failure to prescribe standards for non-radiation hazards associated with licensed activities is tantamount to the decision that such hazards need not be regulated. Therefore, whether the AEC does or does not have the power to regulate non-radiation hazards associated with licensed activities, we may fairly conclude that the state and local governments may require licensees to comply with laws and regulations pertaining to electrical wiring, plumbing and sanitation, structural design and materials, fire prevention and equipment, elevator design and safety features, ventilation, safety features on non-radiation machinery and equipment, and other matters not directly related to radiation safety.

Quite obviously some of these state and local laws could apply to objects for which the AEC has provided standards and specifications in the construction permit or license. The Commission may require, for example, the installation of a particular type of removable floor-covering material in places where there is a possibility of radioactive material spillage. Local building codes and industrial safety codes also may contain specifications for floors in similar establishments. The building code may require floor joists of specified minimum dimensions, a specified distance apart, and flooring material of a particular thickness and strength. The industrial safety code may require the installation of a relatively permanent "non-skid" floor-surfacing material. Despite the fact that they pertain to the same general object, no conflict would exist between the federal requirement and the building code specifications since they are intended to serve different purposes, and imposition of the local requirement often will not prevent or hinder compliance with the Commission's specification. However, in some situations it is conceivable that, even though the purpose of the state industrial safety requirement is different from that of the AEC's regulations, the state requirements may constitute an obstacle to compliance with the federal safety feature. Cases such as *Hill* v. *Florida*,[410] *Automobile Workers* v. *O'Brien*,[411] and *Erie R.R. Co.* v. *New York*[412] indicate that in such a situation the state industrial code requirement may not be imposed on the licensed installation. Other cases, such as *Allen-Bradley Local* v. *Wisconsin Board*,[413] *International Union, United Automobile Workers*

[410] *Supra* note 283.
[411] *Supra* note 286.
[412] *Supra* note 318.
[413] *Supra* note 301.

v. *Wisconsin Board,*[414] *Reid* v. *Colorado,*[415] *Savage* v. *Jones,*[416] *Mintz* v. *Baldwin,*[417] *Kelly* v. *Washington,*[418] *Welsh* v. *New Hampshire,*[419] *Buck* v. *California,*[420] and *Terminal Assn.* v. *Trainmen,*[421] however, suggest that in this situation the federal pre-emption would be only partial. For example, the state still may require the installation of "non-skid" floor-surfacing material to prevent slippage, if it is easily removable in the event of spillage, and otherwise meets the Commission specifications. The general position here asserted is that the states may specify design features, specifications, materials, and other safety features aimed at non-radiation hazards, even though they affect objects touched by federal specifications, if the state requirements do not prevent the licensee from complying with Commission requirements or make it unreasonably difficult to do so. In this sense, we believe that the state or local government may require the submission of installation plans and specifications to an appropriate official and insist upon the issuance of a building permit before construction. In similar fashion, the issuance of an AEC license to use byproduct materials for purposes of medical therapy would not excuse the physician from obtaining a state license to practice medicine.

Since the only health and safety determination made by the Commission at the present time is that a particular production or utilization facility is radiologically safe for a proposed site, it seems entirely probable that the Supreme Court would not deny to the states, or local governments, the power to exclude the facility from the particular location altogether, if the reason for doing so is not related to radiation health and safety and the facility is not owned by the federal government. While the case is not likely to arise, inasmuch as the AEC has indicated that it would respect local zoning ordinances concerning matters other than radiation protection,[422] the holder of a facility construction permit from the Commission could be prohibited by a state from

[414] *Supra* note 303.
[415] *Supra* note 331.
[416] *Supra* note 332.
[417] *Supra* note 333.
[418] *Supra* note 316.
[419] *Supra* note 339.
[420] *Supra* note 341.
[421] *Supra* note 343.
[422] In the analysis accompanying the proposed amendment to the 1954 act which Chairman Strauss sent to Rep. Carl T. Durham in June of 1957, it was admitted that ". . . the states have responsibilities for zoning and use of water resources by industrial facilities." *Supra* note 271.

building in an area zoned against commercial and industrial establishments. The issuance of a construction permit indicates no more than the fact, as determined by the Commission, that there is reasonable assurance of radiation safety. The issuance does not suggest that the Commission has determined that operation of the facility in the particular location will not affect the health and safety of the public in some other objectionable manner, such as by substantially increasing truck traffic on residential streets. The conclusion is not applicable, however, to establishment of such facilities owned by and operated for the federal government for its own purposes. Likewise, if the zoning ordinance discriminates against production and utilization facilities, however, it falls within the scope of the federal health and safety program and different principles of pre-emption apply. This situation is discussed below.

(3) State Regulation of Radiation Hazards Covered by the Atomic Energy Act of 1954

When the state undertakes radiation health and safety regulation of persons, materials, devices, facilities, and activities licensed or otherwise regulated by the AEC, it clearly is acting within the scope of a general and all-inclusive federal statute which imposes certain regulatory duties and bestows even broader powers upon a federal agency. Furthermore, the AEC has issued comprehensive radiation safety standards, by regulation or order, covering the subject of radiation health and safety. Nevertheless, we believe that some state regulation of radiation hazards remains permissible.

(a) State Precautions Preceding Operation

Essentially radiation health and safety precautions preceding operation, as indicated earlier, may be reduced to three official determinations by the AEC: (1) that the persons in charge of the atomic energy activity are qualified to operate safely; (2) that their proposed operating and accident procedures to protect health and minimize danger to life and property are adequate; and (3) that the nuclear materials, devices, and facilities will be so disposed, designed, installed, constructed, and used as not to endanger life, health, or property. Each of these determinations is associated with the federal program of licensing. Obviously, they are not absolute determinations. They are no more than scientifically informed predictions which are translated into installation

designs, specifications, and operating procedures. Starting with empirically determined safe radiation dosage levels (which are largely predictions themselves and none too certain at this time), the engineer and the scientist attempt to incorporate those design features and materials into the radiation device or facility that will keep exposures of persons below the acceptable levels. The complexities of the situation are such that, at the existing level of the art or science, safety cannot be guaranteed. Every atomic energy activity involves a calculated risk, and approval for licensing merely indicates that the risks have been reduced to an acceptable percentage.

There are a number of features of the federal licensing program which indicate that it probably will be found to have pre-empted the field, thus precluding a parallel state licensing program. Among these are the following:

First. The federal licensing scheme to control the development and utilization of atomic energy, as established by Congress and implemented by the AEC, is extraordinarily pervasive, probably more pervasive than any regulatory scheme considered by the Supreme Court in analogous cases discussed above. Furthermore, the Commission's licensing system is but a part of an intensive program to promote the public and private development and utilization of atomic energy. The tendency of the court to regard the feature of "pervasiveness" as one manifestation of implied pre-emptive intent is illustrated in *Bethlehem Steel* v. *State Board,*[428] *La Crosse Telephone Corp.* v. *Wisconsin Board,*[424] *Garner* v. *Teamsters Union,*[425] *Weber* v. *Anheuser-Bush, Inc.,*[426] *Oregon-Washington Co.* v. *Washington,*[427] *Penn. R.R. Co.* v. *Public Service Commission,*[428] *Napier* v. *Atlantic Coast Line,*[429] *Cloverleaf Butter Co.* v. *Patterson,*[430] *Hines* v. *Davidowitz,*[431] and *Pennsylvania* v. *Nelson.*[432] It is also significant that quite recently Congress has made the federal system of licensing production and utilization facilities even more pervasive than it was originally by giving statutory standing to the Advisory Committee on Reactor Safeguards.[433]

[423] *Supra* note 278.
[424] *Supra* note 291.
[425] *Supra* note 292.
[426] *Supra* note 293.
[427] *Supra* note 320.
[428] *Supra* note 325.
[429] *Supra* note 326.
[430] *Supra* note 327.
[431] *Supra* note 278.
[432] *Supra* note 323.
[433] *Supra* note 380.

Second. By forbidding all non-federal atomic energy activities unless carried on under a Commission license and by authorizing the Commission to issue appropriate licenses, Congress, in effect, has directed the AEC to establish and administer a comprehensive licensing program. *Automobile Workers* v. *Russell,*[434] *Oregon-Washington Co.* v. *Washington,*[435] and *Welch* v. *New Hampshire*[436] suggest that the Supreme Court finds stronger indication of pre-emptive intent in areas where Congress has *directed* a federal agency to act than in those where the agency is merely *authorized* to act.

Third. The Commission has been directed to establish minimum criteria for the issuance of source and special nuclear material licenses. These criteria are to be based, in part, upon considerations of public health and safety. Moreover, in connection with research and development facility licenses, as opposed to commercial facility licenses, the 1954 act directs the Commission to impose the minimum amount of regulation consistent with public health and safety. The context rather clearly suggests that, in the interest of promoting the study, development, and utilization of atomic energy, Congress has cautioned the Commission to avoid burdening the science and development of the industry with any requirements except those essential to public health and safety. Lest any essential requirements be overlooked, however, all commercial, research and development, and testing facility applications must be referred to, reviewed by, and publicly reported on by the Advisory Committee on Reactor Safeguards. It seems evident, therefore, that any state licensing requirement which imposes a higher radiation safety standard than that which the Commission finds consistent with public health and safety would necessarily conflict with congressional policy as expressed in the 1954 act. In *Hill* v. *Florida*[437] a state licensing requirement, together with license qualifications which Congress had not thought it necessary to impose, were found to be in conflict with congressional policy encouraging collective bargaining and thus invalid. Similarly, in *Automobile Workers* v. *O'Brien*[438] state imposed conditions on the doing of an act allowed by a federal law which imposed less stringent conditions than those of the state were found to be pre-empted.

Fourth. The 1954 act clearly reflects the realization by Congress that

[434] *Supra* note 282.
[435] *Supra* note 320.
[436] *Supra* note 339.
[437] *Supra* note 283.
[438] *Supra* note 286.

standard safety designs and specifications were not feasible at the time the act was passed. Therefore, while Congress directed that a licensing program be established and that steps be taken to assure safety before operation, it left the details of this program to the informed discretion of a federal agency it had created largely for the purpose. This is re-emphasized in the Price-Anderson amendment which raises the Advisory Committee on Reactor Safeguards to statutory status and provides for review by the ACRS of each facility license application. It scarcely need be mentioned that the Commission is far better qualified to establish and administer the essentials of a licensing program than any comparable state agency. Subsequent Commission action and the close attention it gives to each license application indicate that the sort of standardized safety specifications which can be applied in a comparatively automatic or mechanical fashion are still a development of the future. In this type of atomic energy regulation, expert judgment is especially imperative. The AEC has even indicated in its proposed amendment to the 1954 act that an exclusive system of federal licensing is desirable.[439] These facts may well lead the Supreme Court to conclude that the policy of Congress and the AEC is to maintain the sort of flexibility which centralized administration makes possible so as to encourage experimentation and variation in the part of licensees in the hope of obtaining both greater economy and safety. This does not appear to be the time, for example, for the state to specify the precise amount, design, and type of shielding material that is necessary to operate a nuclear reactor or other atomic energy device, and it is doubtful that Congress intended the almost inevitable frustration of its policies by such state licensing specifications. The *La Crosse Telephone* case [440] suggests that the Supreme Court will find implied congressional intent to pre-empt any state act, the effect of which is to standardize matters left to the discretion of the AEC where the Commission has indicated flexibility and variation is desirable to effectuate the purposes of the act.

Fifth. The AEC is exercising the full measure of its licensing power, and where it has exempted certain classes or quantities of byproduct and source material, or kinds of uses or users, from the requirements of a "specific" license, it has done so after a finding that no unreasonable risk to the health and safety of the public will result. Insofar as radiation hazards are concerned, there do not appear to be any gaps in the

[439] *Supra* note 272.
[440] *Supra* note 291.

Commission's licensing program. Those matters which are not covered by general radiation health and safety standards are covered by more detailed and individually tailored specifications in the license itself. Not only does the Commission study the proposed atomic installation itself and the radiation safety precautions within it, but it also gives due consideration to all of the local geographic (*i.e.,* population density, etc.), geologic, and meteorologic features as well. In short, when the license is issued, the Commission, pursuant to congressional directive, has determined that the particular licensee is qualified to construct and operate a particular atomic energy installation in a specified location, for specified purposes, and in a specified manner. We have seen in *Penn. R.R. Co.* v. *Public Service Commission* and *Napier* v. *Atlantic Coast Line* [441] that the implication of pre-emptive intent becomes quite strong when the authorized federal agency has effectively exercised its power by establishing comprehensive and detailed safety standards.

Sixth. That there is real efficacy and feasibility in an exclusive federal licensing program, at least at the present time, is especially seen in the case of an atomic energy production or utilization facility, the existence of which is not likely to escape the Commission's attention since the federal government owns all special nuclear material. As in the case of union certification and unfair labor practices which are brought to the attention of the NLRB by the parties involved, most proposed atomic energy activities, and therefore the potential hazards they entail, will be brought directly to the attention of the Commission either by the parties intending to act or by other parties possibly affected by the action.[442] It is more likely that the Commission will receive notice of proposed hazardous activities than of actual hazardous conditions after an atomic energy activity becomes operational. The AEC is not only the principal source of atomic energy materials but also is the best informed organization in the nation on the subject of their use, and so it becomes advantageous for the person proposing to undertake a regulated activity to take his problems of installation design and other preliminary matters of radiation safety to the Commission. Furthermore, we may rely upon others, such as state health agencies, unions, and adjacent property owners, to bring these matters to the attention of the Commission should those who are required by law to do so fail in this respect, and there

[441] *Supra* notes 325 and 326.

[442] An example of this is the intervention of the United Automobile Workers in the construction of a reactor by the Power Reactor Development Company. See In the Matter of Power Reactor Development Company, AEC Dkt. F-16, "Notice of Hearing Order," 21 Fed. Reg. 7809 (Oct. 12, 1956), BNA, Atomic Industry Reporter 52:40.

is no public hazard in the pre-operation situation if we wait for action by the more expert federal agency.

Seventh. Reason and experience both suggest that any parallel system of state licensing, predicated on considerations of radiation health and safety, will inevitably conflict with the federal licensing program. Clearly, the Supreme Court is not likely to ascribe to Congress an attitude of indifference toward state licensing requirements which might prevent activities authorized by the Commission because of possible radiation hazards which the Commission has found to be insignificant or non-existent. *Hill* v. *Florida,*[443] *Automobile Workers* v. *O'Brien,*[444] and *Bus Employees* v. *Wisconsin Board*[445] suggest that any state radiation health and safety licensing requirement in addition to, or in excess of, Commission requirements would be found to stand as an obstacle to the accomplishment and execution of the full purposes and objectives of the 1954 act and would not be allowed by the Supreme Court. Such independent state action would very likely tend to discourage activities which Congress clearly wants to encourage. Furthermore, we have seen in *Erie R.R. Co.* v. *New York*[446] that, where Congress imposes burdens on a regulated activity in the interests of health and safety, the implication arises that this is the prescribed measure of what is necessary and sufficient for the purpose as well as the cost which must be sustained to secure the degree of safety desired. In other cases, such as *Oregon-Washington Co.* v. *Washington*[447] or *Welch* v. *New Hampshire,*[448] the court has indicated that a similar implication arises where Congress has directed a federal agency to establish the appropriate safety standard. Even if, for example, the state were to specify dimensions of shielding materials, basing those dimensions on radiation exposure limits identical with those of the AEC, the effect of the state action would be to standardize safety features left to the discretion of the Commission and which the Commission prefers to specify on a case-by-case basis. There is not one but a variety of ways of building a nuclear reactor or a radiation device in order to obtain a desired degree of safety. There is considerable merit, which probably appealed to Congress, in a system which allows the applicant and the Commission to agree on the alternatives to be employed without the intrusion of state

[443] *Supra* note 283.
[444] *Supra* note 286.
[445] *Supra* note 287.
[446] *Supra* note 318.
[447] *Supra* note 320.
[448] *Supra* note 339.

officials. To modify the court's phrase in the *Cloverleaf* case, state licensing requirements would nullify federal discretion over the designs, specifications, and other radiation safety features of atomic energy installations and devices.[449] In the last analysis, then, any parallel state system of radiation safety precautions preceding operation probably would either conflict with the federal licensing system in a substantive sense or it would impair administration of the program. Either event, or the possibility of either event, has generally been held fatal to the state action. At the very least, such a parallel state system would be superfluous expense to both the Commission licensee and the state.

In the light of the above considerations, it seems reasonably safe to assume that the Supreme Court will hold that Congress has prevented any state or local government from requiring a person, who is licensed or otherwise authorized by the Commission, to obtain prior state or local permission to operate if the granting or denying of that permission is predicated upon an independent analysis or standards of radiation health and safety. This does not include, however, state or local action which is designed to alleviate an actual radiation hazard arising out of a federally licensed activity and also constituting a violation of the Commission standards. This type of state action involves regulatory measures during operation and is considered below. It was pointed out previously that the statutes or regulations of several states appear to require prior approval by a state official. While the laws of North Dakota[450] and Wyoming[451] require registration, they are so phrased as also to suggest that permission of state health officials is required. The regulations of the Delaware Board of Health definitely require a permit which may be denied ". . . when there is unsatisfactory proof that the material or device will not be a hazard to health."[452] Although the Michigan Department of Health regulations requiring registration may not be construed as a licensing provision, the State Health Commissioner has reserved discretionary authority to approve: (1) proposed limits on levels of radiation in uncontrolled areas; (2) proposed limits on concentrations of radioactive materials released into the atmosphere of uncontrolled areas; (3) installation changes which materially increase the potential health hazard; and (4) radioactive waste disposal

[449] *Supra* note 327, quoted *supra* note 328.

[450] N.D. Laws 1957, c. 185, §§4, 5.

[451] Wyo. Comp. Stat. §63.1302.

[452] Del. Bd. of Health, Regulations Governing the Manufacture, Distribution, Sale, Storage, Installation, and Disposal of Radioactive Sources, Materials, or Devices, §II, adopted Dec. 5, 1955.

procedures not otherwise authorized by the regulations.[453] In view of the foregoing discussion, these state requirements, as applied to Commission licensees, are probably not valid.

Local zoning ordinances which clearly discriminate against atomic energy uses and facilities, merely because they constitute radiation hazards deemed undesirable by the community, will probably suffer the same fate as state licensing requirements. Such an ordinance would obviously conflict with a determination by the Commission that a licensed use or facility will not create an unreasonable hazard in the particular location. A more difficult question is presented, however, by a zoning ordinance which discriminates against a production or utilization facility for reasons which are not connected with health and safety. For example, in response to a policy which seeks to promote intensive industrial development in an area and thereby increase local property tax revenues and employment possibilities, the local government may zone against commercial reactor facilities because the use of large tracts of land as exclusion areas around reactors, rather than as conventional industrial sites, would lower assessment value and the number of jobs available. While the Commission is not likely to license a facility for such a location, since its policy is to respect the desires of the community, the situation might arise. There appears to be nothing in the 1954 act which would preclude enforcement of such an ordinance if its revenue raising or job promoting purpose is bona fide. It is possible, of course, to frame such a discriminatory zoning ordinance without revealing the reason behind it upon which validity depends. The case of *Village of Euclid* v. *Amber Realty Co.*[454] suggests, however, that in such a case the Supreme Court will not hesitate to look behind the ordinance to determine its real purpose if its validity depends thereon. This statement is not meant to imply in any way that the federal government could not condemn land free of local zoning restrictions in order to construct a government facility if it so desired.

Several other possibilities for state action are offered in the area of radiation regulation preceding operation. Whereas the state probably may not impose licensing requirements of its own, the *Zook*[455] case suggests that the state may make it unlawful for any person to do any of the things for which a Commission license, construction permit, or

[453] Supplement No. 13 to 1954 Mich. Adm. Code pp. 41-70 (adopted Feb. 14, 1958), Regs. 325.1309.2.1, 325.1309.3, 325.1306.2, 325.1312.2.1.

[454] *272* U.S. 365, 47 S. Ct. 114 (1926).

[455] *Supra* note 281.

other authorization is required, without first obtaining the appropriate authorization from the Commission. The enforcement of such a provision, by injunction or by the imposition of criminal sanctions, would not conflict with the federal licensing program. There would be little or no likelihood of the state prohibiting that which the federal law authorizes. Unlike the situation in the *Nelson* case,[456] violation of a state law to this effect definitely affects local as well as national interests. Also, there is less justification for the claim that the threat must be met on a nationwide basis, for no national or international criminal conspiracy is involved. There would seem to be no need for secrecy or delay in prosecution as suggested in the *Nelson* case. Such a situation can be distinguished from that presented in the *Cloverleaf* case [457] where the state act was said to nullify federal discretion over the regulated process. Such a conclusion is necessary to sustain the validity of the New England type of statute and seems justified in the light of applicable Supreme Court cases.

Further opportunity for state action is presented within the administrative procedures of the AEC. Section 189 of the 1954 act provides that:

> In any proceeding under this Act, for the granting, suspending, revoking, or amending of any license or construction permit, or application to transfer control, and in any proceeding for the issuance or modification of rules and regulations dealing with the activities of licensees, . . . the Commission shall grant a hearing upon the request of any person whose interest may be affected by the proceeding, and shall admit any such person as a party to such proceeding.[458]

This section also requires that a hearing be held on each application for a commercial or research and development facility license, whether requested or not. Under the act "person means . . . any State or any political subdivision of, or any political entity within a State." [459] Thus, should the state feel that the public health and safety are not served or adequately protected by a proposed activity or facility, it may petition the Commission for a hearing on the matter or petition to intervene in a facility license hearing.[460]

In order to facilitate prompt state action notice to the state of the

[456] *Supra* note 323.
[457] *Supra* note 327.
[458] §189, 42 U.S.C.A. §2239.
[459] §11q, 42 U.S.C.A. §2014q.
[460] 10 Code Fed. Regs. §2.705.

existence and character of radiation activities and facilities within the state's borders is essential. While there appears to be sufficient pre-emptive effect in the 1954 act to preclude state licensing or the imposition of state safety measures in excess of those provided by Congress and the AEC, this should not prevent the states from requiring the registration of radiation sources, activities, and persons so engaged. A state statute requiring registration only does not directly affect the right of any person to carry out activities authorized by the Commission, and it does not affect the manner of conducting federally authorized activities or the physical characteristics of the nuclear device or facility. It seems doubtful if the rationale applied in *Hines* v. *Davidowitz*,[461] or any other case discussed above, could be successfully invoked to defeat state registration, unless it is a disguised form of licensing. Obviously, the registration of radiation sources and activities is not so intimately blended with responsibilities of the national government as to give rise to an inference of pre-emption. Furthermore, it pertains to the very subject—matters of public health and safety—which Justice Black distinguished in the *Hines* case as being in "an entirely different category" for purposes of federal pre-emption,[462] and Congress certainly has never manifested a consistent opposition to state registration statutes in the interests of public health and safety. Lastly, whatever additional burden is imposed upon a Commission licensee, by reason of a state registration requirement, is only minimal. It should also be pointed out that a state radiation source registration requirement can be sustained for reasons not directly related to radiation hazard regulation. State workmen's compensation commissions, water and wildlife conservation organizations, fire departments, and other state and local agencies may require the information for purposes of administering their respective programs. These clearly provide sufficient reason to justify a state placing such a minimal burden upon a licensee.

(b) State Regulatory Measures During Operation

The task of regulating the use and possession of nuclear materials and facilities during operation is essentially one of establishing operating standards and inspecting to determine whether the standards are met. To this end Congress has authorized, but not directed, the Commission to establish operating standards, instructions, and procedures, to require records and reports relative to radiation safety, and to inspect licensed

[461] *Supra* note 278.
[462] *Ibid.*, quoted *supra* note 356.

activities and facilities. Manifestly, the establishment of any operating radiation health and safety standard, as it affects AEC licensees, falls within the scope of a general and inclusive federal statute which delegates quasi-legislative power to the Commission. In this area of federal regulation there are no gaps in the congressional plan of control which might indicate to the Supreme Court a policy of congressional indifference to state action. Similarly, there are few, if any, gaps in the Commission's radiation health and safety standards. In short, Congress and the Commission have occupied the field of atomic energy safety standards, both before and during operation. Accordingly, cases such as *Penn. R.R. Co.* v. *Public Service Commission*[463] and *Napier* v. *Atlantic Coast Line*[464] indicate that in this situation the states may not impose any operating radiation health and safety standards in addition to those imposed by the Commission. These cases stand for the proposition that where a general and inclusive federal statute confers quasi-legislative authority upon a federal agency and the federal agency has effectively exercised its authority by establishing comprehensive safety standards, the states may not add refinements or impose a higher safety standard since to do so would conflict with the federal policy reflected in the uniform national standard. State action of this nature imposes a heavier burden upon Commission licensees. The additional cost of meeting the higher state standard tends to discourage developments in which Congress has affirmatively manifested an interest. Such being the case, it seems reasonably certain that the states cannot establish and enforce radiation exposure limits against Commission licensees which are more strict than those of the Commission. An attempt by the state to do this indirectly would probably be just as futile. For example, while the Commission has not specified the number of hours per day or week that an employee may work in a radiation installation, exposure limits are expressed and are to be adjusted in terms of hours of employment.[465] Should a state impose a regulation establishing a twenty hour work-week in production and utilization facilities in order to reduce exposures to below the Commission limit, the chances are that the Supreme Court would pronounce the state regulation invalid.

At the present time the Commission has two systems of exposure limits in effect. One of them, the weekly and quarter-year limits set forth in the Commission's "Standards for Protection Against Radia-

[463] *Supra* note 325.
[464] *Supra* note 326.
[465] 10 Code Fed. Regs. §20.101(b).

tion" applies to all licensees. The other applies to Commission activities and those of its contractors, but not to licensees.[466] The second system of limits reduces annual permissible exposures to one third of that allowed under the earlier system. Ultimately the Commission intends to hold licensees to the newer limit, but it has postponed application for several years because of the substantial economic impact on existing installations and facilities. At least one state, Michigan, has anticipated the Commission and imposed the new accumulated annual dose limit upon users of federally licensed materials.[467] This state act obviously conflicts with federal policy, and it is doubtful if Michigan can enforce the higher standard against a federal licensee, even though the Commission intends to do so eventually, for the effect of the Michigan action is to remove the period of grace offered by the Commission's postponement. The significance of this fact is indicated in *Erie R.R. Co.* v. *New York*.[468] The doctrine of the *Welch* decision[469] is not applicable for in that case there was no federal standard in effect at the time the state hour law was violated, the state standard was not as strict as that which the ICC intended to apply in the future, and the ICC had not delayed effectiveness to give interstate motor carriers time to make necessary adjustments.

One possible exception to the above limit on state operating standards exists as to disposal of radioactive wastes by release into sanitary sewage systems. Pursuant to its general authority, the Commission has specified the amount and manner of such disposition. It has even exempted excreta from individuals undergoing medical diagnosis or therapy with radioactive materials from any limitations.[470] Conceivably Commission authorized discharges of radioactive wastes into publicly owned sewage systems may result in conditions which local sanitation officials deem unsafe and necessitate the enlargement, improvement, or other modification of the system at local expense. The analogy between this situation and that where the state has imposed a lower weight limit for interstate motor carriers operating on state owned highways is obvious. The state or local government perhaps has an even stronger argument in connection with the sewers in that there is considerably less federal subsidy than in the case of interstate highways, and the public sewer is scarcely in interstate commerce. The Supreme Court's language in *Maurer* v.

[466] AEC Manual, c. 0524, "Permissible Levels of Radiation Exposure."
[467] *Supra* note 453, R. 325.1309.1.1(3).
[468] *Supra* note 318.
[469] *Supra* note 339.
[470] 10 Code Fed. Regs. §20.303.

Hamilton [471] at least suggests that state or local public ownership of a sewage system raises some question of whether Congress can pre-empt in this area. While it is entirely certain that the federal licensee could not release any greater quantity of radioactive wastes into a publicly owned sewage system than the Commission has specified, it is fairly arguable that the state or local government may impose a higher standard if federally authorized discharges will result in substantial expense to the state or a political subdivision. As in the *Maurer* case, there is a good possibility that the court would simply avoid the question by finding that Congress had not intended to pre-empt regulation of this matter.

A determination that the states may not establish and enforce higher radiation health and safety standards, or fill the gaps in the AEC's program does not conclude the matter of state standards or enforcement, for the question of whether the states may establish and enforce identical operating radiation health and safety standards still remains. It is curious that this question has been litigated infrequently in the Supreme Court. Practically all of the cases have involved situations where state action differed in some essential respect from federal law or might produce a different result, either because the standards were irreconcilable or because the state presumed to tread upon matters over which a federal agency exercised discretionary authority on a case-by-case basis.

The basic standards—that is the permissible doses and levels of radiation and environmental concentrations of radioactive effluents—used by the AEC in operational regulation are the same as those used by its safety experts in analyzing a proposed use or facility and in requiring incorporation of appropriate safety features into its design. A distinction exists, however, in the manner in which the standards are applied before and after operation. Where the standards are applied in licensing a proposed nuclear use or facility, they are applied affirmatively to determine what the applicant must do to assure future safety. By extremely complex calculations and estimates the standards are translated into facility designs, specifications, and materials, which become, in effect, regulations for the particular facility. In contrast, where the standards are applied to regulate activities during operation—after installation or construction—they are applied negatively to indicate what the licensee must not do, regardless of whether or not the facility or installation conforms with the license specifications. As an example, he must not expose the whole body of any person in the area subject to

[471] *Supra* note 372.

his control to more than 600 millirems of any radiation with a half-value-layer greater than one millimeter of soft tissue during any one week.[472] The fact that he has furnished the radiation source with the specified type and amount of shielding material does not excuse him from complying with the standard. Since the basic standards are expressed in terms of measurable units, the calculations necessary to compare actual radiation and concentration levels with permissible limits are fairly simple and straightforward; comparatively little scientific expertise is necessary in determining whether existing uses and facilities meet the basic standards. Even less expertise is necessary to determine whether the licensee is complying with safety standards providing for specified warning signs and signals, personnel monitoring devices, protective clothing, radiation safety instruction, personnel exposure and radioactive material accounting records, and accident and injury reports. The point of this discussion is that once the operating radiation health and safety standards are established by the AEC, there is no logical reason why any qualified state official should not be able to determine compliance. This is particularly true in the case of byproduct material uses, where the problems of regulation are less complex than in the case of a nuclear facility. Whether or not the state official would be qualified to order affirmative action to correct a hazardous condition in a nuclear reactor is, of course, a different matter, but, at least, he could order the cessation of activities and the evacuation of personnel until appropriate action has been taken.

Unfortunately, "the life of the law is not logic," and, to make matters worse, Congress is even less circumscribed by logical considerations than are the courts. Pre-emptive intent is just as effective where the result is unreasonable as it is where reason supports it. The Supreme Court undoubtedly would prefer a sensible solution to a pre-emption problem, but anyone familiar with *Guss* v. *Utah Labor Board*[473] should know that it cannot supply one if it believes that Congress intended otherwise. It is necessary, therefore, to apply the doctrines of the analogous cases.

In *Cloverleaf Butter Co.* v. *Patterson*[474] the Supreme Court said that state officials could not enter a factory to inspect and condemn the raw materials of a food manufacturing process, found to be unwholesome and deleterious to health, when that process was subject to federal supervision and a federal agency had authority to condemn the finished

[472] 10 Code Fed. Regs. §20.101.
[473] *Supra* note 295.
[474] *Supra* note 327.

product for the same reasons. Notice, however, that there was little local interest in the safety of the manufacturing process since there was nothing hazardous in the manufacturing process itself; the product was only dangerous when consumed, and, by express limitation, the court's decision did not prevent the state from condemning unwholesome raw materials prior to the time they were definitely marked for commerce by the manufacturer's acquisition. Neither did the decision prevent the state from regulating the sale of the finished product within the state's borders. In other words, the pre-emptive effect found by the sharply divided court did not entirely prevent the state from protecting the health and safety of the local public.

In *California* v. *Zook*,[475] a later case and one in which the court was again divided five-to-four, the court, in effect, said that it would not presume federal pre-emption as against state enforcement of a law which prohibited precisely the same thing prohibited by federal administrative regulations where (1) state enforcement would not impair administration of the federal law, (2) the state law pertained to public health and safety, (3) neither Congress nor the federal agency had expressed any pre-emptive intent, and (4) federal action preceded state regulation of the same matters. The court also was influenced by the practical need for effective state aid to help enforce the federal requirement. It might be added that under the Federal Motor Carrier Acts, Congress and the ICC had established a system of regulation about as pervasive as the federal system of radiation health and safety regulation.

It is submitted that, if a state establishes and enforces operating radiation health and safety standards identical with those of the AEC, the rationale of the *Zook* case is likely to be applied in any case involving a challenge of the state action, though one should not forget that only one of the majority and two of the dissent on that case are now on the court. The second, third, and fourth of the above conditions would be satisfied in such a case, and the principal question would be whether state action impairs administration of the Atomic Energy Act by the Commission. In the *Nelson* case [476] any state action was held to impair administration of federal laws intended to meet the national emergency arising out of the Communist conspiracy. It was certainly arguable that it was to the nation's advantage that the threat be met by a coordinated national program. In the labor area the standards are quite

[475] *Supra* note 281.
[476] *Supra* note 323.

general and the disputes usually require quasi-judicial solution; the possibility for conflict between state and NLRB decisions, even where the same general standards are applied, is great. *The Oregon-Washington* case [477] presented a condition of possible impairment. The state was asserting the power to do precisely what federal law directed the Secretary of Agriculture to do should circumstances, in his judgment, so required. Determination of the necessity for the specified action, however, involved an analysis of many complex facts and the exercise of considerable expert judgment. Even so, had the Washington law merely prohibited the importation into the state of alfalfa hay and meal from areas quarantined by the Secretary of Agriculture, without his certification, the result probably would have been different. In essence, the state was presuming to establish a regulation which the Secretary was directed to issue upon a finding of urgent need. Since he had not done so, the case turned on irreconcilability of standards, and not so much on impairment of federal administration of fixed health and safety standards.

None of the above types of impairment of federal law administration need occur if the state (1) adopts and enforces operating radiation health and safety standards identical with the current standards of the Commission, (2) carefully refrains from adopting any standard inconsistent with or stricter than those of the Commission, and (3) does not invade any area of regulation in which the Commission applies a flexible standard to the particular situation. The only safe course is for the state to cooperate with the AEC and aid in the enforcement of federal standards in every way, emphasizing maximum safety and avoiding futile assertions of state independence.

(4) Enforcement of State Safety Standards

While it is felt that the pre-emptive effect of the 1954 act probably does not prevent all state health and safety regulation of AEC licensees, there is some question remaining as to permissible methods of state enforcement of such standards. Obviously, the method least calculated to raise the issue of federal pre-emption would be a state petition or other request to the Commission to take appropriate action where state inspectors discover a violation of federal-state health and safety standards. This method seems especially desirable where the violation is of the sort that is not likely to cause immediate injury to persons or property and the short delay occasioned by such a procedure is comparatively

[477] *Supra* note 320.

unimportant to public health and safety. Where a violation poses an immediate threat to safety, however, or where the licensee has wilfully violated radiation health and safety standards, the state may find it advisable and necessary to take more direct action such as by injunction and possibly criminal prosecution.

In order to enforce its radiation health and safety standards, orders, and regulations, the Commission is empowered to deny, suspend, modify, or revoke its licenses, to seize byproduct and special nuclear materials in the possession of a violator, and, through the Attorney General, to seek injunctions or orders enforcing compliance against violators. Furthermore, under the direction of the Attorney General, willful violators may be prosecuted criminally. From this it could be argued that there is no room for duplicating state enforcement procedures. The *Zook* case suggests, however, that it would be permissible where the activity is clearly contrary to federal standards. The local interest in the safety of the local public is more, and the impact on the federal program is much less, than when a state is trying to punish someone for attacking the federal government, as in the *Nelson* case. Therefore, an attempt by the states to enforce federal standards would seem well worth the try.

There seems to the writers to be more than sufficient reason for the states to adopt a radiation hazards regulatory statute of the kind discussed in Chapter VI. There is sufficient radiation hazard from activities and sources which are not within the scope of the federal scheme to justify a comprehensive state program. In addition, there is every reason why a state should at least establish a registration center and collect that information which is necessary to permit the state to protect its own government personnel (*e.g.*, fire fighters, industrial safety inspectors), to administer such programs as workmen's compensation, and to allow it to represent the interests of the state generally in proceedings before the federal agencies. Even more pertinent is the scope of state regulation which in our opinion is still permissible in spite of the pervasive federal regulations. Moreover, the states should act now to establish expert staffs and gain experience so that in the future they may represent fairly to Congress that Congress should re-delegate many radiation health and safety functions to the states. It is our belief that until the states demonstrate their capabilities through existing and efficient staffs and programs Congress will not revise the Atomic Energy Act in respect to radiation health and safety, and perhaps even should not do so. Radiation hazards are too great to risk non-regulation or ineffective regulation.

Chapter VI

FUTURE STATE REGULATION OF ATOMIC ENERGY: A SUGGESTED STATE ACT

A. General Observations

The foregoing examination of state legislation and interstate compacts makes it abundantly clear that atomic energy industry is destined to be subjected to comprehensive health and safety regulation at state, interstate, and local governmental levels. Considerable statutory authority to regulate already exists although with varying degrees of completeness in the several states, and certainly with most unsatisfactory overlapping, indefiniteness, and multiplicity of jurisdiction. Order must be brought out of this statutory chaos.

So far as administrative regulations are concerned, the states, with the notable exceptions of California, Connecticut, Michigan, New York, Pennsylvania, and Texas, have not seen fit to adopt comprehensive codes of regulations dealing specifically with the rather unique radiation hazards. To the extent that federal regulations issued by the Atomic Energy Commission, the Interstate Commerce Commission, and other federal agencies provide an adequate safeguard for the general public, the cautious approach of the states toward establishing definitive regulations is commendable. This is particularly true in view of the fact that knowledge of atomic energy injuries at the present time is somewhat limited, and development of proper precautionary techniques has not as yet been possible. Hasty, ill-conceived standards may prove unduly burdensome, even to the extent of preventing or at least retarding the establishment and growth of the new industry. However, if at some time in the future serious industrial accidents take place as a result of radiation, the responsible state agencies will be placed in a most embarrassing position unless proper and adequate health and safety regulations are adopted at the state level. Therefore, it can only be concluded that the basic statutes will be amended to provide adequate administrative authority and comprehensive health and safety codes will be forthcoming in the near future, at least in those states that are likely to be participating in the early development of atomic enterprise.[1]

[1] For a brief resume of state activities regarding radiation protection, see Atomic Industrial Forum, Inc., "State Governmental Activities Relating to Radiation Protec-

To the atomic energy entrepreneur the maze of statutes and prospective health and safety regulations imposed and to be imposed by numerous state and local agencies presents a most foreboding picture. If such regulations are inconsistent with each other, as may easily prove to be the case when they are adopted by different state agencies with overlapping jurisdiction, it may even prove to be impossible for an atomic industry to comply faithfully with them. Moreover, the cost of compliance with unduly prolix and unnecessarily duplicating regulations may even preclude economic utilization of atomic energy. The potentialities inherent in the atom appear to be very great indeed, and the prospective benefits to mankind seem well worth attaining. Nevertheless it is a fact that in some of its applications at least, and especially in connection with the development of electric power through use of nuclear heat sources, the possibilities do not yet seem to be economically attainable in most portions of the United States. The new industry has a considerable distance to go before it can enter the market in the low cost power areas on a fully competitive basis. It is therefore little short of imperative that state and local regulation of atomic activities be reduced to the most economical possible basis consistent with proper safeguarding of employees and the general public. It is necessary that clear-cut, direct, and consistent regulatory schemes be adopted, taking full cognizance of the latest technology, and that they be no more stringent than the necessities of health and safety demand. Otherwise, peacetime uses of atomic energy may be unreasonably handicapped.

How can inconsistencies, undue prolixity, and unnecessary duplication of effort be avoided? How can the latest and best technology be brought to bear on the state regulatory process? First of all, a comprehensive, competent, and properly integrated state administrative plan must be established by statute after careful consideration of the various possibilities. Several principal types of state administrative organization seem to be worthy of consideration.

1. Utilization of Existing State Agencies

There are many who will argue in favor of use of existing agencies to cover the atomic field, making arrangements through cooperating committees for informal interchange of ideas, and thus seeking uniformity and avoiding overlapping jurisdiction by cooperative solution

tion," Dec. 1, 1955 (mimeo.). For a compilation of all foreign, federal, and state laws and regulations concerning radiation protection, see World Health Organization, National Laws and Regulations on Radiation Protection (July 1955).

of problems that affect two or more agencies. If this method is adopted, it will doubtless become necessary to amend state legislation to extend the powers of some or perhaps all of the agencies thus to include the new and unique problems raised by atomic enterprise that would otherwise not be covered. Pursuant to this plan of utilizing existing agencies each agency would be responsible for preparing and promulgating the necessary regulations, and each would be empowered to issue the requisite orders to compel compliance with its own jurisdictional field.

If this method of administrative control is utilized, it will be necessary for each of the several agencies, that is, the public utilities commission, the labor department, the health department, the water resources board, and perhaps others, to obtain the services of persons properly trained to deal with radiation health and safety problems. It will not be an easy matter to muster such personnel, for properly qualified candidates are in short supply; and this method will be relatively expensive from the standpoint of the state payroll. Moreover, the elimination of overlapping jurisdiction and conflicting regulations by such informal cooperative means will be only partially successful, and, therefore, although this scheme of administrative organization will preserve existing jurisdictional boundary lines and possibly for that reason would prove to be more acceptable to existing state administrative authorities, it will nevertheless prove to be relatively cumbersome and expensive from the standpoint of the state and burdensome from that of industry. It is this plan which is at present operative in New York State, and it has already resulted in two comprehensive health and safety codes—one issued by the New York Department of Health [2] and the other by the New York State Department of Labor.[3]

2. Utilization of an Official Coordinator

The plan involving the use of existing agencies but adding to the payroll an official "coordinator," as proposed by the New England Committee on Atomic Energy, has been discussed in detail in Chapter V. As indicated there, a number of state legislatures have enacted legislation patterned on this proposal.[4] There is much to be said in favor of the coordinator plan as it has been evolved by the New England Committee on Atomic Energy. It preserves the existing agency authority and

[2] N.Y. State Sanitary Code c. XVI, effective Sept. 1, 1955. The code is set forth in Appendix A, Item 4.

[3] N.Y. Industrial Code No. 38, effective Dec. 15, 1955. The code is set forth in Appendix A, Item 3.

[4] See Part III, c. V, text at notes 14-25.

extends it wherever necessary to cover atomic activities. In addition, it makes full use of the principle of cooperation with the United States Atomic Energy Commission, which, of course, possesses the largest available amount of technical knowledge and understanding of the subject matter. There is much to be said for such cooperation. However, in view of the fact that the coordinator will have no powers of enforcement and no means of compelling agencies to adopt or refrain from adopting any particular policies or practices, his position will be far from enviable. Since his directing authority is *nil,* his effectiveness will be dependent upon his personal powers of persuasion, backed to whatever extent is feasible by the chief executive of the state. This is a dubious device for carrying on complex day-by-day administrative functions.

3. Utilization of a Central Agency Plan

This plan would involve the creation of a new central agency to deal with atomic energy problems wherever they may arise within the jurisdiction of the enacting state. Such a plan has in fact been proposed by the National Committee on Radiation Protection. The report of that committee has been published as a National Bureau of Standards handbook.[5] In the recommended draft of a bill contained in this report, Section 3 provides for the establishment of an independent State Radiation Control Agency in charge of a director assisted by a State Radiation Technical Advisory Board of five members.

By Section 4 of the proposed bill, the agency is given the power "to develop comprehensive policies and programs for the evaluation and determination of hazards associated with the use of radiation and for their amelioration." It is further given the power and the duty of consultation and cooperation with the other agencies of the state and those of the federal government and other state and interstate agencies. It is given authority "to adopt and promulgate such rules and regulations as may be necessary to further the purposes of the act," and it is expressly given authority to incorporate by reference the recommended standards of nationally recognized bodies in the field of radiation protection such as the National Committee on Radiation Protection and the American Standards Association. The agency is also given authority "to issue, modify, or revoke orders prohibiting or abating the discharge of radioactive material or waste into the ground, air, or waters of the state."

[5] National Bureau of Standards Handbook No. 61, "Regulation of Radiation Exposure by Legislative Means," Dec. 9, 1955. The recommended legislation is set forth in Appendix B, Item 2.

It is authorized to render opinions upon plans and specifications relative to the design and shielding of radiation sources. It is empowered to make inspections of radiation sources and to report known or suspected deficiencies.

By Section 5 it is required that every person who generates or produces ionizing radiation or who produces, uses, stores, or disposes of radioactive materials must register in writing with the agency, thus giving the agency the requisite information concerning the existence and utilization of radioactive sources within the state.

By Section 6 the agency is authorized to classify and identify radioactive sources, exposures, and hazards, and to adopt standards of protection. Sections 7 and 10 provide authority for the making of inspections and giving notice of deficiencies, and Sections 8, 9, and 12 are concerned with such matters as proceedings before the agency in the case of violations, the notice that must be given, and the opportunity for a fair hearing before the entry of the order. Suitable provisions are made for review of agency decisions by courts of competent jurisdiction.

A centralized agency such as that proposed by the National Committee on Radiation Protection apparently would cut across the jurisdictional areas of numerous existing state agencies (something that the agencies are not likely to welcome), and the fact that industrial establishments throughout the state would be subject to an additional regulatory agency would create additional problems from the standpoint of industry. Furthermore, the creation of an additional agency with extensive enforcement powers, including the necessity for carrying on a system of inspections, would entail substantial expense and require sizable appropriations from the state treasury. On the other hand, with but a single agency responsible for atomic matters, a maximum of technical expertness would result, and the concentration of authority over atomic energy in such agency would minimize or eliminate the necessity of other state agencies obtaining the services of the all too rare technical experts in the atomic field. Although the National Committee plan has both advantages and disadvantages, it would seem that, everything considered, the latter outweigh the former and the likelihood of such an agency being actually established in any state is remote indeed.

4. A Proposed Specialized Rule-Making Agency Plan

A consideration of the advantages and disadvantages inherent in each of the foregoing plans for the promulgation and enforcement of atomic regulations leads to another proposal—one which will divide the neces-

sary functions into two categories, namely, rule-making in the atomic regulatory field on the one hand, and inspection and enforcement on the other, each in the hands of a separate administrative organization. The task of prescribing and promulgating rules and regulations in the field of atomic energy will involve comprehensive and detailed knowledge of a new field of technology which is changing rapidly and is only partly understood at the present time. Such a task might well be delegated to a small, specially constituted body of experts, selected because of knowledge of atomic energy and skill in working out appropriate rules and regulations to protect employees and the general public from radiation injuries. After promulgation, such regulations could fairly readily be enforced by the existing agencies which already exercise jurisdiction over specified areas of industrial activity within the state, that is, the department of labor, with respect to the health and safety of employees, the department of public health, with respect to matters affecting the general public, the public service commission, with respect to transportation of radioactive materials and other phases of its specialized jurisdiction, the conservation commission, with respect to its areas of interest, and other state and local agencies according to their specified powers and duties.

Some such bifurcation of the functions of state administration in the atomic energy field would, like all of the other plans, have both advantages and disadvantages. On the favorable side, it can be said that the formulation of regulations would be carried on by a specialized, technically competent group, and since only one agency would be exercising the rule-making power, the inconsistencies rendered likely by a multiple rule-making plan would be eliminated. With respect to inspection and enforcement, the utilization of existing agencies, personnel, and procedures would minimize the impact upon the state payroll and would also minimize the number of inspection visits to be received each year by industry subject to inspections. The inspectors of the existing agencies would not be required to possess high technical qualifications in the atomic energy field. Certain rules of thumb and mechanically obtained measurements would suffice for most purposes and a small amount of inservice training would take care of the necessities of the situation. In short, this bifurcation plan would seem to have a considerable number of advantages, not the least of which is it does not disturb the vested interests of existing agencies, a real political fact of life.

On the other hand, uncertainties may result in the interpretation of regulations because of the fact that the agency which makes the regula-

tions is not engaged in the enforcement process. Although there are disadvantages to this plan, we believe it is the best possible approach, at least at this stage of development of atomic energy technology, to the creation of sound methods of handling the governmental problems which are destined to arise from peacetime applications of this new and unique type of energy.

a. Registration versus Licensing

A comprehensively drafted statute setting up an organization for the handling of the regulatory problems of atomic energy will include many items. Among others, it will include a statement of policy. It will certainly include definitions—definitions of radiation, radioactive material, radiation producing equipment, and other items. It will create any necessary new agency and provide for its organization and staff. It will set forth the powers and duties of the agency, including the necessary quasi-legislative and quasi-judicial authority. It will establish requisite procedures pursuant to which agency business is to be handled.

Among the most important items for consideration, however, is the question of utilizing registration or licensing as the method pursuant to which the agency will acquire the requisite information concerning the individual radioactive operations in progress throughout the state. There is, of course, a third possibility—*i.e.*, neither registration nor licensing, but instead reliance may be placed upon the adoption of regulations, the establishment of an adequate inspection scheme, and the use of the injunction and criminal sanctions for enforcement. However, in view of the fact that this third named possibility imposes an undue burden upon state administration, it is likely that legislation in the field will resort to either registration or licensing as a means of placing in the hands of the agency the names, locations, and details of the activities of the various industries subject to regulation.

Registration merely requires the filing of a document stating the facts; licensing requires the issuing of a permit to operate. The former is the less cumbersome device; the latter is by far the more undesirable procedure, for it is necessary for the agency to establish arrangements pursuant to which applications for licenses can be reviewed, hearings held, if necessary, and decisions reached in individual cases. This is burdensome and expensive. Accordingly, both the New England Committee on Atomic Energy and the National Committee on Radiation Protection recommend registration rather than licensing, and all arguments seem to favor this conclusion.

b. Uniformity of Regulation

There is one other substantive feature of the regulatory legislation under consideration which should be mentioned. This is the very great desirability of uniformity of regulation, not only within each state but between states, at least states within a given region, and between the states and the United States. It is a fact that the United States Atomic Energy Commission possesses a more complete understanding of the necessities in the field than does any other agency in the country. Accordingly, it should provide leadership, and state agencies should accept this leadership in connection with the establishment of the standards of health and safety. The states can well afford to take advantage of federal experience and understanding, and in so doing they will not in any sense be surrendering state sovereignty. Indeed, they will be exercising such sovereignty in a wise and effective manner, always with the full recognition of the fact that any state which desires to do so, can depart from the federal standard, either by imposing more stringent requirements, or by way of relaxation, except in cases where federal control has pre-empted the field.

In order to conform with this principle of uniformity, state legislation should authorize state agencies in adopting the detailed health and safety codes to take advantage of United States Atomic Energy Commission regulations, either by incorporating by reference or adopting their substance if that be deemed preferable.

c. Public Utility Rate Regulations

The foregoing discussion has been concerned primarily with health and safety regulations to be adopted by state agencies. Different considerations apply when dealing with public utility rate and service regulation. In regard to these matters, it is clear that the state public utility commission must have plenary control over such matters as the kind and quality of service to be rendered, accounting for capital expenditures, operating costs, fixed charges, depreciation and obsolescence allowances, rate bases, rate schedules, and all of the rest of the apparatus of utility regulation.[6] These matters must be left in the hands of the same agency as that which is given responsibility for the regulation of the rates and services of utilities deriving their energy from conventional sources.

This study of state regulatory measures likely to affect atomic utili-

[6] See remarks of John H. McCarthy, Chairman, Michigan Public Service Commission, "Atomic Energy from the Regulator's Point of View," made before the Section of Public Utility Law, American Bar Association (Aug. 23, 1955).

zation for peaceful purposes is revealing in several significant respects. It reveals the almost incomprehensible maze of existing statutes and regulations. It indicates the need of bringing order out of chaos to protect the public and at the same time facilitate the rapid development of a new and useful area of industrial enterprise. It suggests that imaginative and careful constructive work lies ahead, both in the drafting of the basic statutes to handle the subject matter and in the preparation and promulgation of the detailed codes of regulation that within the near future will be necessary for the protection of public health and safety in this new and unique field of endeavor.

B. A Suggested State Act

1. Introduction

Because the utilization of atomic energy is destined to become increasingly important in the American industrial complex, and radiation sources will be more exhaustively employed in medical and research installations, the states are faced with the questions of what phases of this new force warrant state governmental regulation; what should be the nature of the regulation; and what should be the governmental organizational pattern to accomplish the objectives of any desired regulatory pattern. The answers to these questions are not easily resolved because of the singularly unique manner in which atomic energy has been developed as a military, scientific, technological, industrial, and research instrument under the aegis of the federal government during World War II as a military project and since then by the Atomic Energy Commission in accordance with the provisions of the Atomic Energy Acts of 1946 and 1954.

Setting aside temporarily the purely legal problem of federal preemption, as a practical matter the states are not equipped to engage in the production of special nuclear material, military research and production, large scale reactor research, and major basic scientific research of the type now carried on by the Atomic Energy Commission. To the extent that there remains a need for these types of activities, it would appear that the federal government is the logical repository for these functions. Nor are the states likely in the immediate future to be in a position of being able to cope adequately with the problem of reactor technology and safeguards. Even if the states were able to maintain competent staffs, there probably would be a wasteful duplication of

effort at the individual state level.[7] Despite these observations, however, there remain significant areas of activity, predominantly in the field of health and safety, which are of legitimate state concern. At this juncture it appears that the states must accept certain responsibilities on their own initiative. Otherwise, the federal government will assume the activities with the resulting diminution of the role of the states in the federal system. It is not necessary here to reiterate the arguments against further centralization of regulatory functions in Washington which the states are capable of handling themselves. It is our opinion, however, that these arguments validly apply to certain phases of governmental regulation of atomic energy, and we therefore propose the enactment of comprehensive state legislation to deal with those problems created by atomic energy which the states as a practical matter can assume effectively at this time.

In Chapter V the question of federal pre-emption of health and safety regulation under the Atomic Energy Act of 1954 was examined at length. In the absence of judicial determinations, it is impossible to state precisely those areas of state health and safety regulation of atomic energy activities which will be sustained as a matter of constitutional law. Nonetheless, the expansion or clarification of the role of the states by federal amendatory legislation probably will be achieved only upon demonstration by the states of their willingness to accept their responsibilities, so definitive action by the states is called for at an early date. The powers of the Atomic Energy Commission under existing legislation appear sufficiently broad so that the states could act with AEC approval without raising the question of constitutionality. Section 161 of the Atomic Energy Act of 1954 provides in part:

> In the performance of its functions the Commission is authorized to—
> . . . f. with the consent of the agency concerned, utilize or employ the services or personnel of any Government agency or any State or local government . . . to perform such function on its behalf as may appear desirable. . . .[8]

The AEC has already expressed its desire to receive the cooperation of the states with the ultimate goal of turning over to the states at least a portion of its inspection responsibilities. As explained by Curtis A. Nelson, director of the AEC's Division of Inspection:

> It is the Commission's plan to assist the states in every way possible in the training of personnel, particularly those used

[7] The interstate compact device might be a method of establishing practical, economic staffs for this function.

[8] 42 U.S.C.A. §2201(f).

> in the inspection field dealing with health radiology. We have a number of training programs and expect to have more. Some of the states are themselves setting up training programs. Further, we plan to contact the governor of each state, or his designee, in due course of time, to seek agreement as to how the state and the Commission can productively cooperate.
>
> Ordinarily we would hope to end up by designating a group of isotope licensees to be inspected by the appropriate state agency. This obviously could be done only after the state was equipped with the necessary technical resources.
>
> In order for these plans to work properly and in order to avoid duplication of effort, it would be necessary for the state inspection agency to inspect against federal standards and regulations. It would be necessary that the Commission receive copies of the reports prepared by the state inspectors in the case of each inspection made.
>
> In the event a licensee was found to be in noncompliance with his license, the Commission would expect to take appropriate action. We do not expect to accomplish this type of cooperation overnight, but to plan ahead for a working agreement as each interested state is adequately prepared to take on the additional burden.[9]

In 1956 a bill was introduced in Congress whereby greater power would be given to the states in respect to regulation of health and safety. The bill proposed the addition of a new section of the Atomic Energy Act to read as follows:

> The Commission is authorized and directed to cooperate with the States in the formulation of standards for regulating the health and safety aspects of the atomic energy field within those areas in which the Commission is now authorized. . . . Whenever the Commission receives from the governor of any State a certificate to the effect that the State has an agency competent to exercise jurisdiction in any portion of the health and safety aspects of the Atomic Energy Commission, then the Commission is directed, on the day six months after the date of the receipt of that certificate, to relinquish the jurisdiction of health and safety in the areas specified in the certificate.[10]

Undoubtedly, this bill would receive more favorable consideration if the states had already taken positive action to enter the field of health and safety regulation.

Elsewhere in this volume,[11] the unusual nature of the radiation hazard

[9] Address before Regional Advisory Council on Nuclear Energy, Atlanta, Ga., Feb. 2, 1957; BNA, Atomic Industry Reporter 265.5 (1957).

[10] H.R. 8676, 84th Cong., 2d Sess. (1956).

[11] Part I, c. I.

created by atomic energy has been explained. It cannot be disputed that governmental health and safety regulation is essential in the public interest. Traditionally, the state has been the governmental unit responsible for the health and safety of its citizens. As atomic energy becomes more commonplace than it is today, there appear to be no practical obstacles to the states' undertaking their traditional role in the field. Some may argue that only the federal government can obtain the staff essential for the task because of the shortage of trained scientific and technical personnel. In respect to reactor technology and hazard evaluation, this argument has validity today and may continue to have validity in the relatively near future. However, in respect to the uses of radioactive materials and routine reactor safety measures the states should be able to acquire as adequate staffs for inspection as can the federal government. If the activity remains largely federal, the AEC will have several field offices for the function as any effective inspection system requires almost continuous activity at the installations creating radiation hazards. These staff organizations could be as easily maintained at the state level. On balance, it appears desirable to treat the health and safety aspects of atomic energy in accordance with conventional federal-state lines of authority as rapidly as possible.

Aside from those radiation hazards over which the Atomic Energy Commission exercises health and safety jurisdiction, there are three major radiation sources over which the federal government today exercises no control. These are the radiation hazards created by the utilization of X-ray machines, particle accelerators, and radium. The health problem created by these sources are of utmost importance in the whole radiological health field, and even though the states were to relinquish all regulatory power in those areas covered by federal legislation, it is eminently desirable that the states exercise more complete controls over these radiation sources. In fact, it appears that the greatest health hazards are currently created outside the arena of activities of the Atomic Energy Commission and its licensees. The nature and extent of these hazards have only recently been fully appreciated as a result of the extensive research in problems of radiological health stimulated by the advent of atomic energy. Because only the states today can regulate these hazards, affirmative state action is necessitated. Thus, the states must equip themselves to handle those radiological health problems of sole state concern, thereby making it even more practicable for the states also to take the responsibility for the health and safety of their citizens in relation to those activities licensed and regulated by the AEC.

In addition to the radiation health and safety problem, the states also have a legitimate interest in promoting the development and utilization of atomic energy within their borders and in continually studying existing state laws and regulations with the view of recommending revisions whenever unusual problems arise adversely affecting atomic energy activities. At the present time, it does not appear that any radical innovations will be necessary for the satisfactory accommodation of atomic energy into the legal structure. However, minor but nonetheless significant changes may be required, and the states should have an established organization examining the various potential solutions and recommending the precise nature of desirable revisions of legislation or administrative rules.

As indicated previously in this chapter, any number of state governmental organizational patterns may be employed to accomplish the objectives of an atomic energy state regulatory program. On balance, after full consideration of the purpose of any state program and the role of existing state governmental agencies, we believe that the most adequate state structure would be attained by: (1) creating an office of Director of Atomic Energy Activities; (2) establishing a Radiation Safety Standards Board composed of the Director and the heads of existing state agencies concerned with atomic energy developments; and (3) establishing a Scientific Advisory Committee on Atomic Energy composed of scientifically trained personnel having considerable experience in atomic energy affairs. The Director would be a full-time state official charged with the duties of: (1) acting as adviser to the governor; (2) advising and consulting with the federal government, interstate agencies, other states, and state and local governmental agencies; (3) developing comprehensive state policies and programs for developing atomic energy and for evaluating and determining radiation hazards; (4) acting as chairman and chief administrative officer of the Radiation Safety Standards Board; (5) acting as a non-voting secretary of the Scientific Advisory Committee; and (6) submitting reports to the governor and legislature. In addition, the Director would be authorized to train personnel in matters relating to the promotion of atomic energy and the control of radiation hazards and to utilize the services of other governmental agencies to carry out his duties upon the consent of the agencies involved. The Radiation Safety Standards Board would be charged with the responsibility of adopting radiation safety rules and regulations, developing state policies and programs, making continuing studies, and submitting reports to the governor and

legislature. The Scientific Advisory Committee, to be composed of part-time personnel, would have the duties of reviewing all proposed rules of the Safety Board and submitting written opinions concerning their desirability, and of reviewing policies and programs and providing scientific and technical guidance upon request of the Director. In adopting safety rules, the Safety Board would designate the appropriate state agencies to be charged with the enforcement of the rules.

This recommended organization has the advantages of making atomic energy the major responsibility of a state official, utilizing existing state officials concerned with atomic energy in the rule-making process, affording scientific personnel in an area where expertise is essential, and utilizing existing state agencies to enforce radiation safety rules. Moreover, the cost of establishing such an organization would be minimal since the only full-time personnel required is the Director and such enforcement personnel as may have to be added to existing staffs. The costs of the program could be recovered by the state in the form of registration fees paid by persons utilizing atomic energy and radiation sources. Because the preparation of an appropriate fee schedule requires careful study, the Radiation Safety Standards Board should report its recommendations on the matter to the legislature as soon as possible after the establishment of the agency.

In addition to establishing a state organization charged with general promotional programs in respect to atomic energy and with establishing and enforcing radiation safety rules, state legislative enactments should include appropriate provisions for registration and reporting so that the government is kept fully informed of all hazards within the state and for enforcement of the statutory requirements and any radiation safety rules. Furthermore, existing state agencies should be charged with the responsibility of reporting to the governor and legislature recommended revisions of other laws of the state that may be affected by atomic energy developments.

For the purpose of accomplishing what the authors believe to be a desirable program for state action at this time and in accordance with the conclusions explained previously, the authors have drafted the following Model State Act to Promote Atomic Energy and Control Radiation Hazards.[12]

[12] The model act was drafted in 1957 by Dean E. Blythe Stason, Prof. Samuel D. Estep, Prof. William J. Pierce, and Charles D. Olmsted (research assistant) of the University of Michigan Law School at the request of the Governor of the State of Michigan. After the Governor's Advisory Committee on Atomic Energy made certain changes, the bill was introduced in the Michigan 69th Legislature on Feb. 13, 1958, by

2. Model State Act to Promote Atomic Energy and Control Radiation Hazards: Text and Comments

Section 1. *Declaration of policy; purpose*

(a) The State of ———— desires to encourage widespread participation in the development and utilization of atomic energy for peaceful purposes to the maximum extent consistent with the public health and safety and declares the policy of the state to be:

(1) to cooperate actively in the program established under the United States Atomic Energy Act of 1954, and through the exercise of state powers, to encourage and effect the optimum orderly utilization of atomic energy for peaceful purposes consistent with the public health and safety; and

(2) to the extent that the presence of radiation sources within this state constitute a hazard to the public health and safety, to provide for the exercise of the authority of the state so as to establish a uniform and harmonious system of regulation consistent with the standards of the federal government and other recognized bodies in the field of radiation safety.

(b) The State of ———— recognizes that the impact of atomic energy has resulted in new conditions calling for changes in the laws of the state, and rules issued thereunder, with respect to the public health and safety, working conditions, workmen's compensation, transportation, public utilities, industry, insurance, agriculture, education, and the conservation of natural resources, and therefore declares the purpose of this act to be:

(1) to establish and coordinate responsibility within the state government for the state's part in promotion and control of public and private atomic energy affairs;

(2) to provide technical atomic energy advisory services for the executive and legislative bodies of this state and its political subdivisions;

(3) to provide for promulgation of uniform radiation safety rules and for their coordination with the corresponding regulatory program of the federal government and the recommended standards of nationally recognized bodies in the field of radiation safety;

(4) to provide for the regulation of public and private use and

Reps. Phillips and Copeland, as House Bill No. 303 and referred to the Committee on Ways and Means of the House of Representatives. The bill was not enacted during the 1958 session.

possession of radiation sources within this state in the interest of the public health and safety;

(5) to provide penalties for violations of radiation safety rules and orders; and

(6) to provide for continuing studies as to the need for changes in the law of the state to encourage the optimum development of the peaceful uses of atomic energy.

Comment

This general purpose section has a twofold purpose: (1) to establish a general legislative policy; and (2) to declare the public interest in atomic energy and to indicate the desirability of regulation of radiation hazards consistently with standards employed by the federal government and other recognized bodies in the field of radiation safety.

Section 2. *Definitions*

As used in this Act—

(a) "Advisory Committee" means the Scientific Advisory Committee on Atomic Energy established by Section 5 of this Act.

(b) "Atomic energy" means all forms of energy released in the course of nuclear fission or nuclear transformation.

(c) "Byproduct material" means any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear material.

(d) "Director" means the Director of Atomic Energy Activities appointed under the authority of Section 3 of this Act.

(e) "Government agency" means any political subdivision or any officer, department, bureau, division, board, authority, agency, commission, or institution of this state or any political subdivision, except the judicial branch and the legislature.

(f) "Operator" means any individual who manipulates the controls of a utilization or production facility.

(g) "Person" means any individual, partnership, association, joint-stock company, public or private corporation, or government agency.

(h) "Production facility" means any equipment or device capable of the production of special nuclear material in such quantity as to be of significance to the common defense and security of the United States, or in such manner as to affect the health and safety of the public.

(i) "Radiation" means gamma rays and X-rays, alpha and beta particles, high speed electrons, neutrons, protons, and other nuclear particles or electromagnetic radiations capable of producing ions directly or indirectly in their passage through matter, but does not include sound or radio waves, or visible, infra-red, or ultra-violet light.
(j) "Radiation safety rule" means every rule, regulation, or order of general application, including any amendment or repeal thereof, adopted and promulgated by the Safety Board pursuant to this Act.
(k) "Radiation source" means any radioactive material or any instrument, equipment, machine, installation, or other device used for the production of radiation.
(l) "Radioactive material" means any material, solid, liquid, or gas, that emits radiation spontaneously.
(m) "Safety Board" means the Radiation Safety Standards Board established by Section 4 of this Act.
(n) "Source material" means uranium, thorium, or any other material which the Safety Board declares by rule to be source material after the United States Atomic Energy Commission by regulation has made a similar determination; or ores containing one or more of the foregoing materials, in such concentrations as the Safety Board declares by rule after the United States Atomic Energy Commission by regulation has made a similar determination.
(o) "Special nuclear material" means (1) plutonium and uranium enriched in the isotope 233 or in the isotope 235, and any other material which the Safety Board declares by rule to be special nuclear material after the United States Atomic Energy Commission by regulation has made a similar determination; or (2) any material artificially enriched by any of the foregoing.
(p) "Utilization facility" means any equipment or device, except an atomic weapon, capable of making use of special nuclear material in such quantity as to be of significance to the common defense and security of the United States, or in such manner as to affect the health and safety of the public, or peculiarly adapted for making use of atomic energy in such quantity as to be of significance to the common defense and security of the United States.

Comment

The meanings of the terms used in this act are identical or consistent with those of the Atomic Energy Act of 1954, or, where additional terms are included, with those used by the National Committee on Radi-

ation Protection and Measurement. Consistency is particularly important because atomic energy affairs have such broad interstate and international ramifications and are subject to both federal and state control.

The definition of "atomic energy" is taken from the federal statute;[13] however, for purposes of this act, it is used primarily in connection with the promotional program and not with health and safety regulation. It should be noted that while the meaning of this term is sufficiently broad to include both fission and fusion processes, it does not include all forms of energy which can give rise to harmful radiations.

The key terms used in connection with the health and safety program are "special nuclear material," "byproduct material," "source material," "production facility," "utilization facility," "operator," "radiation," "radiation source," and "radioactive material." The first six terms are used in the Atomic Energy Act of 1954,[14] and the federal definitions have been followed insofar as possible, or necessary. However, because these terms are not entirely satisfactory, in light of the state's broader radiation health and safety problem, they are only used in Section 8(a) which prohibits activities for which an AEC license is required unless such a license is obtained. It was necessary to modify the definitions of several of these terms to avoid the possibility of an unconstitutional delegation of state power to the AEC.[15]

The definition of the term "radiation" follows the NCRPM definition;[16] however, certain changes were deemed advisable to avoid possible omission. The definition is sufficiently broad to cover the possible discovery of new types of injurious radiation.

Because of the fact that some sources of radiation, such as radium and other spontaneous radiation emitters, may constitute hazards to health irrespective of how or whether they are being used, and whether they are stationary or in transport, it was necessary to include both a general term, "radiation source," which includes both materials and machines, and a more limited term, "radioactive material." As defined,

[13] 68 Stat. 923 (1954), 42 U.S.C.A. §2014(c).

[14] 68 Stat. 922-4 (1954), 42 U.S.C.A. §2014.

[15] Under the terms of this act, the Safety Board has the power (within prescribed limits) to determine what is "source material" and "special nuclear material." It is believed that the imposition of a limitation on this power, which would first require a similar determination by the AEC, does not involve an unconstitutional delegation of state power to a federal agency.

[16] The term "radiation" is defined by the NCRPM as "gamma rays and X-rays, alpha and beta particles, high-speed electrons, neutrons, protons, and other nuclear particles; but not sound or radio waves, or visible, infrared, or ultraviolet light." National Bureau of Standards Handbook 61 at 27.

"radiation source" provides broader coverage than would be achieved by using only those terms defined in the Atomic Energy Act of 1954.

Section 3. *Director of Atomic Energy Activities: appointment, qualifications, term, salary, duties, and powers*

(a) The Governor, with the approval of the Senate, shall appoint a person having training and experience in radiation protection, or a related science, to be Director of Atomic Energy Activities. In submitting any nomination for the position of Director to the Senate, the Governor shall set forth the training, experience, and other qualifications of the nominee. The Director shall serve at the pleasure of the Governor, and he shall receive an annual salary of $———. The Director shall not engage in any business, vocation, or employment other than that of serving as Director of Atomic Energy Activities. The Department of ———— shall provide suitable office facilities for the Director.

(b) The Director shall—

(1) act as adviser to the Governor on all atomic energy matters and, as deputy to the Governor, advise, consult and cooperate with the federal government, interstate agencies, other states, government agencies of this state, and other persons and groups, public and private, in furtherance of the purposes of this Act;

(2) with the consent of the Governor, represent the interest of the state in communications, negotiations, transactions, and other dealings with the federal government, interstate agencies, and other states concerning atomic energy and radiation safety matters;

(3) submit reports at least once each year, and at such other times as the Governor may direct, to the Governor and to the Legislature concerning developments in atomic energy and radiation safety matters and make such recommendations as should be considered by them;

(4) serve as a member of (*e.g.,* the commission of economic development);

(5) serve as chairman and chief administrative officer of the Safety Board;

(6) serve as secretary, without vote, of the Advisory Committee;

(7) develop comprehensive policies and programs—

(a) for the evaluation and determination of radiation hazards to guide the Safety Board and government agencies charged with the enforcement of radiation safety rules; and

(b) for the development and utilization of atomic energy for

peaceful purposes to guide (*e.g.*, the commission of economic development) and other government agencies;

(8) receive and maintain the following records, reports, and written opinions, and disseminate the information therein contained to any interested and affected government agency in accordance with the rules issued by the Safety Board:

(a) registration records required by Section 8 of this Act and the rules promulgated by the Safety Board;

(b) other reports required to be submitted to the Director by Section 8 of this Act and the rules promulgated by the Safety Board; and

(c) written opinions of the Advisory Committee required to be submitted by Sections 4 and 5 of this Act; and

(9) collect and disseminate information relating to the promotion of atomic energy for peaceful purposes and radiation protection to any government agency and to any interested person or group.

(c) The Director may—

(1) accept and administer loans, grants, or other funds and gifts from the federal government and from other sources, public and private, for carrying out the purposes of this Act;

(2) encourage, participate in, or conduct studies, investigations, research, and demonstrations deemed necessary and desirable to further the purposes of this Act;

(3) employ, train, and prescribe the powers and duties of such persons as may be deemed necessary and desirable to assist him in carrying out the provisions of this Act; and

(4) train and instruct the personnel of other government agencies in matters relating to the promotion of atomic energy and the control of radiation hazards upon the request of the government agencies concerned.

(d) The Director shall utilize the services and personnel of other government agencies to assist him in carrying out his duties under this Act insofar as practicable and with the consent of the government agencies concerned.

Comment

Section 3 creates the office of Director of Atomic Energy Activities to be filled by a person who is experienced in radiation protection or a related science and who will devote his full energies and time to the duties of the office. Atomic energy is of sufficient importance to the

state to warrant making the problems of radiation protection and promotional programs the responsibility of a state official. Moreover, coordination of state activities is desirable in at least three senses: (1) coordination of the policies, regulations, and actions of the several interested state agencies and officers; (2) coordination of the state program with those of the federal government and other states; and (3) coordination of the promotional and regulatory phases of the state program. Essential coordination can be achieved through the creation of the office of the Director.

The duties imposed under Section 3(b) and designed to establish his position as the state official primarily responsible for state atomic energy affairs include: (1) acting as adviser to the governor and, as deputy to the governor to advise, consult, and cooperate with the federal government, interstate agencies, other states, and state and local governmental agencies and private groups; (2) representing the state, with consent of the governor, in negotiations with agencies outside the state; (3) reporting to the governor and legislature; (4) serving as a member of the state's economic or industrial development commission; (5) serving as chairman of the Radiation Safety Standards Board; (6) serving as secretary of the Scientific Advisory Committee; (7) developing comprehensive state policy and programs for the determination and evaluation of radiation hazards and for atomic energy promotional programs; (8) receiving and maintaining records, reports, and opinions required under the act; and (9) collecting and disseminating information relative to atomic energy affairs.

The most important duty of the Director is that of chairman and chief administrative officer of the Radiation Safety Standards Board. As the only full-time member and the only member required to have experience in radiation protection, it is contemplated that the Director will play a major role in the development and promulgation of radiation safety rules and standards. Although enforcement of the rules is the responsibilty of other state agencies under the act, the general powers are sufficiently broad to assure that the Director will be informed of enforcement problems so that whatever additional action is called for can be taken by either the Director or the Radiation Safety Standards Board. Knowledge of new problems will be available by reason of the fact that the Director is responsible for receiving and maintaining all records, reports, and opinions required under other sections of the act.

At this time one of the most compelling needs is the availability of a state official to represent the state in negotiations with the AEC. When-

ever problems of state-federal relations arise today, the AEC is faced with the task of negotiating with several state officers, none of whom may represent all state and local agencies. As a result, the AEC may avoid negotiations merely because of the complexities involved. With the approval of the governor under Section 3(b)(2) the Director can act as representative of the state in negotiations. It should be noted, however, that the Director cannot commit the state to any particular program affecting another state agency without that agency's approval or definitive legislative or executive action.

The discretionary powers of the Director include: (1) accepting and administering loans, grants, or gifts; (2) participating in or conducting studies, investigation, and research; and (3) employing and training personnel to assist him in carrying out his duties. Since the enforcement of radiation safety rules is the responsibility of other state agencies, it is expected that the Director will be assisted by a rather small staff organization.

Section 4. *Establishment of the Radiation Safety Standards Board; composition, powers, and duties*

(a) There is hereby established a Radiation Safety Standards Board consisting of (1) the Director of Atomic Energy Activities, who shall be chairman, (2) (*e.g.*, the state health commissioner), (3) (*e.g.*, the public service commissioner), (4) (*e.g.*, the labor commissioner), and (5) (*e.g.*, the state police commissioner). The members shall have equal responsibility and authority. The powers and duties of the Safety Board shall be exercised only in accordance with a majority vote of the entire membership.

(b) The Safety Board shall—

(1) develop comprehensive policies and programs for the evaluation, determination, and control of radiation hazards in this state;

(2) adopt and promulgate, in accordance with Section 6 of this Act and as may be deemed necessary and advisable to protect persons and property, all radiation safety rules relating to (a) radiation safety standards, (b) enforcement of radiation safety standards, (c) registration, keeping of records, and submission of reports in connection with radiation sources, and (d) dissemination of information contained in the records and reports to government agencies;

(3) make continuing studies and submit reports, from time to time, to the Governor and to the Legislature concerning radiation dis-

aster problems and the need for changes in the laws of the state to protect persons and property; and

(4) make a study and submit a report to the Governor and to the Legislature concerning the establishment of a schedule of gradual annual registration fees for radiation sources to defray the costs of the administration and enforcement of this Act, including the radiation safety rules promulgated by the Safety Board.

(c) The Safety Board may—

(1) order the Director to encourage, participate in, or conduct studies, investigations, training, research, and demonstrations relating to the control of radiation hazards, the measurement of radiation, the effects on health of exposure to radiation, and related problems;

(2) render opinions, upon request, concerning such plans and specifications on the design and shielding of radiation sources as may be submitted before or after construction, for the purpose of determining the possible radiation hazard; and

(3) order the Director to convene the Advisory Committee or to request written opinions from its members in connection with any matter relating to radiation safety.

Comment

Section 4 creates the Radiation Safety Standards Board which is charged primarily with the task of promulgating radiation safety rules. Aside from purely political or economic considerations, it appears desirable that the heads of other state departments or agencies having enforcement responsibilities under the act should have the power to adopt radiation rules. These representatives of other agencies will be able to assess the capabilities of their agencies and are more qualified to determine the respective jurisdictions of the state agencies concerned with the various radiation safety problems. Although these officers may not be trained specifically in radiation safety, their broader regulatory experience is invaluable. The task of training is offset by the presence of the Director of Atomic Energy Activities and the availability of the Scientific Advisory Committee for consultation and recommendations concerning the content of specific rules. Although all state agencies having an interest in atomic energy affairs are not included in the recommendations, it is believed that the membership should not exceed five in order to prevent the Board from becoming unwieldy as an administrative body.

Section 4(b) imposes upon the Board the duties of: (1) developing

comprehensive policies and programs for the evaluation, determination, and control of radiation hazards; (2) promulgating rules relating to radiation safety standards, enforcement of radiation safety standards, registration, maintenance of records and reports, and dissemination of information; (3) making studies and reports to the governor and legislature concerning radiation disaster problems; and (4) studying the problem of registration fees and reporting thereon.

The Safety Board is authorized to direct one or more state agencies to be responsible for the enforcement of specific radiation safety rules. It is expected, of course, that unnecessary duplications will be avoided, not only in the interest of economy, but also to minimize the burdens imposed on the persons using radiation sources. Although the Director is charged with the responsibility of receiving and maintaining records and reports, the Safety Board is given the power to adopt regulations affecting this responsibility.

The "radiation disaster" problem, including both war disaster and major reactor mishaps, requires careful study and perhaps the enactment of new legislation or even constitutional revision. Among the possible types of action that may be necessary in the event of a radiation disaster are mobilization of the state's military and police forces, large-scale evacuation efforts, seizure and destruction of contaminated private property, and decontamination of property and persons. To date, the radiation disaster problem has not received careful deliberative efforts at either the federal or state levels, and it appears desirable that some state agency should undertake the task of studying the problems involved and making recommendations as to feasible courses of action.

In view of the fact that many states have fiscal problems in establishing new governmental agencies, some method of financing of a state atomic energy program is essential. Since the users of radiation sources may be in a position of being able to pass the costs of a radiation safety program to the consumer of the products, it appears feasible that a major percentage of the costs to the state could be recovered through registration fees. The precise form the fee schedule should take, however, cannot be accurately ascertained until the nature of radiation sources within the state is compiled. The registration requirements under the act will provide essential information as to the potential hazard created by each radiation source and the probable scope of state supervision and inspection. On the basis of this information the Safety Board will be capable of making explicit recommendations concerning the establishment of an equitable fee schedule.

Under Section 4(c) the discretionary powers of the Safety Board are set forth. Because existing governmental agencies will enforce radiation safety rules, those agencies will require considerable assistance from qualified persons to instruct personnel in procedures and measurements. Furthermore, as new uses of radiation emerge, a qualified person should make an investigation to determine the best method of protecting the public health and safety against possible hazards. It is therefore suitable for the Director, as a qualified person in radiation safety, to undertake these tasks at the request of the Board which is representative of the state agencies.

Although the Board is not a body of radiological safety experts, it has the necessary means available to render opinions, upon request, concerning plans and specifications of installations employing radiation sources. Although the recommended statute of the National Committee on Radiation Protection and Measurement makes this requirement mandatory, in some instances, particularly in respect to new reactor designs, the state personnel will not be qualified to render opinions. The opinions, although purely advisory and not binding, in respect to installations where the radiation problems are well understood would, of course, be helpful to the potential user of a radiation source in that expensive alterations to conform to state standards may be avoided. Two arguments have been advanced in opposition to the creation of even a discretionary power to render opinions. First, it has been contended that during the initial phases of a state program that the state officials involved will be so burdened with other duties that it is inadvisable to assign even a discretionary power. Secondly, the question of the possible effect on litigation regarding injuries to persons and property in the event of a failure to seek an advisory opinion has been raised. On balance, it has been concluded that the discretionary power should be granted to the Board in the belief that some major assistance could be rendered users even during the earlier period of the state program and that the impact upon tort litigation will be relatively insignificant.

Section 5. *Establishment of the Scientific Advisory Committee on Atomic Energy; composition, qualifications, appointment, term, compensation, functions, and duties*

(a) There is hereby established a Scientific Advisory Committee on Atomic Energy to consist of five persons, who each have training and experience in a science related to the development and utilization of atomic energy for peaceful purposes, and representing, as a group,

the broadest possible range of training and experience in atomic energy matters. The members of the Advisory Committee shall be appointed by the Governor for terms of five years, except that initial appointments and filling of vacancies shall be so made that the term of one appointed member expires each year. The members of the Advisory Committee, while engaged in the work of the Advisory Committee, shall be entitled to receive compensation at $———— per diem and reimbursement for actual and necessary traveling and subsistence expenses. The Advisory Committee shall meet or submit written opinions, or both, at the request of the Director.

(b) Within thirty days after submission of a proposed radiation safety rule by the Safety Board, as provided in Section 6 of this Act, the Advisory Committee shall submit a written opinion to the Director as to the desirability of the rule. When requested by the Director, the Advisory Committee also shall (1) review the policies, programs, and rules developed and promulgated pursuant to this Act; (2) make such recommendations as are deemed necessary and desirable; and (3) give technical advice and assistance on matters relating to the promotion and control of atomic energy in this state.

Comment

Section 5 creates the Scientific Advisory Committee on Atomic Energy, composed of five persons trained in sciences related to the development and utilization of atomic energy. The Committee is to be composed of part-time personnel paid on a per diem basis so that highly qualified persons can be attracted to accept the positions.

Section 5(b) requires the Advisory Committee to submit written opinions on proposed safety rules within thirty days after their submission by the Radiation Safety Standards Board. Through this device, technologically competent review of proposed rules will be achieved. The Safety Board, however, has final authority in deciding the precise nature of radiation safety rules. Upon request by the Director, the Advisory Committee also is directed to review the state policies and programs, to make suitable recommendations, and to give technical advice and assistance on atomic energy matters.

While the act bestows final authority upon the Safety Board to promulgate relations, this subsection is designed to assure that they are necessary and adequate. In effect, the Advisory Committee is an entirely independent board of technical experts which not only advises and assists the Safety Board in establishing radiation safety standards

and issuing regulations, but also must publish its opinions on the desirability of each rule before it becomes effective. These opinions are received and kept on file by the Director, and are intended to indicate how well the regulations conform with current scientific thought.

It should be noted that the Advisory Board is not limited to giving advice and assistance on radiation safety matters. Through the Director, this body is available to give technical advice and assistance on any atomic energy or radiation matter to any agency of the state government.

Section 6. *Promulgation of radiation safety rules*

(a) The Safety Board shall have the exclusive authority in this state to adopt and promulgate radiation safety rules relating to (1) radiation safety standards, (2) enforcement of radiation safety standards, (3) registration, keeping of records, and submission of reports in connection with radiation sources, and (4) dissemination of information contained in the records and reports to government agencies. In adopting and promulgating a radiation safety rule, the Safety Board shall designate the government agency or agencies which shall enforce the rule. In making the enforcement agency selection, the Safety Board shall give due consideration to the technical qualifications and to the enforcement powers and jurisdiction of the individual government agencies.

(b) Except where the rules and standards of federal agencies or nationally recognized bodies in the field of radiation safety are deemed inadequate for this state, the Safety Board, in the interest of uniformity, shall make its radiation safety rules consistent with federal rules or, in the case of radiation hazards not regulated by federal agencies, with the recommended rules and standards of nationally recognized bodies in the field of radiation safety, such as the National Committee on Radiation Protection and Measurement or the American Standards Association.

(c) In promulgating radiation safety rules the Safety Board shall comply with the provisions of (*e.g.,* the state administrative procedure act). Not less than thirty days before final approval of a proposed radiation rule, the Safety Board shall submit the proposed rule to the Advisory Committee for its review and recommendations, except that, upon his finding of emergency need, the Governor may waive all or any part of the thirty day period.

Comment

Section 6(a) establishes the jurisdiction of the Radiation Safety Standards Board in respect to radiation safety rules and authorizes the

Safety Board to determine enforcement agencies by rule. The Safety Board is given exclusive jurisdiction within the state to promulgate radiation safety rules relating to radiation safety standards, to enforce radiation safety standards, registration, record maintenance, and submission of reports, and dissemination of information contained in records and reports to government agencies. In selecting the enforcement agency, the Safety Board is to consider the technical qualifications of the state agencies and the powers and jurisdiction of the state agencies. However, the section does not impose any rigid requirements in selecting enforcement agencies so that complete flexibility is possible.

Section 6(b) recognizes the desirability of uniformity in the field of radiation safety standards and therefore directs the Safety Board to adopt, whenever possible, regulations consistent with standards employed by the federal government or nationally recognized bodies in the field of radiation safety.

Section 6(c) requires the Safety Board to comply with the provisions of the state administrative procedure act in relation to rule-making. In addition, the Safety Board is required to submit its proposed rules to the Scientific Advisory Committee for review and recommendations thirty days before final approval. The governor is given the power to waive all or part of the thirty day period. If a state does not have a state administrative procedure act, it may be desirable to add provisions relating to the rule-making process including notice of proposed rule-making to interested persons, opportunities for interested persons to submit written opinions, and hearings.

Section 7. *Enforcement of radiation safety rules; powers and duties of enforcing government agencies*

(a) Only those government agencies authorized by the Safety Board, pursuant to Section 6(a) of this Act, shall have the power and the duty to enforce the radiation safety rules of this state. The enforcing government agencies shall receive from the Director such information and technical advice and assistance as he is capable of providing and as is necessary for the enforcement of radiation safety rules.

(b) The enforcing government agency shall have the power to enter at reasonable times upon any public or private property wherein a radiation source exists for the purpose of inspecting and investigating conditions and examining records relative to the purposes of this Act and the radiation safety rules the government agency is authorized to enforce. If such inspection and examination indicates that the radiation source does

not constitute a hazard to persons and property and is in compliance with radiation safety rules, the owner, operator, or user shall be so notified in writing by the government agency.

(c) When, in connection with a radiation source within its enforcement jurisdiction, a government agency finds that an emergency exists requiring immediate action to protect persons and property from radiation hazards, it shall, without notice or hearing, issue an order reciting the existence of such emergency and requiring that such action be taken as it deems necessary to meet the emergency. Any person to whom such order is issued shall comply immediately. On application to the government agency, the person to whom the emergency order has been issued shall be afforded a hearing by the government agency within thirty days and in accordance with the provisions of (*e.g.,* the state administrative procedure act). On the basis of such hearing the government agency, in its final order, may continue such emergency order in effect, revoke it, or modify it.

(d) When, in connection with a radiation source within its enforcement jurisdiction, a government agency finds that there are reasonable grounds to believe that a radiation hazard exists or that there is a continuing violation of radiation safety rules, but which does not constitute an emergency requiring immediate action to protect persons and property, it shall give written notice to the alleged violator or violators specifying the grounds of the complaint and the action to be taken to correct the alleged violation. This notice shall require that the alleged violations be corrected or that the alleged violator or violators appear before the agency at a time and place specified in the notice. The notice shall be delivered not less than thirty days before the time set for the hearing. Before any order issued under this subsection shall become final, the government agency shall afford the alleged violator or violators an opportunity for hearing, and, on the basis of evidence produced at the hearing, shall enter such final order as will best effectuate the purposes of this Act and the radiation safety rules it is authorized to enforce. Written notice of such final order shall be given to the alleged violator or violators and to such other persons as may have appeared at the hearing and made written request for notice of the order. The notice and hearing required by this subsection shall conform to the provisions of (*e.g.,* the state administrative procedure act). The final order of the government agency under this subsection shall become binding on all parties to the hearing within thirty days after notice of it has been sent to the parties, unless it shall be appealed to the courts as provided in (*e.g.,* the state administrative procedure act).

(e) In the event of a violation of an emergency order or a final order, the government agency shall immediately apply to the circuit court of the county wherein the violation occurs for an order to restrain and enjoin the persons responsible for such violation. In any action for an injunction brought pursuant to this subsection, any findings of the government agency after hearing or due notice shall be prima facie evidence of the fact or facts found therein. No bond shall be required when such injunctive relief is sought upon the application of the government agency, the attorney general, or the prosecuting attorney of any county.

(f) Any person aggrieved by a final order issued by a government agency authorized to enforce radiation safety rules is entitled to judicial review thereof in the circuit court in the county wherein the person resides or has a place of business in the state or in the circuit court for ———— County, within thirty days after personal service of the final decision of the government agency or within thirty days after the mailing thereof, if notice is given by mail. Judicial review of this final decision shall be controlled by the provisions of (*e.g.*, the state administrative procedure act).

(g) Government agencies acting under the authority of this section shall give written notice to the Director of all emergency and final orders within ——— days after issuance and of all applications for injunction within ——— days after filing with the court.

(h) Except as specifically provided in this section, nothing in this Act shall be construed as extending any government agency's jurisdiction over persons, property, or activities within this state.

Comment

Section 7 establishes the procedures and methods for the enforcement of radiation safety rules. Subsection (a) defines the jurisdiction of the enforcing governmental agencies and provides that the Director shall render technical advice and assistance to the agencies. Subsection (b) authorizes the enforcing agency to inspect and investigate facilities. In addition, the agency is to give written notice to the owner, operator, or user of a radiation source if it finds that the radiation source does not constitute a hazard and that there is compliance with the radiation safety rules.

Section 7(c) authorizes the enforcing agency to enter emergency orders whenever immediate action is necessary to protect persons and property. Although the emergency orders may be issued without notice and hearing, a hearing within thirty days is required upon application

of the affected person. Meanwhile, compliance with the order is required. The hearing procedure is governed by the applicable provisions of the state administrative procedure act. After the hearing, the government agency may enter a final order continuing, revoking, or modifying the emergency order.

Section 7(d) authorizes the enforcing agency to give written notice of alleged violations whenever an emergency situation does not exist. The notice is to specify the nature of the hazard or violation and the action deemed necessary by the agency to correct the violation. A hearing is required before the entry of a final order, and after entry thereof, judicial review may be obtained in accordance with the provisions of the applicable state administrative procedure act. If the state does not have general legislation covering administrative procedures, the statute should be amended to include basic provisions relating to notice, hearing, and judicial review.

Section 7(e) authorizes the government agency to apply to the appropriate state court for necessary injunctions whenever there is a continuing violation of an emergency or final order. The findings of the government agency are made prima facie evidence of the facts, and the government agency is relieved of any bonding requirements when seeking injunctive relief. Section 7(f) assures that any aggrieved person may receive judicial review of agency action which is final. Section 7(g) requires the enforcing government agency to give written notice of any emergency or final order to the Director so that he may be kept currently informed of all enforcement problems. The Director will be able to inform the Safety Board of any problems requiring revision of rules or statutes. Section 7(h) assures that the statute will not be construed as extending the jurisdiction of any government agency except as specifically provided.

Section 8. *United States licenses or permits required; registration of radiation sources required; compliance with radiation safety rules required*

(a) No person shall manufacture, construct, produce, use, transfer, acquire, or possess any source material, byproduct material, special nuclear material, production facility, or utilization facility, or act as an operator of a production or utilization facility within this state unless he shall have first obtained a license or permit for the activity from the United States Atomic Energy Commission, if pursuant to the Atomic Energy Act of 1954, as amended, a license or permit is required.

(b) No person shall produce radiation or produce, use, transport, store, or dispose of radioactive materials, or modify, extend, or alter such activities, except in accordance with the provisions of this Act, the radiation safety rules promulgated thereunder, or emergency or final orders issued to such person by a government agency authorized to enforce radiation safety rules.

(c) Subject to exceptions provided by the rules of the Safety Board, every person who produces radiation or produces, uses, transports, stores, or disposes of radioactive materials, shall register annually in writing with the Director in accordance with rules established and on forms provided by the Safety Board. If the person modifies, extends, or alters such activities, he shall amend his registration accordingly. The Safety Board may by rule exempt from the requirements of registration persons who produce minimal quantities of radiation or who produce, use, transport, store, or dispose of minimal quantities of radioactive materials which the Safety Board determines have no substantial effect on the public health and safety.

Comment

Section 8 requires compliance with the licensing and permit provisions of the Atomic Energy Act of 1954, compliance with radiation safety rules and lawful orders entered in accordance with the provisions of the act, and registration of radiation sources. Section 8(a) is similar to Section 2 of the New England Model Act, and, while perhaps not essential, the provision may serve a useful purpose in the event that constitutional difficulties prevent enforcement of existing AEC licensing practices. Section 8(b) establishes the positive requirement that each person producing radiation or producing, using, transporting, storing, or disposing of radioactive materials comply with radiation safety rules and emergency or final orders issued in accordance with the provisions of the act.

Section 8(c) requires the same persons to register annually with the Director and to amend registrations if activities are modified. The Radiation Safety Standards Board is empowered to exempt persons from the registration requirements if the Board determines that there is no substantial public health and safety problem involved. The registration requirement assures that the Board will have knowledge of all radiation hazards. Although the AEC now informs state officials of the issuance of federal licenses, the registration requirement is essential to ascertain the nature of radiation hazards not covered by federal legis-

lation. The Safety Board is to establish rules for registration and, in respect to a single radiation source, more than one person may be required to register if the Board finds such a requirement beneficial. This may be particularly desirable whenever, for example, the owner of the radiation source has no control over the utilization of the source.

Section 9. *Penalties*

(a) Any person who violates any provision of Section 8 of this Act or any radiation safety rule promulgated pursuant to this Act shall, upon conviction, be subject to a fine of not more than $————.
(b) Any person who willfully violates any provision of Section 8 of this Act or any radiation safety rule promulgated pursuant to this Act shall, upon conviction, be subject to a fine of not more than $———, or imprisonment for not more than ————, or both. Each day on which such violation occurs shall constitute a separate violation.
(c) Any person who violates any emergency or final order issued pursuant to Section 7 of this Act by a government agency authorized to enforce radiation safety rules shall, upon conviction, be subject to a fine of not more than $————, or imprisonment for not more than ———, or both. Each day on which such violation occurs shall constitute a separate violation.

Comment

Section 9 establishes criminal penalties for three types of offenses: (1) simple violations of radiation safety rules, (2) willful (*i.e.*, knowing and intentional) violations of radiation safety rules, and (3) violations of emergency or final orders. As to the second and third types, each day on which a violation occurs constitutes a separate offense.

While the amount of the fines and the duration of the imprisonments is not specified, it is felt that the penalties should increase in the order in which the offenses are listed. On this matter, however, it should be pointed out that the state, in prescribing the magnitude of the penalties, would be well advised to consider those established by the Atomic Energy Act of 1954, for the Supreme Court has indicated that state penalties in excess of those provided by federal laws concerning the same offense are a factor to be considered in deciding in favor of federal pre-emption.[17] Under federal law a willful violation, or conspiracy to violate, a radiation safety regulation of the AEC may ". . . be pun-

[17] See the dissenting opinion in California v. Zook, 336 U.S. 725, 69 S. Ct. 841 (1948).

ished by a fine of no more than $5,000 or by imprisonment for not more than two years, or both." [18]

Section 10. *Conduct of studies concerning changes in laws and rules with a view to the promotion of atomic energy uses*

The following state agencies are directed to initiate and to pursue continuing studies as to the need for changes in the laws and rules administered by them in order to encourage the optimum development of the peaceful uses of atomic energy in this state, and, on the basis of such studies, to make such recommendations to the Governor and to the Legislature for the revision of laws as may appear necessary and appropriate:

(a) The department of economic development, particularly as to opportunities for atomic energy industries.

(b) The department of public instruction, particularly as to the need and facilities for scientific instruction and training.

(c) The department of agriculture, particularly as to the uses of atomic energy in agriculture.

(d) The department of insurance, particularly as to the insurance of persons and property from hazards to life and property resulting from atomic energy development.

(e) The department of workmen's compensation, particularly as to the time and character of proof of claims of radiation injuries and the extent of compensation allowable therefor.

(f) The public service commission, particularly as to the participation by public utilities in projects and research looking to the development of production and utilization facilities of commercial and industrial use.

(g) Such other government agencies as the Governor may direct and for the purposes specified by him.

Comment

With respect to a similar provision the New England Committee on Atomic Energy stated:

> This section is premised on the supposition that study will disclose a need for a number of changes in existing laws and regulations to take care of new conditions created by atomic development for peaceful uses. The statutory directive will justify the use by the several departments and agencies of their personnel in making the studies thus called for, a step that some of them might otherwise be reluctant to make.[19]

[18] 68 Stat. 958 (1954), 42 U.S.C.A. §2273.

[19] Atomic Energy and New England 65 (1955).

Section 11. *Non-applicability of this Act*

(a) Nothing in this Act, or in the radiation safety rules promulgated pursuant to this Act, shall be construed to apply to installations owned or operated by the federal government or to radiation sources operated by the federal government, unless such application is specifically authorized by the federal government.

(b) Nothing in this Act, or in the radiation safety rules promulgated pursuant to this Act, shall be construed to limit the kind or amount of radiation that may be intentionally applied to a person for diagnostic or therapeutic purposes by, or under the direction of, a duly licensed member of the healing professions.

Comment

Section 11(a) recognizes the overriding power of the federal government in relation to its own activities and property. Radiation sources owned and operated by other than the federal government but for the federal government are not exempted, but federally owned installations operated by private contractors are exempted.

Section 11(b) prevents any restriction upon the kind or amount of radiation intentionally employed for diagnostic or therapeutic purposes by persons duly licensed under state law. However, radiation safety rules may be established for medical radiation sources in respect to shielding, the storage of radioactive isotopes, exposure to personnel, and other matters. Only the exposure to which a patient may be submitted for diagnostic or therapeutic purposes is exempted.

Section 12. *Existing rules preserved; pending proceedings*

(a) Until a superseding radiation safety rule has been promulgated by the Safety Board, all health and safety laws or rules concerning radiation shall remain in effect and shall be enforced in the same manner as if this Act had not been adopted.

(b) All proceedings pending and all rights and liabilities existing, acquired, or incurred, at the time this Act takes effect, are hereby saved, and such proceedings shall be consummated under and according to the law in force at the time such proceedings are or were commenced. This Act shall not be construed to alter, affect, or abate any pending prosecution, or prevent prosecution hereafter instituted under such repealed section, chapters, or acts for offenses committed prior to the effective date of this Act; and all prosecutions pending at the effective date of

this Act, and all prosecutions instituted after the effective date of this Act, for offenses committed prior to the effective date of this Act, shall be continued or instituted under and in accordance with the provisions of the law in force at the time of the commission of such offenses.

Section 13. *Effective date; exception*

(a) This Act shall take effect ————————.
(b) The provisions of Section 8(c) of this Act shall not be effective until sixty days after the effective date of this Act as to persons engaged in activities requiring registration at the effective date of this Act.

Appendix A

ITEM 1

Atomic Energy Commission

10 Code Fed. Regs. Part 20

Standards for Protection Against Radiation

General Provisions

§ 20.1 *Purpose.* (a) The regulations in this part establish standards for protection against radiation hazards arising out of activities under licenses issued by the Atomic Energy Commission and are issued pursuant to the Atomic Energy Act of 1954 (68 Stat. 919).

(b) The use of radioactive material or other sources of radiation not licensed by the Commission is not subject to the regulations in this part. However, it is the purpose of the regulations in this part to control the possession, use, and transfer of licensed material by any licensee in such a manner that exposure to such material and to radiation from such material, when added to exposures to unlicensed radioactive material and to other unlicensed sources of radiation in the possession of the licensee, and to radiation therefrom, does not exceed the standards of radiation protection prescribed in the regulations in this part.

§ 20.2 *Scope.* The regulations in this part apply to all persons who receive, possess, use or transfer byproduct material, source material, or special nuclear material under a general or specific license issued by the Commission pursuant to the regulations in Part 30, 40, or 70 of this chapter.

§ 20.3 *Definitions.* (a) As used in this part:

(1) "Act" means the Atomic Energy Act of 1954 (68 Stat. 919) including any amendments thereto;

(2) "Airborne radioactive material" means any radioactive material dispersed in the air in the form of dusts, fumes, mists, vapors, or gases;

(3) "Byproduct material" means any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear material;

(4) "Commission" means the Atomic Energy Commission or its duly authorized representatives;

(5) "Government agency" means any executive department, commission, independent establishment, corporation, wholly or partly owned by the United States of America which is an instrumentality of the United States,

or any board, bureau, division, service, office, officer, authority, administration, or other establishment in the executive branch of the Government;

(6) "Individual" means any human being;

(7) "Licensed material" means source material, special nuclear material, or byproduct material received, possessed, used, or transferred under a general or specific license issued by the Commission pursuant to the regulations in this chapter;

(8) "License" means a license issued under the regulations in Part 30, 40, or 70 of this chapter. "Licensee" means the holder of such license;

(9) "Person" means (i) any individual, corporation, partnership, firm, association, trust, estate, public or private institution, group, Government agency other than the Commission, any State, any foreign government or nation or any political subdivision of any such government or nations, or other entity; and (ii) any legal successor, representative, agent, or agency of the foregoing;

(10) "Radiation" means any or all of the following: alpha rays, beta rays, gamma rays, X-rays, neutrons, high-speed electrons, high-speed protons, and other atomic particles; but not sound or radio waves, or visible, infrared, or ultraviolet light;

(11) "Radioactive material" includes any such material whether or not subject to licensing control by the Commission;

(12) "Restricted area" means any area access to which is controlled by the licensee. "Restricted area" shall not include any areas used as residential quarters, although a separate room or rooms in a residential building may be set apart as a restricted area;

(13) "Source material" means any material except special nuclear material, which contains by weight one-twentieth of one percent (0.05 percent or more of (i) uranium, (ii) thorium, or (iii) any combination thereof;

(14) "Special nuclear material" means (i) plutonium, uranium 233, uranium enriched in the isotope 233 or in the isotope 235, and any other material which the Commission, pursuant to the provisions of section 51 of the act, determines to be special nuclear material, but does not include source material; or (ii) any material artificially enriched by any of the foregoing but does not include source material;

(15) "Unrestricted area" means any area entry into which is not controlled by the licensee, and any area used for residential quarters.

(b) Definitions of certain other words and phrases as used in this part are set forth in other sections, including;

(1) "Airborne radioactivity area" defined in § 20.203;

(2) "Radiation area" and "high radiation area" defined in § 20.202;

(3) "Personnel monitoring equipment" defined in § 20.202;

(4) "Survey" defined in § 20.201;

(5) Units of measurements of dose (rad, rem) defined in § 20.4;

(6) Units of measurement of radioactivity defined in § 20.5.

§ 20.4 *Units of radiation dose.* (a) "Dose," as used in this part, is the quantity of radiation absorbed, per unit of mass, by the body or by any portion of the body. When the regulations in this part specify a dose during a period of time, the dose means the total quantity of radiation absorbed, per unit of mass, by the body or by any portion of the body during such period of time. Several different units of dose are in current use. Definitions of units as used in this part are set forth in paragraphs (b) and (c) of this section.

(b) The rad, as used in this part, is a measure of the dose of any ionizing radiation to body tissues in terms of the energy absorbed per unit mass of the tissue. One rad is the dose corresponding to the absorption of 100 ergs per gram of tissue. (One millirad (mrad) = 0.001 rad.)

(c) The rem, as used in this part, is a measure of the dose of any ionizing radiation to body tissue in terms of its estimated biological effect relative to a dose of one roentgen (r) of X-rays. (One millirem (mrem) = 0.001 rem.) The relation of the rem to other dose units depends upon the biological effect under consideration and upon the conditions of irradiation. For the purpose of the regulations in this part, any of the following is considered to be equivalent to a dose of one rem:

(1) A dose of 1 r due to X− or gamma radiation;

(2) A dose of 1 rad due to X−, gamma, or beta radiation;

(3) A dose of 0.1 rad due to neutrons or high energy protons;

(4) A dose of 0.05 rad due to particles heavier than protons and with sufficient energy to reach the lens of the eye;

If it is more convenient to measure the neutron flux, or equivalent, than to determine the neutron dose in rads, as provided in subparagraph (3) of this paragraph, one rem of neutron radiation may, for purposes of the regulations in this part, be assumed to be equivalent to 14 million neutrons per square centimeter incident upon the body; or, if there exists sufficient information to estimate with reasonable accuracy the approximate distribution in energy of the neutrons, the incident number of neutrons per square centimeter equivalent to one rem may be estimated from the following table:

Neutron energy	Number of neutrons per square centimeter equivalent to a dose of 1 rem
Thermal	960×10^6
0.0001 mev.	480×10^6
0.01 mev.	480×10^6
0.1 mev.	96×10^6
0.5 mev.	38×10^6
1 mev.	29×10^6
2 mev.	19×10^6
3 mev. and higher	14×10^6

§ 20.5 *Units of radioactivity.* (a) Radioactivity is commonly, and for purposes of the regulations in this part shall be, measured in terms of dis-

integrations per unit time or in curies. One curie (c) $=3.7\times10^{10}$ disintegrations per second (dps) $=2.2\times10^{12}$ disintegrations per minute (dpm). A commonly used submultiple of the curie is the microcurie (μc). One μc= 0.000001 c $=3.7\times10^{4}$ dps $=2.2\times10^{6}$ dpm.

NOTE: Many radioisotopes disintegrate into isotopes which are also radioactive. In expressing maximum permissible concentrations in air and water of these materials, as in Appendix B of this part, the activity stated is that of the parent isotope. In some cases, the fact that daughter products may contribute to the total dose has been taken into account in the determination of the maximum permissible concentration of the parent isotopes. In the tables of Appendix B of this part this is indicated by writing $Ba^{140}+La^{140}$, $Sr^{90}+Y^{90}$, $Rn^{222}+dr$, $Ra^{226}+\frac{1}{2}$ dr, etc.

EXAMPLE. In Column 1, Table I, Appendix B, the maximum permissible concentration of Ba^{140} in air for occupational use is $2\times10^{-7}\mu$c/ml. This is the maximum permissible concentration regardless of whether or not any of the La^{140} which may have resulted from the decay of the Ba^{140} is present or not. However, the value given for BA^{140} is less than it would be if La^{140} were a stable isotope, not only because of the possibility of La^{140} in the air but principally because, if the Ba^{140} is inhaled, its radioactive decay in the body will result in the production of La^{140} in the body.

(b) *Radon.* Airborne radioactivity of radon and its decay products may be determined by measurement of the activity of one or more decay products on dust filtered from the air. For purposes of the regulations in this part, the limit prescribed here will be considered to be met if the measured radioactivity of one or more decay products (for example, RaC') does not exceed that which would result from the occurrence, at the time of sampling, of 1×10^{-7} microcuries, per milliliter of air, of RN^{222} and each of its short-lived decay products, RaA, RaB, RaC, and RaC'. For this purpose, due allowance shall be made for changes in the radioactivity of the measured decay products from time of sampling through the period of measurement.

(c) *Natural uranium and natural thorium.* Natural uranium and natural thorium occur as mixtures of isotopes of the respective elements. In the case of uranium or of thorium, the number of microcuries shall be determined by dividing the total rate, in dpm, of alpha emissions from the mixture by 2.2×10^{6} dpm per μc.

§ 20.6 *Interpretations.* Except as specifically authorized by the Commission in writing, no interpretation of the meaning of the regulations in this part by any officer or employee of the Commission other than a written interpretation by the General Counsel will be recognized to be binding upon the Commission.

§ 20.7 *Communications.* All communications and reports concerning the regulations in this part, and applications filed under them, should be addressed to the Atomic Energy Commission, 1901 Constitution Avenue NW., Washington 25, D. C., Attention: Division of Civilian Application.

Permissible Doses, Levels, and Concentrations

§ 20.101 *Exposure of individuals in restricted areas*—(a) *Exposure to radiation.* (1) Except as provided in subparagraph (2) of this paragraph, no licensee shall possess, use, or transfer licensed material in such a manner as to cause any individual in a restricted area to receive in any period of seven consecutive days from radioactive material and other sources of radiation in the licensee's possession a dose in excess of the limits specified in Appendix A of this part.

(2) A licensee may permit an individual in a restricted area to receive a dose in excess of the limits established in subparagraph (1) of this paragraph: *Provided,* (i) That the dose during any period of 7 consecutive days does not exceed three times the limits specified in Appendix A of this part, and (ii) that the dose during any period of 13 consecutive weeks does not exceed 10 times the limits specified in Appendix A of this part.

(b) No licensee shall possess, use or transfer licensed material in such a manner as to cause any individual in a restricted area to be exposed to airborne radioactive material possessed by the licensee in an average concentration in excess of the limits specified in Appendix B, Table I, of this part.

The limits given in Appendix B, Table I of this part, are based upon exposure to the concentrations specified for forty hours in any period of seven consecutive days. In any such period where the number of hours of exposure is less than forty, the limits specified in the table may be increased proportionately. In any such period, where the number of hours of exposure is greater than forty, the limits specified in the table shall be decreased proportionately.

(c) *Exposure of minors.* No licensee shall possess, use, or transfer licensed material in such a manner as to cause any individual under 18 years of age within a restricted area to receive in any period of seven consecutive days from radioactive material and other sources of radiation in the licensee's possession a dose in excess of 10 percent of the limits specified in Appendix A of this part, or to be exposed to airborne radioactive material possessed by the licensee in a concentration in excess of the limits specified in Appendix B, Table II, of this part. For purposes of this paragraph, concentrations may be averaged over periods not greater than a week.

§ 20.102 *Permissible levels of radiation in unrestricted areas.* (a) There may be included in any application for a license or for amendment of a license proposed limits upon levels of radiation in unrestricted areas resulting from the applicant's possession or use of radioactive material and other sources of radiation. Such applications should include information as to anticipated average radiation levels and anticipated occupancy times for each unrestricted area involved. The Commission will approve the proposed limits if the applicant demonstrates that the proposed limits are not likely to cause any individual to receive a dose in any period of seven consecutive

days in excess of 10 percent of the limits specified in Appendix A of this part.

(b) Except as authorized by the Commission pursuant to paragraph (a) of this section, no licensee shall possess, use, or transfer licensed material in such a manner as to create in any unrestricted area from radioactive material and other sources of radiation in his possession:

(1) Radiation levels which, if an individual were continuously present in the area, could result in his receiving a dose in excess of two millirems in any one hour, or

(2) Radiation levels which, if an individual were continuously present in the area, could result in his receiving a dose in excess of 100 millirems in any seven consecutive days.

§ 20.103 *Concentrations in effluents to unrestricted areas.* (a) There may be included in any application for a license or for amendment of a license proposed limits upon concentrations of licensed and other radioactive material released into air or water in unrestricted areas as a result of the applicant's proposed activities. Such applications should include information as to anticipated average concentrations and anticipated occupancy times for each unrestricted area involved. The Commission will approve the proposed limits if the applicant demonstrates that it is not likely that any individual will be exposed to concentrations in excess of the limits specified in Appendix B, Table II, of this part. For purposes of this paragraph, concentration may be averaged over periods not greater than one year.

(b) Except as authorized by the Commission pursuant to § 20.302 or paragraph (a) of this section, no licensee shall possess, use, or transfer licensed material in such a manner as to release into air or water in any unrestricted area any concentration of radioactive material in excess of the limits specified in Appendix B, Table II of this part. For purposes of this paragraph, concentrations may be averaged over periods not greater than one year.

(c) For purposes of this section, determinations as to the concentration of radioactive material shall be made with respect to the point where such material leaves the restricted area. Where the radioactive material leaves the restricted area in a stack, tube, pipe, or similar conduit, the determination may be made with respect to the point where the material leaves such conduit.

(d) The provisions of this section do not apply to disposal of radioactive material into sanitary sewerage systems (see § 20.303).

§ 20.104 *Medical diagnosis, therapy, and research.* Nothing in the regulations in this part shall be interpreted as limiting the intentional exposure of patients to radiation for the purpose of medical diagnosis or medical therapy.

§ 20.105 *Measures to be taken after excessive exposures.* In the event

that any individual in a restricted area receives a dose or is exposed to concentrations of radioactive material in excess of the permissible limits established in § 20.101, the licensee shall limit the weekly dose or exposure of the individual to 10 percent of such permissible limit until such time as the average weekly dose or exposure to the individual for the period beginning with the week in which the excessive dose or exposure occurred is less than the permissible limit established in § 20.101.

Precautionary Procedures

§ 20.201 *Surveys.* (a) As used in the regulations in this part, "survey" means an evaluation of the radiation hazards incident to the production, use, release, disposal, or presence of radioactive materials or other sources of radiation under a specific set of conditions. When appropriate, such evaluation includes a physical survey of the location of materials and equipment, and measurements of levels of radiation or concentrations of radioactive material present.

(b) Each licensee shall make or cause to be made such surveys as may be necessary for him to comply with the regulations in this part.

§ 20.202 *Personnel monitoring.* (a) Each licensee shall supply appropriate personnel monitoring equipment to, and shall require the use of such equipment by:

(1) Each individual who enters a restricted area under such circumstances that he receives, or is likely to receive, a dose in excess of 25 percent of the limits specified in Appendix A of this part;

(2) Each individual who enters a high radiation area.

(b) As used in this part,

(1) "Personnel monitoring equipment" means devices designed to be worn or carried by an individual for the purpose of measuring the dose received (e. g., film badges, pocket chambers, pocket dosimeters, film rings, etc.);

(2) "Radiation area" means any area, accessible to personnel, in which there exists radiation, originating in whole or in part within licensed material, at such levels that a major portion of the body could receive in any one hour a dose in excess of 5 millirem, or in any 5 consecutive days a dose in excess of 150 millirem;

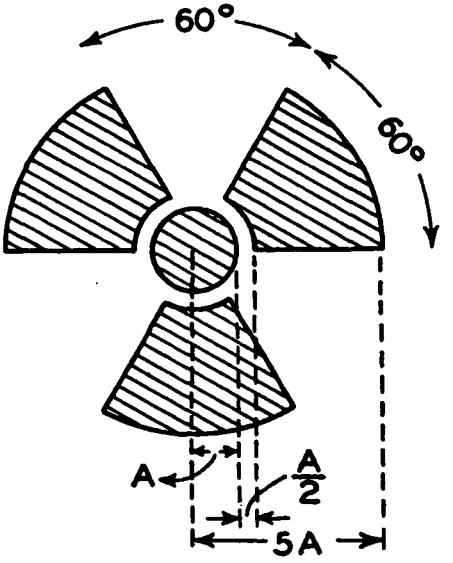
(3) "High radiation area" means any area, accessible to personnel, in which there exists radiation originating in whole or in part within licensed material at such levels that a major portion of the body could receive in any one hour a dose in excess of 100 millirem.

§ 20.203 *Caution signs, labels, and signals*—(a) *General.* (1) Except as otherwise authorized by the Commission, symbols prescribed by this section shall use the conventional radiation caution colors (magenta or

purple on yellow background). The symbol prescribed by this section is the conventional three-bladed design:

RADIATION SYMBOL

1. Cross-hatched area is to be magenta or purple.
2. Background is to be yellow.



(2) In addition to the contents of signs and labels prescribed in this section, licensees may provide on or near such signs and labels any additional information which may be appropriate in aiding individuals to minimize exposure to radiation or to radioactive material.

(b) *Radiation areas.* Each radiation area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words:

CAUTION [1]

RADIATION AREA

(c) *High radiation areas.* (1) Each high radiation area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words:

CAUTION [1]

HIGH RADIATION AREA

(2) Each high radiation area shall be equipped with a control device which shall either cause the level of radiation to be reduced below that at which an individual might receive a dose of 100 millirem in one hour upon

[1] Or "Danger."

entry into the area or shall energize a conspicuous visible or audible alarm signal in such a manner that the individual entering and the licensee or a supervisor of the activity are made aware of the entry. In the case of a high radiation area established for a period of 30 days or less, such control device is not required.

(d) *Airborne radioactivity areas.* (1) As used in the regulations in this part, "airborne radioactivity area" means (i) any room, enclosure, or operating area in which airborne radioactive materials, composed wholly or partly of licensed material, exist in concentrations in excess of the amounts specified in Appendix B, Table I, Column 1 of this part; or (ii) any room, enclosure, or operating area in which airborne radioactive material composed wholly or partly of licensed material exists in concentrations which, averaged over the number of hours in any week during which individuals are in the area, exceed 25 percent of the amounts specified in Appendix B, Table I, Column 1 of this part.

(2) Each airborne radioactivity area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words:

CAUTION [1]

AIRBORNE RADIOACTIVITY AREA

(e) *Additional requirements.* (1) Each area or room in which licensed material is used or stored and which contains any radioactive material (other than natural uranium or thorium) in an amount exceeding 10 times the quantity of such material specified in Appendix C of this part shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words:

CAUTION [1]

RADIOACTIVE MATERIAL(S)

(2) Each area or room in which natural uranium or thorium is used or stored in an amount exceeding one-hundred times the quantity specified in Appendix C of this part shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words:

CAUTION [1]

RADIOACTIVE MATERIAL(S)

(f) *Containers.* (1) Each container in which is transported, stored, or used a quantity of any licensed material (other than natural uranium or thorium) greater than the quantity of such material specified in Appendix C of this part shall bear a durable, clearly visible label bearing the radiation caution symbol and the words:

CAUTION [1]

RADIOACTIVE MATERIAL

[1] Or "Danger."

(2) Each container in which natural uranium or thorium is transported, stored, or used in a quantity greater than ten times the quantity specified in Appendix C of this part shall bear a durable, clearly visible label bearing the radiation caution symbol and the words:

CAUTION [1]

RADIOACTIVE MATERIAL

(3) Notwithstanding the provisions of subparagraphs (1) and (2) a label shall not be required:

(i) If the concentration of the material in the container does not exceed that specified in Appendix B, Table I, Column 2 of this part, or

(ii) For laboratory containers, such as beakers, flasks, and test tubes, used transiently in laboratory procedures, when the user is present.

(4) Where containers are used for storage, the labels required in this paragraph shall state also the quantities and kinds of radioactive materials in the containers and the date of measurement of the quantities.

§ 20.204 *Exceptions from posting requirements.* Notwithstanding the provisions of § 20.203,

(a) A room or area is not required to be posted with a caution sign because of the presence of a sealed source provided the radiation level twelve inches from the surface of the source container or housing does not exceed five millirem per hour.

(b) Rooms or other areas in hospitals are not required to be posted with caution signs because of the presence of patients containing byproduct material provided that there are personnel in attendance who shall take the precautions necessary to prevent the exposure of any individual to radiation or radioactive material in excess of the limits established in the regulations in this part.

(c) Caution signs are not required to be posted at areas or rooms containing radioactive materials for periods of less than eight hours provided that (1) the materials are constantly attended during such periods by an individual who shall take the precautions necessary to prevent the exposure of any individual to radiation or radioactive materials in excess of the limits established in the regulations in this part and; (2) such area or room is subject to the licensee's control.

§ 20.205 *Exemptions for radioactive materials packaged for shipment.* Radioactive materials packaged and labeled in accordance with regulations of the Interstate Commerce Commission shall be exempt from the labeling and posting requirements of § 20.203 during shipment, provided that the inside containers are labeled in accordance with the provisions of § 20.203 (f).

[1] Or "Danger."

§ 20.206 *Instruction of personnel.* All individuals working in or frequenting any portion of a restricted area shall be informed of the occurrence of radioactive materials or of radiation in such portion, and shall be instructed in the hazards of excessive exposure to such materials or radiation and in precautions or procedures to minimize exposure.

§ 20.207 *Storage of licensed material.* Licensed materials stored in an unrestricted area shall be secured against unauthorized removal from the place of storage.

WASTE DISPOSAL

§ 20.301 *General requirement.* No licensee shall dispose of licensed material except:

(a) By transfer to an authorized recipient as provided in the regulations in Part 30, 40, or 70 of this chapter, whichever may be applicable; or

(b) As authorized pursuant to § 20.302; or

(c) As provided in § 20.303 or § 20.304, applicable respectively to the disposal of licensed material by release into sanitary sewerage systems or burial in soil, or in § 20.103 (Concentrations in Effluents to Unrestricted Areas).

§ 20.302 *Method for obtaining approval of proposed disposal procedures.* Any licensee or applicant for a license may apply to the Commission for approval of proposed procedures to dispose of licensed material in a manner not otherwise authorized in the regulations in this chapter. Each application should include a description of the licensed material and any other radioactive material involved, including the quantities and kinds of such material and the levels of radioactivity involved, and the proposed manner and conditions of disposal. The application should also include an analysis and evaluation of pertinent information as to the nature of the environment, including topographical, geological, meteorological, and hydrological characteristics; usage of ground and surface waters in the general area; the nature and location of other potentially affected facilities; and procedures to be observed to minimize the risk of unexpected or hazardous exposures.

§ 20.303 *Disposal by release into sanitary sewerage systems.* No licensee shall discharge licensed material into a sanitary sewerage system unless:

(a) It is readily soluble or dispersible in water; and

(b) The quantity of any licensed or other radioactive material released into the system by the licensee in any one day does not exceed the larger of subparagraphs (1) or (2) of this paragraph:

(1) The quantity which, if diluted by the average daily quantity of sewage released into the sewer by the licensee, will result in an average concentration equal to the limits specified in Appendix B, Table I, Column 2 of this part; or

(2) Ten times the quantity of such material specified in Appendix C of this part; and

(c) The quantity of any licensed or other radioactive material released in any one month, if diluted by the average monthly quantity of water released by the licensee, will not result in an average concentration exceeding the limits specified in Appendix B, Table I, Column 2 of this part; and

(d) The gross quantity of licensed and other radioactive material released into the sewerage system by the licensee does not exceed one curie per year.

Excreta from individuals undergoing medical diagnosis or therapy with radioactive material shall be exempt from any limitations contained in this section.

§ 20.304 *Disposal by burial in soil.* No licensee shall dispose of licensed material by burial in soil unless:

(a) The total quantity of licensed and other radioactive materials buried at any one location and time does not exceed, at the time of burial, 1,000 times the amount specified in Appendix C of this part; and

(b) Burial is at a minimum depth of four feet; and

(c) Successive burials are separated by distances of at least six feet and not more than 12 burials are made in any year.

RECORD, REPORTS, AND NOTIFICATION

§ 20.401 *Records of surveys, radiation monitoring, and disposal.* (a) Each licensee shall maintain records showing the radiation exposures of all individuals subject to personnel monitoring control under § 20.202 of the regulations in this part.

(b) Each licensee shall maintain records showing the name of each individual exposed to radiation pursuant to § 20.101 (a) (2) and the weekly dose of each such individual for the 13 consecutive weeks of highest cumulative weekly dose.

(c) Each licensee shall maintain records in the same units used in the appendices to this part, showing the results of surveys required by § 20.201 (b), and disposals made under §§ 20.302, 20.303, and 20.304.

§ 20.402 *Reports of theft or loss of licensed material.* Each licensee shall report by telephone and telegraph to the Manager of the nearest Atomic Energy Commission Operations Office listed in Appendix D, immediately after its occurrence becomes known to the licensee, any loss or theft of licensed material in such quantities and under such circumstances that it appears to the licensee that a substantial hazard may result to persons in unrestricted areas.

[22 F. R. 3389, May 14, 1957]

§ 20.403 *Notifications and reports of incidents*—(a) *Immediate notification.* Each licensee shall immediately notify the Manager of the nearest Atomic Energy Commission Operations Office listed in Appendix D by tele-

phone and telegraph of any incident involving licensed material possessed by him and which may have caused or threatens to cause:

(1) Exposure of any individual to 25 rems or more of radiation, including any radioactive material taken into the body; or

(2) The release of radioactive material in concentrations which, if averaged over a period of 24 hours, would exceed 5000 times the limits specified for such materials in Appendix B, Table 2; or

(3) A loss of one working week or more of the operation of any facilities affected; or

(4) Damage to property in excess of $100,000.

(b) *Twenty-four hour notification.* Each licensee shall within 24 hours notify the Manager of the nearest Atomic Energy Commission Operations Office listed in Appendix D by telephone and telegraph of any incident involving licensed material possessed by him and which may have caused or threatens to cause:

(1) Exposure of any individual to 3 rems or more of radiation, including any radioactive material taken into the body; or

(2) The release of radioactive material in concentrations which, if averaged over a period of 24 hours, would exceed 500 times the limits specified for such materials in Appendix B, Table 2; or

(3) A loss of one day or more of the operation of any facilities affected; or

(4) Damage to property in excess of $1,000.

(c) *Thirty-day reports.* Each licensee shall make a report in writing within 30 days to the Director, Division of Civilian Application, United States Atomic Energy Commission, Washington 25, D. C., of each incident involving licensed material possessed by him which appears to have resulted in the exposure of an individual to radiation or to concentrations of radioactive material, or to have resulted in levels of radiation or concentrations of radioactive material, in excess of any applicable limits set forth in these regulations or in the licensee's license. Each report required under this paragraph shall describe the nature of the incident, the extent of exposure of persons to radiation or to radioactive material, the levels of radiation and concentrations of radioactive material involved, the cause of the incident, and corrective steps taken or planned to assure against a recurrence of the incident. A copy of each report shall be transmitted to the Manager of the nearest Atomic Energy Commission Operations Office listed in Appendix D. [22 F. R. 3389, May 14, 1957]

EXCEPTIONS AND ADDITIONAL REQUIREMENT

§ 20.501 *Applications for exemptions.* The Commission may, upon application by any licensee or upon its own initiative grant such exemptions

from the requirements of the regulations in this part as it determines are authorized by law and will not result in undue hazard to life or property.

§ 20.502 *Additional requirements.* The Commission may, by rule, regulation, or order, impose upon any licensee such requirements, in addition to those established in the regulations in this part, as it deems appropriate or necessary to protect health or to minimize danger to life or property.

ENFORCEMENT

§ 20.601 *Violations.* An injunction or other court order may be obtained prohibiting any violation of any provision of the act or any regulation or order issued thereunder. Any person who willfully violates any provision of the act or any regulation or order issued thereunder may be guilty of a crime and, upon conviction, may be punished by fine or imprisonment or both, as provided by law.

APPENDIX A

PERMISSIBLE WEEKLY DOSE

Conditions of exposure		Dose in critical organs (mrem)			
Parts of body	Radiation	Skin at basal layer of epidermis	Blood forming organs	Gonads	Lens of eye
Whole body	Any radiation with half-value-layer greater than 1 mm of soft tissue....	[1] 600	[1] 300	[1] 300	[1] 300
Whole body	Any radiation with half-value-layer less than 1 mm of soft tissue.....	1,500	300	300	300
Hands and forearms or feet and ankles or head and neck.	Any radiation	[2] 1,500	...	...	...

[1] For exposures of the whole body to X or gamma rays up to 3 mev, this condition may be assumed to be met if the "air dose" does not exceed 300 mr, provided the dose to the gonads does not exceed 300 mrem. "Air dose" means that the dose is measured by an appropriate instrument in air in the region of highest dosage rate to be occupied by an individual, without the presence of the human body or other absorbing and scattering material.

[2] Exposure of these limited portions of the body under these conditions does not alter the total weekly dose of 300 mrem permitted to the bloodforming organs in the main portion of the body, to the gonads, or to the lens of the eye.

APPENDIX B

PERMISSIBLE CONCENTRATIONS IN AIR AND WATER ABOVE NATURAL BACKGROUND

Material	Table I		Table II	
	Column 1 [1] Air (2)	Column 2 [2] Water (3)	Column 1 [1] Air (2)	Column 2 [2] Water (3)
A^{41}	1.6×10^{-6}	1.4×10^{-3}	5×10^{-6}	5×10^{-3}
Ag^{105}	3.6×10^{-5}	5	1.2×10^{-6}	1.6×10^{-1}
Ag^{111}	1×10^{-4}	13	3×10^{-6}	4×10^{-1}
Am^{241}	8×10^{-12}	4×10^{-4}	3×10^{-12}	1.3×10^{-6}
As^{76}	7×10^{-6}	6×10^{-1}	2×10^{-7}	2×10^{-2}
At^{211}	9×10^{-10}	6×10^{-6}	3×10^{-11}	2×10^{-7}
Au^{198}	3.4×10^{-7}	9×10^{-6}	1.1×10^{-8}	3×10^{-4}
Au^{199}	8×10^{-7}	2×10^{-2}	2.5×10^{-8}	7×10^{-4}
$Ba^{140} + La^{140}$	2×10^{-7}	6×10^{-6}	6×10^{-9}	2×10^{-4}
Be^{7}	1.3×10^{-5}	3	4×10^{-7}	1×10^{-1}
C^{14}	1.4×10^{-6}	1×10^{-2}	5×10^{-8}	3.6×10^{-4}
Ca^{45}	9×10^{-6}	1.5×10^{-6}	3×10^{-9}	5×10^{-5}
$Cd^{109} + Ag^{109}$	2×10^{-7}	2×10^{-1}	7×10^{-9}	7×10^{-3}
$Ce^{144} + Pr^{144}$	2×10^{-8}	1×10^{-1}	7×10^{-10}	3.6×10^{-6}
Cl^{36}	1×10^{-6}	7×10^{-6}	4×10^{-6}	2.4×10^{-4}
Cm^{242}	5×10^{-10}	2.7×10^{-2}	1.8×10^{-11}	1×10^{-4}
Co^{60}	3.4×10^{-6}	5×10^{-3}	1.2×10^{-7}	1.8×10^{-3}
Cr^{51}	2.4×10^{-5}	1.4	8×10^{-7}	5×10^{-2}
$Cs^{137} + Ba^{137}$	6×10^{-7}	4.5×10^{-3}	2×10^{-8}	1.5×10^{-4}
Cu^{64}	2×10^{-5}	2.5×10^{-1}	6×10^{-7}	8×10^{-3}
Eu^{154}	2×10^{-8}	1×10^{-1}	6×10^{-10}	3×10^{-6}
F^{18}	3.5×10^{-4}	2.6	1.2×10^{-6}	9×10^{-2}
Fe^{55}	1.8×10^{-6}	1.3×10^{-2}	6×10^{-8}	4×10^{-4}
Fe^{59}	5×10^{-8}	3.3×10^{-4}	1.5×10^{-8}	1.1×10^{-6}
Ga^{72}	1×10^{-5}	26	3.4×10^{-7}	9×10^{-1}
Ge^{71}	1×10^{-4}	27	3.6×10^{-6}	9×10^{-1}
H^{3} (HTO or T_2O)	7×10^{-6}	5×10^{-1}	2.5×10^{-9}	1.6×10^{-2}
Ho^{166}	1×10^{-6}	70	3×10^{-7}	2.3
I^{131}	9×10^{-9}	9×10^{-5}	3×10^{-10}	3×10^{-6}
Ir^{190}	2.2×10^{-6}	4×10^{-2}	7×10^{-8}	1.3×10^{-6}
Ir^{192}	1.5×10^{-7}	2.7×10^{-2}	5×10^{-9}	9×10^{-5}
K^{42}	6×10^{-6}	4×10^{-2}	2×10^{-7}	1.4×10^{-3}
La^{140}	4×10^{-6}	3.4	1.4×10^{-7}	1.1×10^{-1}
Lu^{177}	1.5×10^{-5}	70	5×10^{-7}	2.4
Mn^{56}	8×10^{-6}	5×10^{-1}	3×10^{-7}	1.5×10^{-2}
Mo^{99}	5×10^{-5}	40	1.8×10^{-4}	1.4
Na^{24}	5×10^{-6}	2.4×10^{-2}	1.6×10^{-7}	8×10^{-4}
Nb^{95}	1.3×10^{-5}	1.2×10^{-2}	4×10^{-8}	4×10^{-4}
Ni^{59}	5×10^{-5}	7×10^{-1}	1.6×10^{-6}	2.5×10^{-2}
P^{32}	4×10^{-7}	6×10^{-4}	1.4×10^{-8}	2×10^{-5}
Pb^{203}	2×10^{-5}	4×10^{-1}	6×10^{-7}	1.4×10^{-2}
$Pb^{208} + Rh^{103}$	2×10^{-6}	2×10^{-2}	7×10^{-8}	1×10^{-3}
Pm^{147}	6×10^{-7}	3	2×10^{-8}	1×10^{-1}
Po^{210} (soluble)	6×10^{-10}	9×10^{-5}	2×10^{-11}	3×10^{-6}
Po^{210} (insoluble)	2×10^{-10}	.....	7×10^{-12}	.....
Pr^{143}	2.3×10^{-6}	1	7×10^{-8}	3.6×10^{-2}
Pu^{239} (soluble)	6×10^{-12}	4.5×10^{-6}	2×10^{-13}	1.5×10^{-7}
Pu^{239} (insoluble)	6×10^{-12}	.....	2×10^{-13}	.....
$Ra^{226} + \frac{1}{2}$ dr	2.4×10^{-11}	1.2×10^{-7}	8×10^{-13}	4×10^{-9}
Rb^{86}	1.1×10^{-6}	9×10^{-3}	4×10^{-8}	3×10^{-4}
Re^{183}	2.4×10^{-5}	2.4×10^{-1}	8×10^{-7}	8×10^{-3}
Rh^{105}	3×10^{-6}	5×10^{-2}	1×10^{-7}	1.6×10^{-3}
$Rh^{223} + dr$	1×10^{-7}	6×10^{-4}	3.3×10^{-9}	2×10^{-5}
$Ru^{106} + Rh^{106}$	8×10^{-6}	4×10^{-1}	2.6×10^{-9}	1.3×10^{-2}
S^{35}	3×10^{-6}	1.5×10^{-2}	1×10^{-7}	5×10^{-4}
Sc^{46}	2×10^{-7}	1	7×10^{-9}	3.6×10^{-2}

See footnotes at end of table.

APPENDIX B—Continued

PERMISSIBLE CONCENTRATIONS IN AIR AND WATER ABOVE NATURAL BACKGROUND

Material	Table I		Table II	
	Column 1 [1] Air (2)	Column 2 [2] Water (3)	Column 1 [1] Air (2)	Column 2 [2] Water (3)
Sm^{151}	4×10^{-6}	6×10^{-1}	1.3×10^{-9}	2×10^{-2}
Sn^{113}	1.7×10^{-6}	5×10^{-1}	6×10^{-6}	1.6×10^{-2}
Sr^{89}	6×10^{-6}	2×10^{-4}	2×10^{-9}	7×10^{-6}
$Sr^{90} + Y^{90}$	6×10^{-10}	2.4×10^{-6}	2×10^{-11}	8×10^{-8}
Tc^{96}	8×10^{-6}	8×10^{-2}	3×10^{-7}	3×10^{-3}
Te^{127}	3×10^{-7}	8×10^{-2}	1×10^{-8}	3×10^{-3}
Te^{129}	1.2×10^{-7}	3.3×10^{-2}	4×10^{-9}	1.1×10^{-3}
Th^{234}	2×10^{-6}	10	6×10^{-8}	3×10^{-1}
Th-natural (soluble)	5×10^{-11}	1.5×10^{-6}	1.7×10^{-12}	5×10^{-8}
Th-natural (insoluble)	5×10^{-11}	.....	1.7×10^{-12}	.....
Tm^{170}	1.5×10^{-7}	8×10^{-1}	5×10^{-9}	2.5×10^{-2}
U-natural (soluble) [3]	5×10^{-11}	2×10^{-4}	1.7×10^{-12}	7×10^{-6}
U-natural (insoluble) [3]	5×10^{-11}	.....	1.7×10^{-12}	.....
U^{233} (soluble)	4×10^{-10}	4.5×10^{-4}	1×10^{-11}	1.5×10^{-5}
U^{233} (insoluble)	5×10^{-11}	.....	1.6×10^{-12}	.....
V^{48}	3×10^{-6}	1.5	1×10^{-7}	5×10^{-2}
Xe^{130}	1.3×10^{-6}	1.3×10^{-2}	4×10^{-7}	4×10^{-4}
Xe^{135}	5×10^{-6}	4×10^{-2}	1.7×10^{-7}	1.4×10^{-4}
Y^{91}	1.2×10^{-7}	6×10^{-1}	4×10^{-9}	2×10^{-2}
Zn^{65}	6×10^{-6}	2×10^{-1}	2×10^{-7}	6×10^{-3}
Unidentified beta or gamma emitters or any undetermined mixtures of beta or gamma emitters	.....	.....	1×10^{-9}	1×10^{-7}
Unidentified alpha emitters or any undetermined mixtures of alpha emitters	.....	.....	5×10^{-12}	1×10^{-7}

[1] Air concentrations are given in microcuries per milliliter of air.

[2] Water concentrations are given in microcuries per milliliter of water. These figures also apply to foodstuffs in microcuries per gram (wet-weight).

[3] For enriched uranium the same radioactivities per unit volume as those for natural uranium are applicable. It should be noted that the contribution of U-234 to the gross activity of enriched uranium is 20–40 times that of the U-235.

APPENDIX C

Material	Micro-curies
Ag^{105}	1
Ag^{111}	10
As^{76}, As^{77}	10
Au^{198}	10
Au^{199}	10
$Ba^{140} + La^{140}$	1
Be^{7}	50
C^{14}	50
Ca^{45}	10
$Cd^{109} + Ag^{109}$	10
$Ce^{144} + Pr^{144}$	1
Cl^{36}	1
Co^{60}	1
Cr^{51}	50
$Cs^{137} + Ba^{137}$	1
Cu^{64}	50
Eu^{154}	1
F^{18}	50
Fe^{55}	50
Fe^{59}	1
Ga^{72}	10
Ge^{71}	50
H^3(HTO or H^3_2O)	250
I^{131}	10
In^{114}	1
Ir^{192}	10
K^{42}	10
La^{140}	10
Mn^{52}	1
Mn^{56}	50
Mo^{99}	10
Na^{22}	10
Na^{24}	10
Nb^{95}	10
Ni^{59}	1
Ni^{63}	1
P^{32}	10
$Pd^{103} + Rh^{103}$	50
Pd^{109}	10
Pm^{147}	10
Po^{210}	0.1
Pr^{143}	10
Pu^{239}	1
Ra^{226}	0.1
Rb^{86}	10
Re^{186}	10
Rh^{105}	10
$Ru^{106} + Rh^{106}$	1
S^{35}	50
Sb^{124}	1
Sc^{46}	1
Sm^{153}	10
Sn^{113}	10
Sr^{89}	1
$Sr^{90} + Y^{90}$	0.1
Ta^{182}	10
Tc^{96}	1
Tc^{99}	1
Te^{127}	10
Te^{129}	1
Th (natural)	50
Tl^{204}	50
Tritium. See H^3	250
U (natural)	50
U^{233}	1
U^{234}–U^{235}	50
V^{48}	1
W^{185}	10
Y^{90}	1
Y^{91}	1
Zn^{65}	10
Unidentified radioactive materials or any of the above in unknown mixtures	0.1

NOTE: For purposes of §§ 20.203 and 20.304, where there is involved a combination of isotopes in known amounts the limit for the combination should be derived as follows: Determine, for each isotope in the combination, the ratio between the quantity present in the combination and the limit otherwise established for the specific isoptope when not in combination. The sum of such ratios for all the isoptopes in the combination may not exceed "1" (i.e., "unity").

EXAMPLE: For purposes of § 20.304, if a particular batch contains 2,000 μc of Au^{198} and 25,000 μc of C^{14}, it may also include not more than 3,000 μc of I^{131}. This limit was determined as follows:

$$\frac{2{,}000\ \mu c\ Au^{198}}{10{,}000\ \mu c} + \frac{25{,}000\ \mu c\ C^{14}}{50{,}000\ \mu c} + \frac{3{,}000\ \mu c\ I^{131}}{10{,}000\ \mu c} = 1$$

The denominator in each of the above ratios was obtained by multiplying the figure in the table by 1000 as provided in § 20.304.

APPENDIX D

UNITED STATES ATOMIC ENERGY COMMISSION OPERATIONS OFFICES

	Mail address	Telegraph address
Albuquerque Operations Office	P. O. Box 5400, Albuquerque, N. Mex.	Albuquerque, N. Mex.
Chicago Operations Office	P. O. Box 59, Lemont, Ill.	Lemont, Ill.
Grand Junction Operations Office	Grand Junction, Colo.	Grand Junction, Colo.
Hanford Operations Office	P. O. Box 550, Richland, Wash.	Richland, Wash.
Idaho Operations Office	P. O. Box 1221, Idaho Falls, Idaho	(Telegram), 550 Second St., Idaho Falls, Idaho. (Teletype), Idaho Falls, Idaho.
New York Operations Office	70 Columbus Ave., New York 23, N. Y.	(Telegram), 70 Columbus Ave., New York 23, N. Y. (Teletype), New York, N. Y.
Oak Ridge Operations Office	P. O. Box E, Oak Ridge, Tenn.	Oak Ridge, Tenn.
San Francisco Operations Office	518 17th St., Oakland 12, Calif.	518 17th St., Oakland 12, Calif.
Savannah River Operations Office	P. O. Box A, Aiken, S. C.	Augusta, Ga.
Schenectady Operations Office	P. O. Box 1069, Schenectady, N. Y.	(Telegram), Knolls Atomic Power Laboratory, Schenectady, N. Y. (Teletype), Schenectady, N. Y.

[22 F. R. 3389, May 14, 1957]

NOTE: The record keeping and reporting requirements contained herein have been approved by the Bureau of the Budget in accordance with the Federal Reports Act of 1942.

ITEM 2

CALIFORNIA GENERAL INDUSTRY SAFETY ORDERS

Title 8, Group 6

Article 53. *Radioactivity and Ionizing Radiation*

3800. *Purpose.* Article 53 sets up minimum standards for the protection of employees exposed to potentially injurious levels of ionizing radiation or potentially injurious quantities of radioactive materials but does not include such ionizing radiation or radioactive materials as cosmic radiation or normal radon or thoron in the atmosphere.

3801. *Definitions.* (a) "Roentgen" (r) is the international unit of quantity of x-rays or gamma rays.

(b) "Milliroentgen" (mr) is one thousandth of a roentgen.

(c) "Rad" is the unit of absorbed dose, defined as 100 ergs per gram of tissue.

(d) "Totally protective installation" is one where the radiating equipment or material is surrounded by barriers such that no person has access to any place where exposure can be more than seven milliroentgens in an hour. If the radiation is not properly measurable in roentgens, then the biological effect shall be no greater than that from seven mr of x-rays in an hour.

(e) "Sealed container" means one from which radioactive contents cannot escape whether the radiations from them do or not.

(f) "Shielded container" means one such that the radiations produced by the equipment or materials within it will measure no more than 200 milliroentgens in an hour at any point on the outside surface of the container and no more than 10 milliroentgens in an hour at a distance of one meter from the container. In the case of radiations not properly measurable in roentgens, the biological effect shall be no greater than that from x-rays in the above named amounts.

(g) "Curie" is the international unit of radioactivity.

(h) "Integral absorbed dose" (total body dose) is the total energy absorbed throughout a given body or region of interest. The unit is the gramrad (equal to 1/100,000 joule).

3802. *Supervision and Instruction.* (a) All operations involving exposure to potentially injurious levels of ionizing radiation or potentially injurious quantities of radioactive materials shall be under the supervision of competent technical personnel. A competent technical person is one who is capable of evaluating the radiation exposure to employees and specifying such protection as required by these orders.

(b) Every employee who may be regularly or frequently exposed to ionizing radiation shall be instructed in the hazards he may encounter in the course of his duties and in methods of protecting himself and others against them.

3803. *Maximum Permissible Exposures.* (a) No employee shall be exposed to more than 0.3r of x-rays or gamma rays, or other ionizing radiation producing equivalent biologic effect, in a week. Measured or presumed exposure of any employee of more than 0.3r in any week shall be reported to the medical supervisor. See Section 3811.

Note: The maximum allowable exposures set forth in 3803 are derived from best available authorities on the subject. However, since it is probable that further experience may lead to revision of some of these figures, the Division of Industrial Safety plans to hold hearings on revisions of 3803 periodically. The following handbooks should be consulted for a more thorough and detailed discussion of the subject of radiological health safety, including more details on the maximum allowable exposures in

the table in 3803(b). Reference: National Bureau of Standards Handbooks Nos. 23, 27, 41, 42, 47, 48, 49, 50, 51, 52, and 55.

(b) For the purpose of these orders the following table gives the biological effect of other ionizing radiations equivalent to unit x-ray exposure, and the permissible limits for whole body exposed and for hands only exposed. (See table below.)

(c) Concentrations of radioactive substances in the air of workrooms or other locations in which employees are regularly or frequently present shall not be greater than:

(1) 5×10^{-12} microcuries per cubic centimeter for alpha emitters.

(2) 10^{-9} microcuries per cubic centimeter for beta and gamma emitters.

Type of Radiation	Relative Biological Effect	Exposure	Maximum Permissible Absorbed Dose as Measured in Basal Layer of Epidermis	
			Entire Body	Hands Only
X-rays	1	0.3r	0.5 rads	1.5 rads
Gamma rays	1	0.3r	0.5 rads	1.5 rads
Beta rays	1	—	0.5 rads	1.5 rads
Proton rays	10	—	0.05 rads	0.15 rads
Alpha rays	20	—	0.025 rads	0.075 rads
Fast neutrons	10	—	0.05 rads	0.15 rads
Thermal neutrons	5	—	0.1 rads	0.3 rads

For more detailed maximum permissible amounts of radioisotopes in the human body and maximum permissible concentrations in air and water, see National Bureau of Standards Handbook No. 52.

3804. *Monitoring.* (a) Workrooms or other locations in which material giving rise to ionizing radiation is used or handled shall be inspected for hazardous amounts of radiation at scheduled intervals. The Division of Industrial Safety may prescribe a monitoring schedule for a particular operation but such a schedule is subject to an immediate change if it is indicated by personnel monitors or other means that more frequent inspections are necessary to maintain exposures below those set forth in 3803. When such materials are received, transferred, or used for different operations, they shall be monitored to assure safe handling. Radioactive materials in sealed containers shall be inspected for leaks at least yearly.

Note: National Bureau of Standards Handbook No. 51, Radiological Monitoring Methods and Instruments, should be consulted for details of radiological monitoring.

(b) Equipment, machines or totally protective installations giving rise to ionizing radiation shall be surveyed to determine the stray radiation level when first installed and thereafter whenever any change is made in the installation or its use which would affect its protective features, but in no case shall monitoring be done less often than yearly. Where such equipment, machines or installations are in such locations or are so constructed

that vibration or other physical conditions may cause changes in the protective features, inspection of protective devices and check for stray radiation shall be made at least every six months and also whenever it is indicated, by personnel monitors or other means, that more frequent inspections are necessary to maintain exposures below those set forth in 3803.

(c) The monitoring and inspections required by (a) and (b) shall be done by a competent person with instruments adequate to discover hazardous amounts of whatever radiations the machines or materials are producing. Records of such inspection shall be reviewed by the competent technical person and shall be filed as a permanent record available to representatives of the division. These records shall show the dates and results of the monitoring and the observations, recommendations or comments of the competent technical personnel.

(d) Employees who may be subjected to ionizing radiation which could potentially exceed the exposures referred to in 3803 shall wear appropriate indicating or monitoring devices to show the amount of ionizing radiation to which such employees have been subjected. Personnel monitoring devices shall be worn on that part of the body expected to receive the greatest exposure. Records of exposure as recorded by these devices shall be reviewed by the competent technical person and shall be filed as a permanent record available to representatives of the division.

3805. *Maintenance of Protective Devices.* (a) Whenever it is found, by monitoring or otherwise, that any shielding or other protective device is defective, insufficient or inoperative, such shielding or device shall be promptly repaired or augmented as may be needed, and operations involving productions of ionizing radiation shall not be resumed until adequate repairs or changes are completed.

(b) Whenever it is found, by personnel monitoring or otherwise, that any employee is exposed to a weekly dosage of ionizing radiation greater than that specified in 3803, immediate steps shall be taken to locate the condition giving rise to such exposure, and the operation giving rise to the exposure shall be discontinued until such condition is corrected. The employees who have been exposed to excessive radiation shall be immediately referred to the medical supervisor.

3806. *Handling of Radioactive Materials.* Wherever radioactive materials are handled except in sealed containers:

(a) General or local exhaust ventilation shall be provided adequate to prevent concentrations of radioactive substances in the air greater than those set forth in 3803 and National Bureau of Standards Handbook No. 52.

(b) Spillage or other contamination of floors, walls or workbenches shall be removed promptly and monitored for adequate decontamination. In the event of a spill of a significant quantity of long-lived material the employer shall immediately notify the Division of Industrial Safety. Cloth-

ing contaminated by spillage shall be changed promptly and persons monitored for adequate decontamination. Contaminated clothing shall be decontaminated by special decontamination facilities equipped to safely cope with the problem. See National Bureau of Standards Handbooks Nos. 42 and 48.

(c) Radioactive wastes shall not be allowed to accumulate in sufficient amounts to cause hazardous exposures and shall be disposed of in such manner as will not cause harmful concentrations of radioactive material in either the atmosphere or other environment. See Bureau of Standards Handbooks Nos. 42, 48, and 49.

(d) Surfaces shall be designed and used as to afford easy and safe decontamination. See National Bureau of Standards Handbook No. 48 for details.

(e) Smoking or eating shall not be permitted in workrooms. Food, tobacco, or personal effects such as purses, combs or cosmetics shall not be set down in such rooms.

(f) At the close of each work period, workers' faces, hands, hair and clothes shall be inspected for contamination by radioactive material. Such inspection shall be made by a competent person. Unsafe garments shall be decontaminated or adequately disposed of. Skin surfaces shall be decontaminated. Protective clothing or other protective devices, which may include gowns, coats or overalls, shoes or overshoes, caps, hoods, or respiratory protection, shall be provided by the employer and used by the employee. Such personal safety devices or safeguards shall be suitable and adequate to provide protection against exposure to the radioactive materials being handled. If contamination of clothing or any part of the body is possible, both shall be monitored before leaving the work area, and suitable action (disposal or decontamination) taken. When skin surfaces have become contaminated the medical supervisor shall be notified. See National Bureau of Standards Handbooks Nos. 42, 48, and 52, and Sections 3803 and 3811 in these orders for more details.

(g) Where monitoring indicates contamination, floors and benches shall be cleaned by a process which will prevent the dispersion of radioactive dust. Dry sweeping with broom or brush is prohibited.

(h) All working surfaces where radioactive materials are handled shall be provided with illumination of not less than 50 foot-candles.

3807. *Storage of Radioactive Materials.* (a) Radioactive materials stored in a workroom or other location where employees are regularly or frequently present shall be enclosed in containers of such thickness and construction that employees will not be exposed to radiation in amounts greater than those set forth in 3803.

(b) Vaults or rooms in which substances giving rise to ionizing radiation are stored shall be so isolated by construction, location or a combination of

the two that no employee shall in the course of his employment be exposed to radiation in quantities greater than those set forth in 3803. Such rooms or vaults shall be ventilated as required by 3806(a) unless all radioactive materials are stored in sealed containers.

(c) Each container of radioactive materials in storage shall be labeled to indicate:

(1) That the material is radioactive.
(2) The chemical name of the material or the isotope.
(3) The amount or quantity of the radioactive material.
(4) The date received and the person responsible for the material.

(d) Radioactive materials should be housed in fireproof containers and preferably placed in a fireproof room or enlosure for storage purposes.

3808. *Warning Signs or Signals.* (a) All locations or installations where ionizing radiation from radioactive materials may be encountered in injurious amounts shall be marked or posted with warning signs, signals or lights. Purple shall be the basic color for the radioactive warning symbol, and the background should be yellow.

(b) All locations where machines may produce injurious amounts of ionizing radiation shall be provided with warning signals or lights activated when the machine is producing such radiation.

3809. *Totally Protective Installations.* (a) No employee shall be permitted to remain within the confines of such an installation while ionizing radiation is being produced or generated.

(b) Every entrance to such an installation shall be provided with an electrically contacted or interlocked door or gate so arranged that no person or part of body can enter the enclosure while the source of ionizing radiation is in operation. Visible or audible signals shall be provided in each such enclosure and shall be so arranged as to be in continuous operation while the source of ionizing radiation is producing radiation.

(c) At least one door shall be provided with knobs or handles on the inside of the door so that anyone who may have been locked in accidentally can leave the enclosure without delay.

3810. *Special Orders for Radium Dial Painting.* (a) All pertinent provisions of 3800 to 3809 inclusive shall apply to radium dial painting operations. See National Bureau of Standards Handbook No. 27 for additional details.

(b) All radioactive luminous compounds shall be mixed with adhesive before being applied; no dry method of application of powder shall be used. Mixing and painting shall be done under a mechanically ventilated hood.

(c) When in use, radioactive luminous paint shall be kept in a porcelain or other impervious container of proper size to avoid spillage and shall be set in a lead block. Not more than one container shall be on any work bench

at any time, and no container shall contain more than one gram of mixed luminous compound. The container shall provide at least one inch of lead protection and shall be covered when the paint is not in use.

(d) Brushes in use for radium dial painting shall be kept on racks in the ventilated hood so that the bristle part does not touch the table top. Solvents and small wiping papers shall be used to clean brushes. Wiping papers shall be discarded after a single use and placed in covered containers, and they shall be disposed of as radioactive waste material.

(e) Brushes shall never be pointed in the mouth.

(f) Removal of radioactive paints from dials shall be done under liquid. Dry scraping or removal of luminous compounds by buffing is prohibited.

(g) Drying racks in the workroom shall be equipped with exhaust ventilation which will remove radon and prevent its dispersal in the workroom. Finished work shall be placed in the drying racks promptly and shall not be allowed to accumulate on work benches.

3811. *Medical Supervision.* (a) Each employee exposed to ionizing radiation shall be under the supervision of or in consultation with a competent medical expert experienced in the diagnosis of the harmful effects of ionizing radiation. Such supervision shall include an examination prior to starting work with a source of ionizing radiation and again at intervals not less than once yearly while so employed. Certification of such supervision shall be kept current and shall be posted conspicuously in the place of employment. Such notice shall contain (1) the name of the competent medical expert providing the medical supervision and (2) the number and names of the employees under supervision and their occupation. The employer shall be responsible for the provision of the necessary medical supervision.

(b) When in the opinion of the medical supervisor continued exposure to ionizing radiation is likely to injure an employee's health, such employee shall be removed from the exposure. See Section 3803(a) in these orders.

3812. *Devices Containing Radioactive Materials That Are Used as Hand Tools or Worn on the Person.* (a) The employer shall not require or permit the use of such devices unless a complete set of instructions is supplied with the device. The instructions must contain at least the following information:

(1) A statement that the device has been tested and is free from radioactive contamination on its external surfaces. The name of the person who made the test and the date on which it was made shall be included in the statement.

(2) Instructions for operation and use, with specific reference to the nature of the danger if the device should become defective, permitting the escape of sources of ionizing radiation.

(3) Detailed instructions giving proper methods of decontamination in the event of contamination.

(4) Instructions for safe disposal of damaged or wornout devices.

(b) Each device must be legibly labled with words or phrases equivalent to the following:

WARNING: Contains Radioactive Material

Handle With Care

DO NOT DISMANTLE

Note: The division may require additional warning words or precautionary statements on the label where the potential exposure justifies such additional precautions.

3813. *Radioactive Luminous Compounds.* The container of every radioactive luminous compound shall be labeled or tagged as follows:

DANGER! Contains radioactive substance.

POISON

(Name substance)

Do not take internally.

Avoid contact with skin.

Do not breathe dust, vapors, or gas.

ITEM 3

NEW YORK INDUSTRIAL CODE RULE NO. 38

RADIATION PROTECTION

Finding of Fact

The Board finds that every industry, trade, occupation and process involving the use or presence of radioactive material or radiation-producing equipment involves elements of danger to the lives, health and safety of persons employed therein. The Board further finds that special regulations are necessary for the protection of such persons, in that such material and equipment may emit invisible and imperceptible rays or particles having the property of producing deleterious or fatal effects, immediate or deferred, upon and within the human body.

38-1 APPLICATION

This rule applies to every place and every operation where any employee in the course of his work may be exposed to radiation in excess of one tenth the permissible weekly dose as set forth in this rule except the following places and installations which are subject to the provisions of the New York State sanitary code relating to ionizing radiation, to wit:

1. Hospitals, institutions, medical clinics, medical offices, dental offices and podiatry offices.

2. Veterinary clinics and veterinary offices.

3. Educational institutions.

4. Commercial, private or research laboratories performing diagnostic procedures or handling equipment or material for medical use.

38-2 EXEMPTIONS

Except as herein specifically provided, every operation involving only the following devices, appliances and materials are hereby exempted from the application of this rule:

1. Small lots of timepieces, instruments, novelties or devices containing self-luminous elements during the course of retail sale, during industrial use or during repair. The repair and refinishing of the self-luminous elements themselves, however, are not exempted.

2. Naturally radioactive materials of a degree of specific radioactivity approximately equivalent to that of potassium as it occurs normally.

3. Electrical equipment having thermionic conduction current and operated at voltages less than 16 kilovolts which is not primarily intended to produce radiation.

4. Domestic television receivers except during production testing.

5. Potentially radiation-producing equipment which is not being used or operated in such manner as to produce radiation, e.g., during storage or shipping or during the course of retail sale. Such equipment is not, however, exempted from the labeling requirements of this rule.

6. Any radioactive material being transported by common carrier and subject to the jurisdiction of the Interstate Commerce Commission or other governmental agency having jurisdiction.

7. Total quantities of the following radioactive material not exceeding the amounts specified in Columns 1 and 2 below:

	Column 1 Unsealed (Microcuries)	Column 2 Sealed (Microcuries)
Antimony 124 (Sb 124)	1	10
Arsenic 76 (As 76)	10	10
Arsenic 77 (As 77)	10	10
Barium 140—Lanthanum 140 (Ba La 140)	1	10
Beryllium (Be 7)	50	50
Cadmium 109—Silver 109 (Cd Ag 109)	10	10
Calcium 45 (Ca 45)	10	10
Carbon 14 (C 14)	50	50
Cerium 144—Praseodymium 144 (Ce Pr 144)	1	10
Cesium 137—Barium 137 (Cs Ba 137)	1	10
Chlorine 36 (Cl 36)	1	10
Chromium 51 (Ch 51)	50	50
Cobalt 60 (Co 60)	1	10
Copper 64 (Cu 64)	50	50
Europium 154 (Eu 154)	1	10
Fluorine 18 (F 18)	50	50
Gallium 72 (Ga 72)	10	10
Germanium 71 (Ge 71)	50	50
Gold 198 (Au 198)	10	10

	Column 1 Unsealed (Microcuries)	Column 2 Sealed (Microcuries)
Gold 199 (Au 199)	10	10
Hydrogen 3 (Tritium) (H 3)	250	250
Indium 114 (In 114)	1	10
Iodine 131 (I 131)	10	10
Iridium 192 (Ir 192)	10	10
Iron 55 (Fe 55)	50	50
Iron 59 (Fe 59)	1	10
Lanthanum (La 140)	10	10
Manganese 52 (Mn 52)	1	10
Manganese 56 (Mn 56)	50	50
Molybdenum 99 (Mo 99)	10	10
Nickel 59 (Ni 59)	1	10
Nickel 63 (Ni 63)	1	10
Niobium 95 (Nb 95)	10	10
Palladium 109 (Pd 109)	10	10
Palladium 103—Rhodium 103 (Pd Rh 103)	50	50
Phosphorus 32 (P 32)	10	10
Polonium 210 (Po 210)	0.1	1
Potassium 42 (K 42)	10	10
Praseodymium 143 (Pr 143)	10	10
Promethium 147 (Pm 147)	10	10
Radium 226 (Ra 226)	1	10
Rhenium 186 (Re 186)	10	10
Rhodium 105 (Rh 105)	10	10
Rubidium 86 (Rd 86)	10	10
Ruthenium 106—Rhodium 106 (Ru Rh 106)	1	10
Samarium 153 (Sm 153)	10	10
Scandium 46 (Sc 46)	1	10
Silver 105 (Ag 105)	1	10
Silver 111 (Ag 111)	10	10
Sodium 22 (Na 22)	10	10
Sodium 24 (Na 24)	10	10
Strontium 89 (Sr 89)	1	10
Strontium 90—Yttrium 90 (Sr Y 90)	0.1	1
Sulfur 35 (S 35)	50	50
Tantalum 182 (Ta 182)	10	10
Technetium 96 (Tc 96)	1	10
Technetium 99 (Tc 99)	1	10
Tellurium 127 (Te 127)	10	10
Tellurium 129 (Te 129)	1	10
Thallium 204 (Tl 204)	50	50
Tin 113 (Sn 113)	10	10
Tungsten 181 (W 181)	10	100
Tungsten 185 (W 185)	10	10
Vanadium 48 (V 48)	1	10
Yttrium 90 (Y 90)	1	10
Yttrium 91 (Y 91)	1	10
Zinc 65 (Zn 65)	10	10
Natural Uranium	1,000	10,000
Natural Thorium	1,000	10,000

Such materials however, are not exempted from the labeling requirements of this rule.

8. Any other radiation-producing device or radiation appliance incorporating either radioactive materials or radiation-producing equipment which the Board finds, either by variation or by approval, to be exempt from the application of this rule.

38-3 Definitions

As used herein and for the purposes of this rule, the following terms mean:

38-3.1 Airborne Radioactive Material. Airborne radioactive material in any form such as dusts, fumes, mists or gases.

38-3.2 Approved. In compliance with a subsisting resolution of approval adopted by the Board.

38-3.3 Board. The Board of Standards and Appeals of the New York State Department of Labor.

38-3.4 Commissioner. The Industrial Commissioner of the State of New York.

38-3.5 Controlled Area. Any area access to which is restricted by the owner.

38-3.6 Dose. Radiation received by an individual during exposure thereto expressed in "mrem." The dose for an individual includes all doses to the region of interest from all types and energies of radiation.

38-3.7 Dose Rate. The dose per unit of time.

38-3.8 Employee. A person employed; one who works for wages or salary in the service of another.

38-3.9 Exposure. The presence of an individual in a field of radiation.

38-3.10 High Airborne Concentration Area. Any room, enclosure or area of operation accessible to employees in which airborne radioactive material exists in excess of the amounts specified in 38-6.1, Table I, at any one time or in excess of 25 percent of the amounts specified in 38-6.1, Table I, averaged over a period of one week.

38-3.11 High Radiation Area. A radiation area accessible to employees in which there exists a radiation level in excess of 100 millirem in any one hour.

38-3.12 Installation. A location where for a period of more than 30 days one or more sources of radiation are used, operated or stored. The confines of an installation shall be as designated by the owner. A part of a building, an entire building or a plant may be designated as an installation.

38-3.13 Mobile Source. A source of radiation used or operated outside an installation.

38-3.14 Owner—of an Installation. The person or organization having by law the administrative control of a source or radiation located within the confines of the installation, whether as proprietor, lessee, or otherwise.

Of a Mobile Source. The person or organization having by law the administrative control thereof, whether as owner, lessee, contractor or otherwise.

38-3.15 Personnel Monitoring Equipment. Devices designed to be worn or carried by an individual for the purpose of measuring radiation received by him. Examples of personnel monitoring equipment include film badges, pocket chambers, pocket dosimeters and film rings.

38-3.16 Radiation. Alpha and beta particles, electrons, protons, neutrons, gamma and x-rays and all other radiations which produce ionizations directly or indirectly but not electromagnetic radiations other than gamma and x-rays.

38-3.17 Radiation Area. Any part of an installation accessible to employees in which there exists a radiation level over 5 millirem in any one hour or over 150 millirem in any seven consecutive days.

38-3.18 Radiation Worker. A person entrusted with or put in charge of a source of radiation by the owner of such source for the purpose of actually using the radiation thereof for a prescribed purpose.

38-3.19 Radiation of Very Low Penetrating Power. Radiation whose half value layer is less than one millimeter of soft tissue.

38-3.20 Radiation-Producing Equipment. Any equipment producing radiation by the application of electrical energy.

38-3.21 Radiation Safety Physician. A duly licensed physician who has had training or experience in the biological or physiological effects of radiation.

38-3.22 Radiation Safety Officer. A person qualified by training and experience in radiological science and the control of the health hazards of radiation to perform dependable radiation protection surveys and to assume all responsibilities required of him under this rule.

38-3.23 Radiation Safety Supervisor. A person employed at supervisory level who has been sufficiently instructed and trained to manage the application of all protective techniques applicable to the radiation areas within an installation to the satisfaction of a radiation safety officer.

38-3.24 Radioactive Material. Any material either solid, liquid or gas, which emits radiation spontaneously.

38-3.25 Sealed Source. Radioactive material that is encased in and is to be used in a container in a manner intended to prevent leakage of the radioactive material.

38-3.26 Shall. The word "shall" is always mandatory.

38-3.27 Survey. An evaluation of the radiation hazards associated with each source of radiation under normal use or storage conditions. Such an evaluation may include a physical survey of the location of each source and the measurement of the dose rate of radiation therefrom.

38-3.28 Weekly Dose. The total dose received by an individual in any period of 7 consecutive days.

38-3.29 Weekly Intake. The total amount of radioactive material taken into an individual's body in any period of seven consecutive days.

38-4 Registration

38-4.1 Installations. The owner of every installation shall register the same or cause it to be registered with the Industrial Commissioner. Such

registration shall be in a form acceptable to the Commissioner, and shall include the following:

(a) The name and address of the owner.

(b) A designation of the confines of the installation.

(c) A designation of the type or types of sources of radiation expected to be in the installation. (For example, x-ray machines, particle accelerators, sealed radioactive sources, unsealed radioactive material.)

(d) For each type of source designated in (c), an estimate of the maximum number of sources of radiation expected to be in the installation at any one time, and an estimate of the maximum size or rating of such sources of radiation. (For example, 5 x-ray machines, maximum rating 250 kilovolts, 5 milliamperes; 75 sealed gamma ray sources, 15 millicuries each ; 50 millicuries of unsealed radioactive material.)

(e) The name, address, qualifications and signature of the radiation safety officer or other person in charge of radiation protection for the installation.

38-4.2 Mobile Sources. Every mobile source shall be registered by its owner with the Commissioner.

Such registration shall be in a form acceptable to the Commissioner and shall include the following:

(a) Name and address of owner.

(b) Type of source and its size or rating. (For example, 2 x-ray machines, 250 KV, 5 milliamps.)

(c) Name and address and the qualifications and signature of the radiation safety officer or other person in charge of radiation protection for the source.

38-4.3 Time of Registration. Existing installations and mobile sources shall be registered within ninety (90) days after the effective date of this rule and every new installation and mobile source shall be registered before it is placed in operation.

38-4.4 Changes in Installations. The owner of every registered installation or mobile source shall advise the Commissioner forthwith of all changes which may substantially increase the potential hazard to any employee.

38-5 Control of Exposure

38-5.1 Control—General. The owner of every source shall shield, protect or isolate the same or arrange and control exposure thereto so that no employee in the course of his work receives a dose in excess of the permissible limits specified in 38-6.

38-5.2 Supervision Required—General. The owner of every installation and every mobile source shall provide or cause to be provided the safety measures required by this rule and shall designate a radiation safety supervisor who shall maintain such safety measures in accordance with this rule.

38-5.3 Supervision Required—High Hazards. The owner of a source creating a high radiation area or a high airborne concentration area shall designate a radiation safety officer as herein defined. Such officer shall cause to be provided the required safety measures with respect to such areas.

38-5.4 Control Outside an Installation. The owner of every source shall shield, isolate, protect or otherwise arrange and control the same so that radiation cannot penetrate walls, partitions, floors, ceilings or other enclosing structural portions delimiting the source as a whole to an extent capable of exposing employees of himself or another outside the installation to radiation in excess of 10% of the permissible weekly dose as specified in 38-6.

38-5.5 Maintenance. The owner of protection devices required by this rule shall maintain them in good repair and proper operating condition.

38-5.6 Control of Airborne Radioactive Material. Airborne Radioactive Material shall be controlled by means of local exhaust ventilation, isolation of the process, approved respiratory equipment or other effective means as may be necessary to maintain the average concentration of inhaled or ingested radioactive material within the limits specified in 38-6.1, paragraph 7, Table I, of this rule.

38-5.7 Mobile Sources. The placing in storage, the transportation and the use of every mobile source shall be under the supervision of a radiation safety supervisor.

38-5.8 Doors from Shielded Enclosures. Shielded enclosures of radiation areas with access openings large enough for the entry of personnel shall have at least one exit door easily and quickly openable manually from the inside.

38-5.9 Warning Signals—High Radiation Areas. Within and at the entrance to all high radiation areas conspicuous warning signs shall be posted or signals shall be installed and arranged to operate whenever the dose rate exceeds 100 mrem per hour except as provided in 38-10.5.

38-5.10 Instruction of Employees. No employer shall suffer or permit an employee of himself or another to work in a radiation area unless such employer has first informed the employee of the presence of radiation, instructed him as to the safe means and methods of performing his work during such exposure, and taken all necessary measures for his protection.

38-5.11 Training of Radiation Worker. No employer shall employ any person as a radiation worker unless such person is sufficiently informed, instructed and trained by a radiation safety supervisor or radiation safety officer to handle, use or operate the source of radiation with which he works so that the exposure to radiation is maintained within the limits prescribed by this rule.

38-5.12 Radiation Safety Supervisor—Qualifications. No employer shall employ or designate any person as a radiation safety supervisor unless such person has been instructed and trained by a radiation safety officer in the use of all protective measures that may be necessary for all radiation sources

that may be in his charge. The qualifications of the radiation safety supervisor shall be in writing and shall be signed by the qualifying radiation safety officer.

38-5.13 Minors Under 18. No employer shall suffer or permit an employee under 18 years of age to be exposed to radiation in excess of 10% of the permissible weekly dose limits as specified in 38-6.1.

38-5.14 Leakage. Every sealed source shall be so maintained that the concentration in any area accessible to employees, as a result of leakage, will not exceed the limits specified in 38-6.1, paragraph 7, Table I.

38-5.15 Eating Places. No person shall use any part of a high airborne concentration area for eating purposes.

38-6 Dose Limits

38-6.1 Permissible Weekly Dose Limit. Except as below provided no employer shall suffer or permit an employee to receive in the course of his work a weekly dose greater than the following:

1. For employees whose entire body or major portion thereof is exposed to radiation from external sources: 300 mrem in the blood-forming organs, in the gonads and the lenses of the eyes; 600 mrem in the skin.

2. For employees whose entire body or major portion thereof is exposed to radiation of very low penetrating power from external sources: 300 mrem in the lenses of the eyes; 1500 mrem in any other part of the body.

3. For employees whose hands and forearms only are exposed to radiation from external sources: 1500 mrem in the skin area receiving the highest dose.

4. For employees whose feet and ankles only are exposed to radiation from external sources: 1500 mrem in the skin area receiving the highest dose.

5. For employees whose heads and necks only are exposed to radiation from external sources: 1500 mrem in the skin area receiving the highest dose; 300 mrem in the lenses of the eyes.

6. For employees exposed to radiation from both external sources and ingested or inhaled radioactive material simultaneously or successively; an aggregate weekly dose not exceeding any of the appropriate weekly doses specified above.

7. For employees who are exposed to radiation from ingested or inhaled radioactive material only: 300 mrem in any part of the body.

For the purpose of this rule continuous inhalation or ingestion during a work week of 40 hours of concentrations of radioactive material set forth in Table I below are deemed to produce a weekly dose equivalent to 300 mrem in some part of the body.

TABLE I

MAXIMUM PERMISSIBLE AVERAGE CONCENTRATIONS OF INHALED OR INGESTED RADIOACTIVE MATERIALS

Col. (1) Effective half life in body in days.
Col. (2) Inhaled concentrations in microcuries per milliliter of air.
Col. (3) Ingested concentrations in microcuries per milliliter of water.

Material	Col. (1)	Col. (2)	Col. (3)
A^{41}	0.74	1.6×10^{-6}	1.4×10^{-3}
Ag^{105}	2.8	3.6×10^{-5}	5
Ag^{111}	2.1	1×10^{-4}	1.3×10
Am^{241}	890.	8×10^{-11}	4×10^{-4}
As^{76}	1.09	7×10^{-6}	6×10^{-1}
At^{211}	0.31	9×10^{-10}	6×10^{-3}
Au^{198}	2.6	3.4×10^{-7}	9×10^{-3}
Au^{199}	3.1	8×10^{-7}	2×10^{-2}
$Ba^{140} + La^{140}$	12	2×10^{-7}	6×10^{-3}
Be^{7}	48	1.3×10^{-5}	3
C^{14}	180	1.4×10^{-6}	1×10^{-2}
Ca^{45}	151	9×10^{-8}	1.5×10^{-3}
$Cd^{109} + Ag^{109}$	77	2×10^{-7}	2×10^{-1}
$Ce^{144} + Pr^{144}$	180	2×10^{-8}	1×10^{-1}
Cl^{36}	29	1×10^{-6}	7×10^{-3}
Cm^{242}	120	5×10^{-10}	2.7×10^{-3}
Co^{60}	8.4	3.4×10^{-8}	5×10^{-2}
Cr^{51}	22	2.4×10^{-5}	1.4
$Cs^{137} + Ba^{137}$	17	6×10^{-7}	4.5×10^{-3}
Cu^{64}	0.53	2×10^{-5}	2.5×10^{-1}
Eu^{154}	820	2×10^{-8}	1×10^{-1}
F^{18}	.078	3.5×10^{-4}	2.6
Fe^{55}	61	1.8×10^{-6}	1.3×10^{-2}
Fe^{59}	27	5×10^{-8}	3.3×10^{-4}
Ga^{72}	0.59	1×10^{-5}	2.6×10
Ge^{71}	3.9	1×10^{-4}	2.7×10
H^3 or T(HTO or $H_2{}^3O$)	19	7×10^{-5}	5×10^{-1}
Ho^{166}	1.1	1×10^{-6}	7×10
I^{131}	7.7	9×10^{-9}	9×10^{-5}
Ir^{190}	7.3	2.2×10^{-8}	4×10^{-2}
Ir^{192}	17	1.5×10^{-7}	2.7×10^{-3}
K^{42}	0.51	6×10^{-6}	4×10^{-2}
La^{140}	1.6	4×10^{-6}	3.4
Lu^{177}	3.2	1.5×10^{-5}	7×10
Mn^{56}	0.106	8×10^{-6}	5×10^{-1}
Mo^{99}	2.8	5×10^{-6}	4×10
Na^{24}	0.61	5×10^{-6}	2.4×10^{-2}
Nb^{95}	21	1.3×10^{-6}	1.2×10^{-3}
Ni^{59}	8	5×10^{-5}	7×10^{-1}
P^{32}	14	4×10^{-7}	6×10^{-4}
Pb^{203}	2.16	2×10^{-5}	4×10^{-1}
$Pd^{103} + Rh^{103}$	4.4	2×10^{-6}	3×10^{-2}
Pm^{147}	140	6×10^{-7}	3
Po^{210} (sol.)	40	6×10^{-10}	9×10^{-6}
Po^{210} (insol.)	31	2×10^{-10}	—
Pr^{143}	11	2.3×10^{-6}	1
Pu^{239} (sol.)	43,000	6×10^{-12}	4.5×10^{-6}
Pu^{239} (insol.)	360	6×10^{-12}	—
$Ra^{226} + \frac{1}{2}$ dr.	16,000	2.4×10^{-11}	1.2×10^{-7}
Rb^{86}	7.8	1.1×10^{-6}	9×10^{-3}
Re^{183}	0.5	2.4×10^{-5}	2.4×10^{-1}
Rh^{105}	1.4	3×10^{-6}	5×10^{-2}
Rn^{222} + dr.	—	1×10^{-7}	6×10^{-6}
$Ru^{106} + Rh^{106}$	19	8×10^{-8}	4×10^{-1}

Continued

TABLE I—Continued

MAXIMUM PERMISSIBLE AVERAGE CONCENTRATIONS OF INHALED OR INGESTED RADIOACTIVE MATERIALS

Col. (1) Effective half life in body in days.
Col. (2) Inhaled concentrations in microcuries per milliliter of air.
Col. (3) Ingested concentrations in microcuries per milliliter of water.

Material	Col. (1)	Col. (2)	Col. (3)
S^{35}	18	3×10^{-6}	1.5×10^{-2}
Sc^{46}	13	2×10^{-7}	1
Sm^{151}	39,000	4×10^{-6}	6×10^{-1}
Sn^{113}	44	1.7×10^{-6}	5×10^{-1}
Sr^{89}	52	6×10^{-8}	2×10^{-4}
$Sr^{90} + Y^{90}$	2,700	6×10^{-10}	2.4×10^{-6}
Tc^{96}	2.1	8×10^{-6}	8×10^{-2}
Te^{127}	13	3×10^{-7}	8×10^{-2}
Te^{129}	10	1.2×10^{-7}	3.3×10^{-2}
Th^{234}	24.1	2×10^{-6}	1×10
Tm^{170}	59	1.5×10^{-7}	8×10^{-1}
U-natural (sol.)	30	5×10^{-11}	2×10^{-4}
U-natural (insol.)	120	5×10^{-11}	—
U^{233} (sol.)	300	4×10^{-10}	4.5×10^{-4}
U^{233} (insol.)	120	5×10^{-11}	—
V^{48}	12	3×10^{-6}	1.5
Xe^{133}	5.27	1.3×10^{-5}	1.3×10^{-2}
Xe^{135}	0.38	5×10^{-6}	4×10^{-3}
Y^{91}	51	1.2×10^{-7}	6×10^{-1}
Zn^{65}	21	6×10^{-6}	2×10^{-1}
All other beta or gamma emitters..		3×10^{-9}	3×10^{-7}
All other alpha emitters.....		1.5×10^{-11}	3×10^{-7}

38-6.2 Quarter Year Dose Limits. Notwithstanding the provisions of 38-6.1, an employer may, during any quarter-year period, suffer and permit an employee over 18 years of age to receive a weekly dose greater than a permissible weekly dose subject to the following requirements:

1. Personnel monitoring equipment and a proper method of determining the dose shall be provided and used.

2. During such quarter-year period the employer shall not suffer or permit the employee to receive a weekly dose or intake exceeding three times the weekly limits specified in 38-6.1.

3. The employer shall not suffer or permit an employee to receive a total dose or intake throughout such quarter-year period exceeding ten times the weekly limits specified in 37-6.1.

38-6.3 Repeated Excessive Dose. Whenever personnel monitoring, physical examination by a radiation safety physician or appropriate tests indicate that any employee may have received an excessive amount of radioactive material or received during a period of 13 consecutive weeks more than 10 times the permissible weekly dose specified in 38-6.1, the employer shall report the fact to the Commissioner within 7 days after such finding. Such report shall describe the nature and extent of the exposure and the reason therefor and a description of corrective measures instituted.

38-7 Surveys

38-7.1 General. Every employer shall cause such surveys to be made by a radiation safety officer as may be necessary to determine whether the dose to any employee is maintained within the limits prescribed by this rule.

38-7.2 Report. A report shall be made of each survey and shall be signed by the person by or under whose direction it was made and shall show the date when the survey was completed.

38-7.3 Radiation Instruments. Every owner of an installation wherein radiation areas associated with radioactive materials, other than sealed sources, are present shall provide or have readily available instruments and procedures suitable for detecting and measuring radiations or contamination in accordance with the requirements of this rule and said instruments shall be maintained in proper calibration.

38-8 Records

38-8.1 Retention of Records. The owner of every installation shall keep in his possession a copy of all reports of surveys, dosimeter readings and physical examinations or tests.

38-8.2 Record of Use—Sources Outside Installations. The owner of every source of radiation used outside an installation shall keep a written record of each such use setting forth the following information:

1. The specific identification of each source.
2. The place or site of use.
3. The date and time of the removal of the radiation source from its installation or place of storage.
4. The date and time of its return thereto.
5. The name of the radiation worker by whom each source was used and the name of the radiation safety supervisor in charge.

38-8.3 Availability and Destruction of Records. No person shall damage or destroy any required radiation records, or suffer or permit the same to be destroyed without first having obtained the written consent of the Commissioner. All pertinent radiation records or copies thereof shall be readily available to the attending physician of any person who may have undergone exposure in connection with the installation to which such records relate and they shall also be available to the Commissioner.

38-8.4 Commissioner to Receive Records. The Commissioner shall receive all radiation records of a discontinued radiation installation which are voluntarily presented to him by the owner of such installation and acknowledge the receipt thereof in writing. The delivery of such records to the Commissioner relieves the owner from all subsequent responsibility in respect thereto. The Commissioner may keep or destroy such records in his discretion.

38-9 Personnel Monitoring

38-9.1 General. Any employee who in any week receives or is likely to receive a radiation dose which is more than 25% of the limits set forth in 38-6.1 shall be supplied with and shall use appropriate personnel monitoring equipment.

38-9.2 High Radiation Areas. Every employee having any occasion to enter a high radiation area shall be supplied with and shall use appropriate personnel monitoring equipment when the dose rate may exceed 100 mrem in any one hour.

38-10 Caution Labels and Signs

38-10.1 General. Except as provided in 38-10.5, the owner of every installation or mobile source shall indicate the presence of each source of radiation by conspicuous labels on the source or container thereof or by conspicuous signs in their immediate vicinity, or both.

Each label or sign shall bear the standard radiation warning symbol specified in 38-10.3 and appropriate explanatory wording, such as "radiation," "radioactive," "airborne radioactivity" or "X-ray." The printing of any further matter upon such label shall not obliterate or obscure the symbol or the said words.

38-10.2 Special Provision. Where, in the judgment of the radiation safety officer, personnel monitoring or the use of respiratory equipment is required for employees entering a high radiation area or high airborne concentration area, the posted signs shall conspicuously indicate such requirement.

38-10.3 Standard Radiation Warning Symbol. The following described standard radiation warning symbol is hereby adopted:

1. Upon a yellow background there shall be the design shown in purple.

. . .

2. The design in purple must be centered within a sufficient area of yellow background to make it conspicuous.

* * *

(Reproduction of Symbol Deleted)

38-10.4 Use of Symbol Restricted. No person shall affix, post or display any sign or label bearing said standard radiation warning symbol or any closely similar symbol to, upon or in any thing or location in any place to which this rule applies except for the purpose of warning of the presence of radiation.

38-10.5 Exception from Posting Requirements. Caution signs are not required to be posted at areas or rooms containing sources of radiation for periods of less than twenty-four hours provided such sources are attended by a radiation worker during such periods.

38-11 Storage of Radioactive Material

Radioactive material not in use shall be stored in properly shielded and secured containers.

38-12 Severability

If any provisions of this rule or the application thereof to any person or circumstances is held invalid, such invalidity shall not affect other provisions or applications of this rule which can be given effect without the invalid provision or application, and to this end the provisions of this rule are declared to be severable.

ITEM 4

New York State Sanitary Code

Chapter XVI

Ionizing Radiation

Regulation 1. Definitions (a) The term "radiation" or "ionizing radiation" as used in this chapter shall refer to electromagnetic radiations (x-rays and gamma rays, etc.) or particulate radiations (electrons or beta particles, protons, neutrons, alpha particles, etc.) usually of high energy, but in any case it includes all radiations capable of producing ions directly or indirectly in their passage through matter.

(b) The term "roentgen" (r) shall mean the quantity of x-radiation or gamma radiation such that the associated corpuscular emission per 0.001293 grams of air produces, in air, ions carrying an electrostatic unit of quantity of electricity of either sign. Milliroentgen (mr) equals 1/1000 of a roentgen.

(c) The "rad" is the unit of absorbed dose and is equal to 100 ergs per gram of matter irradiated. Millirad (mrad) is equal to 1/1000 rad.

(d) The term "rem" is that quantity of any type of ionizing radiation such that the energy imparted to a biological system (cell, tissue, organ or organism) per gram of living matter by the ionizing particles present in the region of interest has the same biological effectiveness as an absorbed dose of 1 rad of lightly filtered x-radiation generated at potentials of 200 to 300 kilovolts. Millirem (mrem) is equal to 1/1000 rem.

(e) The term "Relative Biological Effectiveness" (RBE) is the ratio of the absorbed dose of lightly filtered x-radiation generated at potentials of 200 to 300 kilovolts, to the absorbed dose of any other type and/or energy of radiation that is required to produce the same biological effect on a particular biological system, when the conditions under which the radiation is received

are the same. A dose in rems is equal to the dose in rads multiplied by the appropriate RBE.

(f) The term "curie" as used in this chapter shall mean that quantity of any radioactive material in which the number of disintegrations per second is 3.7×10^{10}. Millicurie (mc) equals 1/1000 of a curie. Microcurie (uc) equals 1/1000 of a millicurie.

(g) The term "radiation installation" shall mean a location or facility where radiation equipment is used or where radioactive material is produced, transported, stored or used for any purpose. The limits of the radiation installation area shall be as designated by the operator. (See regulation 4(e) and 5.) As used in this chapter, "radiation installation" shall refer only to those installations located in a hospital; institution; medical clinic; medical office; dental clinic; dental office; veterinarian clinic; veterinary office; podiatry office; educational institution; commercial, private or research laboratory performing diagnostic procedures or handling equipment or materials for medical use; shoe store; trucking, storage, messenger or delivery service establishment; or any industrial or commercial establishment not subject to supervision by the New York State Department of Labor in accordance with the Laws of New York State. "Radiation installation," as used in this chapter, shall include, whether or not it is specifically stated above, any facility where radiation is applied intentionally to a human. "Radiation installation," as used in this chapter, shall not include facilities subject to the regulations adopted by the Interstate Commerce Commission, United States Coast Guard, United States Post Office or Civil Aeronautics Board.

(h) The term "radiation equipment" as used in this chapter, unless otherwise specified, shall include any device which emits or may emit ionizing radiation, except that radiation equipment shall not include equipment operated at less than 15 Kilovolts and which is not designed primarily to produce useful radiation; or, except for the repair and servicing thereof, equipment operating normally at higher voltages, but which, by nature of design, does not produce radiation at the point of nearest normal approach at a weekly rate higher than one-tenth the appropriate basic minimum permissible total weekly dose for any critical organ exposed. It shall not include equipment in storage, in transit or not being used, or equipment operated in such a manner that it cannot produce radiation.

(i) The term "radioactive material" as used in this chapter is any solid, liquid or gaseous substance containing radioactive atoms which undergo spontaneous disintegration resulting in the emission of one or more types of radiation. As used in this chapter, radioactive material shall not include:

(1) Natural radioactive materials having an equivalent specific radioactivity not exceeding that of natural potassium.

(2) Small lots of time pieces, instruments, novelties or devices containing self-luminous elements, except during manufacture or repair of the self-

luminous elements themselves. Such time pieces, instruments, novelties or devices shall be included, however, if they are stored, used or handled in such quantity or fashion that any person might receive within a week a radiation dose exceeding 1/10 the maximum permissible total weekly dose.

(3) Radioactive material of such quantity that if the total amount were taken internally by a person, no serious harm would be likely to result. (Column 3—Table 3—National Bureau of Standards Handbook 52 can be used as a guide.)

(j) The term "radioactive waste" as used in this chapter shall include any solid, liquid or gaseous substance containing radioactive material, regardless of its source, which is discharged into the environment.

(k) The term "competent person" as used in this chapter shall mean an individual who has received training or instruction in radiation hazards and their control, sufficient to specify protection for himself and others in the vicinity.

(l) The terms "hazard," "radiation hazard," or "hazardous amounts of radiation" when used in relation to external radiation exposure, shall refer to any exposure rate, which may result in a person receiving within a period of one week a total radiation dose exceeding the maximum permissible total weekly dose. When used in relation to internal exposure, they shall refer to concentrations of radioactive material in air, food or water, which exceed the maximum permissible concentrations in air, food or water for continuous exposure.

(m) The term "sealed source" as used in this chapter shall mean any device containing radioactive material to be used primarily as a source of radiation which has been constructed in such a manner as to prevent the escape, under normal conditions, of any radioactive material.

(n) The term "survey" as used in this chapter shall mean the evaluation of the potential radiation hazard in the vicinity of a radiation source.

(o) The term "personnel monitoring equipment" as used in this chapter shall mean devices or equipment which are capable of indicating or recording with reasonable accuracy the radiation dose a person has received during a specific period.

(p) The term "operator" as used in this chapter shall mean an individual, group of individuals, partnership, firm, corporation or association conducting the business or activities carried on within the radiation installation.

(q) The term "health officer" as used in this chapter shall mean the county or part-county health officer, the health officer of a city of 50,000 population or over or the state district health officer.

REGULATION 2. REGISTRATION. Every operator of a radiation installation as defined in this chapter shall register such installation with the health officer having jurisdiction, prior to March 1, 1956. All new installations as defined in this chapter made on or after September 1, 1955, shall be regis-

tered with the health officer having jurisdiction, before the installation is placed in operation. Such registration shall be made on a form prescribed by the state commissioner of health. The following information shall be provided by the operator at the time of registration: The name of the operator; a designation of the confines of the installation; a statement of the type of sources of radiation expected to be used, operated or stored within the installation and of the approximate total number of each type; a summary of the radiation safety program.

A central committee (such as an isotope committee) having supervision for radiological safety over two or more radiation installations may register such installations in lieu of registration by the individual operator.

Registration shall not imply approval of manufacture, storage, use, handling or operation, but shall serve merely to notify the health officer having jurisdiction, of the location and character of radiation sources.

Any change in the character of the radiation installation which might increase the radiation exposure, such as addition to number of sources, increase in source strength, increase in output, increase in energy of radiation produced, shall be considered a new installation and shall be registered with the health officer having jurisdiction.

If the registration of each device or each change in the character of the installation would be impractical, the state commissioner of health, upon request of the operator or central committee, may approve blanket registration of the installation.

Radioactive materials in quantities not exceeding the amounts shown in Table 1 shall be exempt from registration.

REGULATION 3. CONSTRUCTION MAINTENANCE AND OPERATION. Every radiation installation shall be constructed, maintained and operated in such a manner as not to create a hazard.

Note: As a general guide to compliance with Regulation 3, the recommendations of the National Committee on Radiation Protection, as published in Handbooks 41, 42, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, and 59 of the National Bureau of Standards, and such other recommendations as may be made by that Committee, may be followed.

The applicable regulations of the Interstate Commerce Commission, Civil Aeronautics Board, United States Coast Guard and United States Post Office may be used as a general guide to compliance with this regulation in relation to the proper storage and intrastate shipment of radioactive materials. [See Chapter 281: TRANSPORTATION.]

REGULATION 4. MAXIMUM PERMISSIBLE DOSES. (a) The radiation exposure of a person or persons shall always be kept at the lowest practical level, in accordance with the current recommendations of the National Com-

TABLE I

Element	Upper Limit Microcurie	Element	Upper Limit Microcurie
Pb^{210}	1	Sn^{113}	100
Po^{210}	1	Te^{127}	100
At^{211}	1	Ba^{140}	100
Ra^{226}	1	La^{140}	100
Ac^{227}	1	Pr^{148}	100
U^{228}	1	Sm^{151}	100
Pu^{239}	1	Ho^{166}	100
Am^{241}	1	Tm^{170}	100
Cm^{242}	1	Lu^{177}	100
Sc^{46}	10	Ta^{182}	100
Co^{60}	10	Pt^{191}	100
Sr^{90}	10	Pt^{193}	100
Ru^{106}	10	Au^{196}	100
Ag^{105}	10	Au^{199}	100
Te^{129}	10	Tl^{200}	100
I^{131}	10	Tl^{204}	100
Cs^{137}	10	Pb^{203}	100
Ce^{144}	10	Th^{234}	100
Eu^{154}	10	H^{3}	1000
W^{181}	10	Be^{7}	1000
Re^{183}	10	C^{14}	1000
Ir^{192}	10	Na^{24}	1000
P^{32}	100	S^{35}	1000
Cl^{136}	100	K^{42}	1000
Ca^{45}	100	Cr^{51}	1000
Sc^{47}	100	Fe^{55}	1000
Sc^{48}	100	Mn^{56}	1000
V^{48}	100	Ni^{59}	1000
Fe^{59}	100	Cu^{64}	1000
Zn^{65}	100	Ge^{71}	1000
Ga^{72}	100	Mo^{99}	1000
As^{76}	100	Pd^{103}	1000
Rb^{86}	100	Pm^{147}	1000
Sr^{89}	100	Ir^{190}	1000
Y^{91}	100	Au^{198}	1000
Nb^{95}	100	Tl^{201}	1000
Tc^{96}	100	Tl^{202}	1000
Rh^{105}	100	Natural U	1000
Cd^{109}	100	Natural Th	1000
Ag^{111}	100		

mittee on Radiation Protection, as published in the handbooks of the National Bureau of Standards.

(b) When the source of radiation is outside the body, the maximum permissible total weekly dose under the conditions noted shall not exceed the following:

(1) *Entire body or major portion thereof exposed to penetrating radiation (half-value layer greater than 1 mm of soft tissue).* The maximum permissible total weekly dose shall be 600 mrems in the skin; and 300 mrems in the blood-forming organs, gonads and lens of the eye. For exposure of the whole body to x-rays or gamma rays with an energy up to 3 million electron volts, this condition may be assumed to be met if the "air dose" does not exceed 300 milliroentgens.

(2) *Entire body or major portion thereof exposed to radiation of very*

penetrating power. (*Half-value layer less than 1 mm of soft tissue.*) The maximum permissible total weekly dose shall be 1500 mrems in the skin and 300 mrems in the lens of the eye.

(3) *Hands and forearms or feet and ankles or head and neck exposed to any radiation.* The maximum permissible total weekly dose shall be 1500 mrems in the skin.

(4) *Exposures Exceeding Basic Permissible Weekly Doses.* In exceptional cases, it may be necessary for a person to receive in one week a radiation dose exceeding the basic permissible total weekly dose, outlined in Regulation 4(b): 1, 2, & 3. This shall be allowable provided that the basic permissible dose during any seven consecutive days is not exceeded by more than a factor of three; and provided further that the total dose in any organ accumulated during a period of thirteen (13) consecutive weeks does not exceed ten (10) times the basic permissible weekly dose.

(5) *Accidental or Emergency Exposure to Radiation.* Accidental or emergency exposure of the whole body or parts thereof to x-rays or gamma rays with photon energy less than 3 million electron volts occurring only once in a lifetime of a person shall be assumed to have no effect on the radiation tolerance status of that person provided that the total exposure of the whole body or major portion thereof does not exceed 25 roentgens measured in air and provided also that the exposure to the hands, forearms, feet and ankles does not exceed 100 roentgens in addition to the whole body exposure.

Accidental or emergency exposure to radiation of other types and energies occurring once in a life-time of a person shall be assumed to have no effect on the radiation tolerance status of the person provided that the total tissue doses resulting therefrom in the different tissues and organs of the body (expressed in rems) do not exceed numerically the respective tissue doses in rads resulting from exposure to x-rays with photon energy less than 3 million electron volts.

Planned emergency exposure shall be carried out on the basis that a person will not receive doses higher than one-half the tolerable accidental or emergency dose.

(c) When the source of radiation is radioactive materials within the body, the dose rates to the tissues of the body shall be controlled by limiting the average rates at which radioactive materials are taken into the body either by inhalation or by ingestion. The maximum permissible concentrations of radioactive material in air and water shall be in accordance with nationally recognized limits (Table 3 and Appendix 3—National Bureau of Standards Handbook #52).

(d) The maximum permissible dose for any person shall include all doses from all types and energies of radiation, whether delivered simultaneously or successively, during the period of measurement, to the region of interest.

(e) The radiation dose delivered to any person outside the installation

shall be limited to 1/10 the maximum permissible amounts stated in Regulation 4(b): (1), (2), & (3) and 4(c).

(f) Nothing in this regulation shall be construed to limit the kind and amount of radiation that a physician, dentist, or other licensed practitioner may intentionally apply to a person in diagnosis or treatment.

(g) The limitations expressed in this regulation shall not apply to exposure received by persons being fitted for shoes in a shoe fitting fluoroscope, provided such fluoroscope installation is constructed, operated and maintained in compliance with Regulation 19 of this Chapter.

TABLE 2

MAXIMUM PERMISSIBLE TOTAL WEEKLY DOSES IN CRITICAL ORGANS UNDER VARIOUS CONDITIONS OF EXPOSURE

Conditions of Exposure		Dose in Critical Organs (mrem per week)			
Part of Body	Radiation	Skin, at Basal Layer of Epidermis	Blood-Forming Organs	Gonads	Lens of Eye
Whole Body	Any Radiation with Half-value layer greater than 1 mm of soft tissue	600[a]	300[a]	300[a]	300[a]
Whole Body	Any Radiation with Half-value layer less than 1 mm of soft tissue	1500	300	300	300
Hands and Forearms or Feet and Ankles or Head and Neck	Any Radiation	1500[b]			

[a] For exposures of the whole body to x-rays or gamma rays up to 3 Mev, this condition may be assumed to be met if the "air dose" does not exceed 300 mr, provided the dose to the gonads does not exceed 300 mrem. "Air dose" means that the dose is measured by an appropriate instrument in air in the region of highest dosage rate to which an individual might be exposed without the presence of the human body or other absorbing and scattering material.

[b] Exposure of these limited portions of the body under these conditions does not alter the total weekly dose of 300 mrem permitted to the blood-forming organs, the main portion of the body, to the gonads, or to the lens of the eye.

(h) In special cases, exposure in excess of the values outlined in this regulation may be permitted for individuals over 45 years of age. This will be allowable if such exposures are in accordance with nationally recognized standards (National Bureau of Standards Handbook #59).

(i) The radiation dose delivered to any person less than 18 years of age shall be limited to a maximum of 1/10 the maximum permissible total weekly amounts specified in Regulation 4(b): 1, 2, & 3 and 4(c).

REGULATION 5. SUPERVISION. All radiation installations shall be operated by or under the direction of a competent person who shall be responsible for all necessary safety precautions.

The operator of a radiation installation shall be responsible for:

(a) Insuring beyond reasonable doubt that all persons working with radiation equipment or radioactive materials are properly and adequately instructed in the hazards associated with and the safe methods of handling or operation and use of the radiation equipment or radioactive materials.

(b) Insuring beyond reasonable doubt that all persons working with radiation equipment or radioactive materials are properly and adequately instructed in the purpose and proper use of any protective and monitoring equipment provided. This shall also apply to visitors to areas under his control.

(c) Insuring beyond reasonable doubt, by means of radiation surveys, that any space normally occupied by persons not primarily engaged in radiation or associated work is not subjected to radiation levels which would result in a person receiving a dose exceeding one-tenth the maximum permissible amounts indicated in Regulation 4(b): 1, 2, & 3 and 4-c of this chapter.

(d) Controlling the discharge of radioactive wastes so that any person outside the installation is not subjected to radiation levels exceeding one-tenth the maximum permissible levels specified in Regulation 4-c of this chapter.

REGULATION 6. PERSONNEL PROTECTION. The operator of a radiation installation shall provide personnel monitoring equipment, properly calibrated, for every individual who may possibly receive routinely, a weekly radiation dose in excess of one-fourth the maximum permissible amounts specified in Regulation 4(b): 1, 2, & 3 of this chapter. Summary records shall be kept of all exposures indicated or recorded on personnel monitoring equipment and shall be filed by the operator; (1) for the length of the employment of the exposed individual plus 5 years, or (2) until two years following the death of the exposed individual, or (3) until, upon application, specific instructions have been given by the state commissioner of health for the disposition of the records. These records shall be open to inspection by a duly authorized representative of the health officer and/or the state commissioner of health. The operator shall on request furnish any person with a summary statement of his radiation exposure record.

Personnel monitoring equipment shall be worn on the torso. If it is determined that the head and neck or extremities might receive exposures greater than 1/4 the maximum permissible amounts specified for these areas of the body, personnel monitoring equipment shall be worn also on the body area likely to be so exposed.

Protective equipment such as interlocked tube screen, leaded rubber aprons and leaded rubber gloves, shall be available to and used by the operator of fluoroscopic equipment. Protective equipment shall be without defects.

Radiation shields, including protective windows or other visualization de-

vices or their equivalent, which will provide protection for the person operating the equipment, shall be supplied for all radiographic equipment.

When it is known or believed that the exposure of an individual during any one week may have exceeded five times the maximum permissible total weekly amounts specified in Regulation 4(b): 1, 2, & 3 of this chapter, the person shall be notified and all known facts relative to its occurrence shall be reported to the health officer having jurisdiction, within 72 hours of the discovery thereof and a copy of the report shall be put into that person's personnel file. Immediate corrective measures leading to the elimination of the recurrence or continuance of the overexposure shall be undertaken by the operator.

REGULATION 7. MEDICAL EXAMINATIONS. All persons who might regularly ingest or inhale radioactive materials in concentrations exceeding one-quarter of the maximum permissible amounts specified in Regulation 4(c) shall be examined by a physician at least once each year to determine the presence of radioactive material in the body. Such examinations shall include, according to the physician's judgment, pertinent laboratory examinations such as urinalysis, expired air analysis or other laboratory tests or aids which will give data of value bearing on the person's state of health.

All persons who might be exposed accidentally or under emergency conditions to external radiation exceeding the maximum outlined in Regulation 4(b)(5) shall be examined by a physician for evidence of radiation injury or for any physical condition which would tend to predispose to radiation injury. Such examination shall include, according to the physician's judgment, pertinent laboratory examinations, such as blood counts.

Records shall be kept of physical examinations and shall be filed by the operator; (1) for the length of the employment of the exposed individual plus five years, or (2) until two years following the death of the exposed individual, or (3) until, upon application, specific instructions in writing have been given by the state commissioner of health for the disposition of records.

REGULATION 8. PROTECTION OF PATIENT. Filtration equivalent to at least a total of 2 millimeters of aluminum shall be used with all diagnostic x-ray equipment.

Fluoroscopy equipment installed after September 1, 1955 shall not be operated for the examination of a patient unless an automatic timer is installed, so set and functioning as to interrupt the x-ray exposure at the end of four minutes' total exposure. The timer shall be so installed that the equipment may not be reactivated without resetting the equipment controls.

Focal skin distance for all fluoroscopes shall be not less than twelve inches. The dosage rate at table top shall not exceed ten roentgens per minute.

REGULATION 9. DISPOSAL OF RADIOACTIVE WASTES. Radioactive wastes discharged to the environment shall not be released in such manner that they

will accumulate in the environment in concentrations that may lead to any person receiving a dose exceeding that specified in Regulation 4(e) of this chapter. If several users are discharging wastes in such way that the radioactivities are additive, they shall enter into a mutual agreement each to limit his release, so that the total comes within the permissible limit specified in Regulation 4(e). If no agreement is reached, then the amount of maximum discharge for each user shall be set by the State Commissioner of Health.

Radioactive wastes shall not be disposed of by dumping on the surface of the ground or by burial in the soil, except in areas specifically approved by the state commissioner of health. Controlled surface or subsurface storage in such a fashion that radioactive material cannot mix with the soil or enter the ground water shall not be considered disposal by dumping or burial.

Note: The contamination of soil resulting from the use of radioactive materials in plant, animal and similar studies shall not be considered as contamination by radioactive waste. It is recommended, however, that the health officer having jurisdiction be consulted prior to the initiation of such studies.

REGULATION 10. RADIATION INSTRUMENTS. Every operator of a radiation installation where radioactive materials, not in sealed sources, are present shall provide or have immediately available instruments suitable for detecting and measuring radiation and radioactive contamination. Such instruments shall be maintained in proper calibration.

REGULATION 11. HANDLING OF CADAVERS CONTAINING RADIOISOTOPES. The identification of a particular patient as radioactive shall be the responsibility of the physician in charge of the case or his designated representative. If such a patient dies in a hospital, the doctor who pronounces him dead shall notify the physician in charge of the case or his designated representative at once.

An autopsy shall not be commenced on a body that contains more than five millicuries of radioactivity without the consultation and advice of the radiation safety officer of the hospital or, if he is not available, of the physician responsible for the administration of the radioactive material. If neither is available, their designated representative may serve.

Note: An official radiation safety officer is required by the Isotopes Division of the Atomic Energy Commission in institutions equipped for treatment with radioisotopes obtained from Atomic Energy Commission or secondary suppliers.

A radioactivity report on every cadaver containing more than 5 millicuries of radioactivity shall be completed by the radiation safety officer or the physician responsible for the administration of the radioactive material or their designated representatives. This report shall accompany the body

(whether autopsied or not) when it is surrendered to the funeral director. This report shall contain the following information:

(a) Name of hospital

(b) Name of deceased

(c) A statement, "This certifies that the remains of..... .....has been examined this date by..... (person certifying) Radioactivity close to the surface of the body, as determined by..... .....(is) (is not) below the rate of 30 mr/hr (state instrument or method) that is acceptable for embalmers during their work. This maximum permissible dose per hour will not be exceeded, if rubber gloves are worn, and further precautions are observed as listed below."

(d) Statement of precautions to be taken

(e) Date

(f) Signature of Radiation Safety Officer or physician.

Note: As a general guide to compliance with Regulation 11, the recommendations of the National Committee on Radiation Protection, as published in Handbook 56 of the National Bureau of Standards, may be followed.

REGULATION 12. MONITORING OF RADIATION INSTALLATION. It shall be the responsibility of the operator of a radiation installation to make certain that surveys of the radiation installation are made by a competent person with appropriate, properly calibrated monitoring equipment.

Records shall be made of such surveys and shall be filed by the operator for: (1) five years following the date of the survey, or, (2) until, upon application, specific instructions have been given by the state commissioner of health for the disposition of such records. Such records shall be open to inspection by a duly authorized representative of the health officer and/or the state commissioner of health. The operator shall keep the radiation intensity in any occupied space below that which would result in any person receiving more than the maximum permissible total weekly dose during the time the space is occupied by that person during the week.

Surveys of radiation installations shall be made at the intervals outlined below:

(a) Installations where radioactive materials not contained in a sealed source are handled shall be surveyed at least once a month. Such surveys shall be made more often if it is indicated by personnel monitoring equipment or other means that more frequent surveys are necessary to limit radiation intensities or contamination below the permissible maximum. Regularly scheduled radiation monitoring of the air shall be required where there is any reasonable possibility that concentrations of radioactivity in inhaled air may exceed the amounts specified in Regulation 4-c of this chapter.

(b) Installations where radiation equipment is used or where radioactive materials in a sealed source are handled or installed on or after September 1, 1955 shall be surveyed when originally installed.

All radiation installations of this type, regardless of the date of installation, shall be surveyed whenever any change is made in the installation or its use that might increase the radiation to which a person could be exposed.

When vibrations or other physical conditions exist which may cause changes in the protective features, inspection of protection devices and surveys for radiation rates shall be made at least every six months or at more frequent intervals if required by the health officer having jurisdiction.

REGULATION 13. THERAPY ROOMS. No person other than the patient and those who may be required to hold the patient, shall be allowed to remain within a therapy room during irradiation. No person who is habitually near radiation producing equipment or materials shall hold a patient during irradiation. The person holding the patient shall not be in the useful beam and shall be protected as much as practicable from scattered radiation.

Every entrance to an x-ray therapy room in which equipment is operated at a potential above 150 KV and every entrance to a teletherapy room shall be protected by interlocks so that no person can enter without turning off the radiation equipment or adequately shielding the radiation source. It shall be so arranged that irradiation equipment cannot be started again, or the radiation source unshielded again, without resetting the controls.

In addition to the interlocking controls, signals shall be installed which are visible or audible inside the therapy room. These signals shall be installed so that they will be activated whenever irradiation is proceeding. It shall be possible for a person to escape from a therapy room at all times.

REGULATION 14. WARNING SIGNS. (a) Standard Symbol. A standard symbol for designating any radiation hazard has been adopted . . .

[Symbol Omitted]

(b) Radiation Areas—The operator of a radiation installation shall post conspicuous warning signs to indicate the area where a radiation hazard exists. Such warning signs shall contain the standard symbol and the words "Danger" and "Radiation Area."

(c) Radiation Sources—The operator of a radiation installation shall label conspicuously all radioactive material as follows:

(1) Containers for sealed sources of external hazard only: A label containing the standard symbol and the words "Danger—Radiation." Where a time limit is specified, it shall be posted.

(2) Containers for storage or shipment of loose bulk or unsealed sources primarily of an internal hazard: A label containing the standard symbol and the words, "Danger—Radioactive Material."

(3) Additional Precautions: The printing of further precautions and instructions on the warning labels for radioactive materials shall not obscure the standard symbol and required precautionary words.

(d) Removal of signs and labels—All radiation labels or signs which may have been posted at a time when a radiation hazard existed shall be removed when there is no longer a need for such warning.

REGULATION 15. ACCOUNTING FOR RADIOACTIVE MATERIALS. The operator of a radiation installation shall maintain an accurate account of all radioactive materials in a radiation installation. Such records shall show amounts and form of the radioactive materials received, purpose for which used, amounts of wastes and such other information as may be necessary to account for the difference between the amount of radioactivity received and the amount on hand. Such records shall be open to inspection on request by the state commissioner of health and/or the health officer having jurisdiction, or their authorized representatives.

The state commissioner of health, or his authorized representative, upon application, may modify this accounting requirement under special circumstances.

REGULATION 16. RADIATION ILLNESS, INJURIES, EMERGENCIES, ACCIDENTS. Accidents involving the serious overexposure of personnel; the discharge of radioactive wastes in a concentration above an acceptable limit; the spillage, loss or theft of radium, or other radioactive materials; fire; flood or other catastrophe affecting places using or storing radioactive materials; or other incidents, which will or are likely to expose people to hazardous quantities of radiation; whether it occurs at an installation as defined in this chapter or in any other place, shall be reported immediately by the person in charge by telephone or telegraph to the health officer having jurisdiction. Such reporting shall not relieve the operator of the responsibility for instituting and performing such corrective and preventive measures as are necessary to reduce the hazard. Following the receipt of notification, the health officer having jurisdiction shall investigate the incident promptly and determine that the operator has taken all necessary corrective and preventive measures.

For the purpose of this regulation, "the serious overexposure of personnel" shall mean the exposure of a person to a quantity of external radiation exceeding that specified in Regulation 4(b-5) of this chapter, or to a quantity of internal exposure which would result from the ingestion or inhalation of radioactive material in such quantities as to exceed 50 times the maximum permissible amount (Handbook 52, National Bureau of Standards).

For the purpose of this regulation, "acceptable limit" shall mean that concentration of radioactive material which will not constitute a hazardous external or internal exposure to a person.

It shall be the duty of every physician to report in writing to the state department of health the full name, address and age of every patient who is suffering from radiation illness or injury from exposure to ionizing radiation.

Radiation received by a patient for therapy under the supervision of a physician or the effects of such radiation shall not come within the intent of this regulation.

REGULATION 17. ELECTRICAL HAZARDS. All x-ray equipment installed in a radiation installation after September 1, 1955, shall, where applicable, bear the seal of approval of the Underwriters' Laboratories, Inc., or shall be required to meet an equivalent safety standard. All equipment installed prior to September 1, 1955, if not bearing such seal, shall be altered to comply with the pertinent requirements of the standard of the National Board of Fire Underwriters' (The National Electrical Code) prior to September 1, 1956.

Certification by a duly constituted local authority that the installation is free of electrical hazards shall be acceptable.

REGULATION 18. VACATED PREMISES. Upon vacating any radiation installation handling radioactive materials, the operator shall decontaminate it, if necessary. If decontamination is not possible, the operator shall inform the owner and the health officer having jurisdiction. The owner shall inform the future occupants of any residual potential hazard.

> *Note:* As general guide to decontamination, the recommendations of the National Committee on Radiation Protection as published in Handbook 48 of the National Bureau of Standards may be followed.

REGULATION 19. SHOE-FITTING FLUOROSCOPES. (a) No fluoroscopic or x-ray equipment for fitting shoes shall be operated unless it is equipped with an automatic timer which will cut off each x-ray exposure at the end of a five-second interval.

(b) All establishments which use a shoe-fitting fluoroscope shall display at all times, in a location where all users can see it, a warning sign furnished by the state department of health.

(c) Exposure to the useful beam measured on the base of the foot opening in fluoroscopic shoe-fitting machines installed after September 1, 1955, shall not exceed 1.0 roentgen per five-second exposure.

Exposure to the useful beam measured on the base of the foot opening of fluoroscopic shoe-fitting machines installed prior to September 1, 1955, shall not exceed two roentgens per five-second exposure. After January 1, 1960, no shoe-fitting fluoroscope shall be operated if the exposure to the useful beam measured on the base of the foot opening exceeds 1.0 roentgen per five-second exposure.

(d) The base of the foot opening shall be covered with a sheet of aluminum at least 2 mm. thick and of dimensions equal to or greater than the base. This aluminum filter shall be protected from wear by a covering layer of other material and shall be installed in such a fashion that its thickness can be conveniently determined.

(e) Only salespersons shall be permitted to operate a shoe-fitting fluoroscope. The starting mechanism shall be so designed and located as to prevent operation by customers.

(f) The fluorescent viewing screen shall be covered with leaded glass having a lead equivalent of at least 1.5 mm.

(g) Customers should be required to have shoes on both feet during a fluoroscopic examination.

(h) Customers should be questioned regarding dates and numbers of previous shoe-fitting fluoroscopic examinations and may not be allowed such fittings in excess of 12 five-second viewings per year or in excess of three per day.

(i) Salespersons shall operate the device for their own customers only.

(j) Salespersons shall not use their own feet or hands for demonstrating x-ray fluoroscopy. Children's feet shall not be held in position by any person while the machine is in operation.

(k) Salespersons shall report any defects in the machine to the person in charge of the establishment wherein such machine is installed. Defective machines shall not be operated until repairs are made.

(l) Machines shall be located as far as possible from frequently occupied areas. X-ray tubes shall be shielded and cabinets constructed so that stray radiation is reduced to less than 10 milliroentgens per hour at all positions six inches from the cabinet surface and at viewing ports at eye level, except at the foot opening. Foot openings shall be so oriented and shielded that scattered radiation from the openings is not directed toward areas which are continuously or frequently occupied unless suitable protecting screens are interposed. Scatter radiation from the foot opening shall not exceed a rate of 10 milliroentgens per hour at a distance of ten feet.

(m) All metal non-current carrying parts shall be properly grounded.

(n) An interlocking switch shall be provided on any door or panel giving access to high voltage components. This switch shall operate to break the electrical current whenever the door or panel is opened.

(o) Cabinet doors or panels shall be kept locked at all times except when making necessary repairs.

ITEM 5

MICHIGAN ADMINISTRATIVE CODE

Michigan Department of Health

Division of Occupational Health

REGULATIONS GOVERNING THE USE OF RADIOACTIVE ISOTOPES, X-RADIATION AND ALL OTHER FORMS OF IONIZING RADIATION

PART 1. ADMINISTRATIVE RULES AND PROCEDURES

R 325.1301. Radiation protection advisory committee.

Sec. 1. The state health commissioner shall appoint a radiation protection advisory committee to be known as the commissioner's radiation committee which will serve to advise him on all matters pertaining to radiation protection and the rules and regulations promulgated for this purpose.

R 325.1302. Same; qualification of members, chairman.

Sec. 2. The state health commissioner shall appoint 9 members to serve on the commissioner's radiation committee.

2.1 Members shall be appointed on the basis of their recognized knowledge in the field of radiation and the committee shall be so constituted as to be a fair representation of all interested groups of users of ionizing radiation.

2.2 The state health commissioner or his representative shall act as chairman of the committee.

2.3 Members shall be appointed for 3-year periods. Of the original appointees, 3 shall be appointed for 1 year, 3 for 2 years, and 3 for 3 years.

2.4 The committee shall meet for review of these regulations at least once annually and at such other times, not to exceed 4 times a year, as may seem necessary. Meetings may be called by the state health commissioner on his own initiative or at the request of 5 or more of the members.

R 325.1303. Technical committees or consultants, appointment.

Sec. 3. The state health commissioner may appoint such technical committees or consultants as may be indicated from time to time.

R 325.1304. Local health departments, enforcement of rules.

Sec. 4. The state health commissioner may delegate authority to the county, city or district health departments to enforce these rules and regulations.

PART 2. GENERAL REQUIREMENTS AND DEFINITIONS

R 325.1305. Sec. 5. Scope of regulations.

5.1 These regulations apply to all persons who receive, possess or use materials or devices capable of emitting ionizing radiation as de-

fined in these regulations except the sources or uses cited in section 7, exemptions.

5.2 Person includes any municipality, industry, public corporation, copartnership, firm or any other entity whatsoever.

5.3 Nothing in these regulations should be interpreted as limiting the intentional exposure of patients to radiation for the purpose of medical diagnosis, medical therapy, or medical research conducted by duly licensed members of the healing professions.

R 325.1306. Sec. 6. Registration of users and sources of radiation.

6.1 Within 10 days after receipt or completion thereof all sources of ionizing radiation shall be registered with the state health commissioner by the legal owner, user or authorized representative. Registration information shall include the name and address of the owner or user, the name of the individual and the training and/or qualification of the individual who will be appointed by the owner or user to see that the radiation source is safely used and stored, location in which the radiation source shall be used or stored, type of radiation source, and the quantity in curies or the energy and capacity of the radiation source. Existing sources of ionizing radiation shall be registered within 90 days of the effective date of these rules and regulations. The owner of every registered source of ionizing radiation shall advise the state health commissioner and receive prior approval for all changes which may materially increase the potential health hazard.

6.2 A written exemption to the notification of changes, which may materially increase the potential health hazard in an existing installation, or the registering of each individual source or use may be granted by the state health commissioner, provided that the legal owner, user or authorized representative of the registered source is registered with the state health commissioner and the registrant meets the health and safety requirements specified and prescribed in these regulations for such registrant by the state health commissioner.

R 325.1307. Sec. 7. Exemptions.

7.1 The following materials, sources and uses are exempted from registration:

7.1.1 Natural radioactive materials of an equivalent specific radioactivity not exceeding that of natural potassium.

7.1.2 (1) Radioactive materials in such total quantity that if the entire amount were taken internally, at any one time by a single person, no harmful effects would be likely to result. A listing of the upper quantities of radioactive material that shall not require registration are given in appendix D. Up to

10 quantities of material listed in this appendix may be possessed by any person provided that no 2 or more quantities are combined in any way so as to increase the amount of radioactive material in any one quantity.

(2) Radioactive materials in air, water, or food in concentrations not exceeding those listed in appendix B, table II, columns 1 or 2 of these regulations, or radioactive materials in non-edible liquids and solids in such concentrations that they would not result in contamination of air, water, or edibles in excess of the limits in appendix B, table II, columns 1 or 2 of these regulations.

7.1.3 Electrical equipment that is primarily not intended to produce radiation and that, by nature of design, does not produce radiation at the point of nearest approach at a rate higher than 1/10 of the appropriate permissible limit for any critical organ exposed. The production testing or production servicing of such equipment shall not be exempted only if the dose to the gonads is less than 1/10 of the appropriate maximum permissible limit.

7.1.4 Timepieces, instruments, novelties, or devices containing self-luminous elements. However, all persons engaged in the manufacture or repair of self-luminous elements and possessing amounts of radioactive materials in excess of the limits prescribed in appendix B, table II, column 2, of these regulations shall register such sources.

7.1.5 Radiation devices not being used in such manner as to produce radiation.

7.1.6 Radioactive material being transported in accordance with specific radiation safety regulations of a state or federal agency having jurisdiction over such transport.

7.1.7 Any other special research devices or nuclear devices so specified by the state health commissioner.

R 325.1308. Sec. 8. Definition of terms.

8.1 For the purpose of these regulations, the following terms shall mean:

8.1.1 Air-borne radioactive material means any radioactive material dispersed in the air in the form of dusts, fumes, mists, vapors, or gases.

8.1.2 Air-borne radioactivity area means any area in which air-borne radioactive materials are accessible to persons in concentrations of which

(1) Values at any time are in excess of respective values stated in appendix B, table I, column 1; or

(2) Values averaged over a week of working time are in excess of 25% of the respective values stated in appendix B, table I, column 1.

8.1.3 Authorized recipient means any person licensed by the Atomic Energy Commission to possess radioactive materials, and if resident in Michigan, registered under these regulations.

8.1.4 Controlled area means any area in which the activities of occupants are subject to control or supervision by the registrant and which is designated by the registrant as a potential radiation hazard area. (A controlled area shall not include space in use as residential quarters, although a room or rooms in a residential building may be set apart as a controlled area.)

8.1.5 Diagnostic-type housing. A type of x-ray tube housing that reduces the leakage radiation to at most 0.10 r/hr at a distance of 1 meter from the tube target when the tube is operating at its maximum continuous rated current for the maximum rated voltage.

8.1.6 Dose is a quantity of radiation measured at a certain point expressed in roentgens, rems or rads.

Absorbed dose of any ionizing radiation is the amount of energy imparted to matter by ionizing particles per unit mass of irradiated material at the place of interest (expressed in rads).

Exposure dose is a quantity of radiation measured in air in roentgens without back scatter at a given point.

Dose rate is dose per unit time.

8.1.7 Film badge is an appropriately packaged and calibrated sensitive film for detecting and measuring ionizing radiation received by persons. It is usually dental-film size and worn/or carried on the person.

8.1.8 High radiation area means any area accessible to personnel, in which there exists radiation at such levels, that a major portion of the body could receive in any 1 hour a dose in excess of 100 millirems.

8.1.9 Installation is a location where for a period of more than 30 days 1 or more sources of radiation are used, operated, or stored. The confines of an installation shall be designated by the owner. A part of a building, an entire building or a plant may be designated as an installation.

8.1.10 Ionizing radiation means any or all of the following forms of ionizing radiation: alpha rays, beta rays, gamma rays,

x-rays, neutrons, high-speed electrons, high-speed protons and other atomic particles; but not sound or radio waves, or visible, infra-red, or ultraviolet light.

8.1.11 Leakage radiation is all radiation coming from within the tube housing except the useful beam.

8.1.12 Maximum permissible dose is that dose of ionizing radiation which, in the light of present knowledge, is not expected to cause bodily injury to a person during his lifetime.

8.1.13 Normal operating conditions for x-ray machines. Operating conditions under which the x-ray apparatus is normally used with respect to the following:

(a) Maximum tube voltage
(b) Maximum tube current
(c) Total weekly operational time
(d) Direction of the useful beam
(e) Minimum radiographically usable distance from the tube to personnel barrier
(f) Occupancy of adjacent areas

8.1.14 Occupancy factor (T) is the factor by which the work load should be multiplied to correct for the degree or type of occupancy of the area in question.

8.1.15 Occupied area is an area that may be occupied by persons or radiation sensitive materials.

8.1.16 Personnel barrier is a barrier which restricts the movements of personnel in the vicinity of an x-ray apparatus.

8.1.17 Potential radiation area. That area surrounding a radiation source such that the radiation source may produce a radiation field in the area, if it is operated under maximum conditions, which exceeds 1/10 of the maximum permissible dose based on 13 weeks of continuous occupancy.

8.1.18 Primary radiation is radiation coming directly from the target of an x-ray tube or from other radiation sources.

8.1.19 Protective apron is an apron made of attenuating materials used to reduce radiation hazards.

8.1.20 Protective barrier is attenuating material used as shield to reduce radiation hazards.

Primary protective barrier is a barrier sufficient to attenuate the useful beam to the required degree.

Secondary protective barrier is a barrier sufficient to attenuate the stray radiation to the required degree.

8.1.21 Protective glove is a glove made of attenuating materials used to reduce radiation hazards.

8.1.22 Rad is that quantity of any radiation which produces an absorbed dose of 100 ergs per gram.

8.1.23 Radiation area. Any part of an installation accessible to employees in which there exists a radiation level of 7.5 millirem in any 1 hour or over 150 millirem in any 7 consecutive days.

8.1.24 Radiation field is the region in which ionizing radiation is propagated.

8.1.25 Radiation hazard is any situation where persons might be exposed to radiation in excess of the maximum permissible dose.

8.1.26 Radiation monitoring is the periodic or continuous determination of the dose rate in an occupied area (area monitoring) or of the dose received by a person (personnel monitoring).

8.1.27 Radioactive material means any compound or element which may emit any or all of the following: alpha and beta particles, electrons, photons, neutrons and gamma and all other emissions which produce ionization directly or indirectly.

8.1.28 Relative biological effectiveness (RBE) is the biological effectiveness of 1 type and energy of radiation, relative to that of lightly filtered x-rays, generated at potentials of 200 to 300 kv, for the particular biological system and biological effect, and for the conditions under which the radiation is received.

8.1.29 Rem is the quantity of any radiation such that the energy imparted to a biological system (cell, tissue, organ, or organism) per gram of living matter by the ionizing particles present in the region of interest, has the same biological effectiveness as an absorbed dose of 1 rad from lightly filtered x-rays generated at potentials of 200 to 300 kv. A dose in rems is equal to the dose in rads multiplied by the appropriate RBE.

8.1.30 Roentgen is the quantity of x or gamma radiation such that the associated corpuscular emission per 0.001293 grams of air produces, in air, ions carrying 1 electrostatic unit of quantity of electricity of either sign. The roentgen is applicable only to x- and gamma radiation of quantum energies up to 3,000,000 electron volts.

8.1.31 Scattered radiation is radiation that has been deviated by substances in its path.

8.1.32 Sealed source means any radioactive material that is encased in and is to be used in a container in a manner intended to prevent leakage of the radioactive material.

8.1.33 Secondary radiation is radiation emitted by any matter being irradiated with x-rays, gamma rays, etc. or with any high energy rays or particles.

8.1.34 Source of ionizing radiation is any material that is emitting ionizing radiation spontaneously or as a result of impingement of energy upon it.

8.1.35 Stray radiation is radiation not serving any useful purpose. It includes leakage and secondary radiation.

8.1.36 Survey means an evaluation of the radiation hazards incident to the production, use, release, disposal, or presence of radioactive materials or other sources of radiation under a specific set of conditions.

8.1.37 Therapeutic-type housing. An x-ray tube housing that reduces the leakage radiation to at most 1.0 r/hr at a distance of 1 meter from the tube target and 1.0 r/min. at any point on the surface of the housing when the tube is operating at its maximum continuous rated current for the maximum rated voltage.

8.1.38 Uncontrolled area means any area not designated as a controlled area.

8.1.39 Use factor (U) is the fraction of the work load during which the useful beam is pointed in the direction under consideration.

8.1.40 Useful beam is that part of the primary radiation that passes thru the aperture, cone or other collimator.

8.1.41 (1) Workload (W) is the working activity of an x-ray machine measured in milliampere minutes per week.
(2) Workload (W) is the total exposure measured in roentgens per week in the useful beam at 1 meter from a teletherapy source.

8.1.42 X-ray apparatus shall mean any source of x-ray and its high voltage supply, including high energy betatron.

Part 3. Permissible Dose Levels and Concentrations

R 325.1309. Sec. 9. Basic standards.

These basic standards are designed to be in general conformance with requirements of recognized authorities, are based on current knowledge of biological effects of radiation, and subject to change with the development of new information or with substantial increase in the average exposure of the whole population to radiation.

9.1 Exposure of individuals in controlled areas.

9.1.1 Exposure to radiation:

(1) Except as provided in subparagraph (2) of this paragraph no registrant shall possess, use or transfer radioactive material in such a manner as to cause any individual in a controlled area to receive in any period of 7 consecutive days from radioactive material and other sources of radiation in the registrant's possession a dose in excess of the limits specified in appendix A.

(2) A registrant may permit an individual in a controlled area to receive a dose in excess of the limits established in sub-paragraph (1) of this paragraph provided (a) this dose accumulated during any period of 7 consecutive days does not exceed 3 times the limits specified in appendix A, and (b) that the dose accumulated during the period of any 13 consecutive weeks does not exceed 10 times the limits specified in appendix A.

(3) It is further provided that the maximum permissible accumulated dose, in rems, at any age, shall not exceed 5 times the number of years beyond the age 18, and that no annual increment shall exceed 15 rems.

9.1.2 No registrant shall possess, use, or transfer registered material in such a manner as to cause any individual in a controlled area to be exposed to air-borne radioactive material as specified by the registrant in an average concentration in excess of the limits specified in appendix B, table I. The limits given in appendix B, table I are based on exposure to the concentrations specified for 40 hours in any period of 7 consecutive days. In any such period where the number of hours of exposure is less than 40, the limits specified in the table may be increased proportionately, provided the number of hours of work in any period of 7 consecutive days is less than 40. In any such period where the number of hours of exposure is greater than 40, the limits specified in the table shall be decreased proportionately.

9.1.3 Exposure to minors: No registrant shall possess, use or transfer registered material in such a manner as to cause any individual under 18 years of age within a controlled area to receive in any period of 7 consecutive days from radioactive material and other sources of radiation in the registrant's possession a dose in excess of the 10% of the limits specified in appendix A or to be exposed to air-borne radioactive material possessed by the registrant in a concentration in excess

of the limits specified in appendix B, table 2. Concentrations may be averaged over a period of not greater than a week.

9.2 Permissible levels of radiation in uncontrolled areas.

9.2.1 There may be included in any registration proposed limits on levels of radiation in uncontrolled areas resulting from the registrant's possession or use of radioactive material and other sources of radiation. Such registration should include such information as anticipated average radiation levels and anticipated occupancy times for each uncontrolled area involved. The state health commissioner may approve the proposed limits if the registrant will demonstrate that the proposed limits are not likely to cause any individual to receive a dose in any period of 7 consecutive days in excess of the 10% of limits specified in appendix A.

9.2.2 Except as authorized by the state health commissioner pursuant to paragraph 9.2.1 no registrant shall possess or use registered material in such a manner as to create in any uncontrolled area from radioactive material and other sources of radiation in his possession:

(1) Radiation levels which if an individual were continuously present in the area could result in his receiving an exposure dose in excess of 2 mr in any 1 hour.

(2) Or radiation levels which if an individual were continuously present in an area could result in his receiving an exposure dose in excess of 10 mr in any 7 consecutive days.

9.2.3 Except for radioactive materials being transported as contemplated by section 7.1.6 all radioactive materials which are transferred or moved through uncontrolled areas shall be packaged in tightly sealed unbreakable containers. Absorbent materials sufficient to absorb the liquid contents of any radioactive liquids shall be wrapped around the container inside any shielding present if the radioactivity is transferred in liquid form. In addition the radioactive material must be packaged so that:

(1) The radiation field on any acceptable surface of the container is less than 200 mr per hour.

(2) The radiation field 1 meter from the center of the container is less than 10 mr per hour.

(3) The outside dimensions of the container are equal to or greater than 4 x 4".

In the process of transferring or moving radioactive materials in such containers they shall not be allowed to remain

in any 1 uncontrolled area longer than 2 working days. All containers shall in addition be labeled as specified in section 11.3.6.

9.2.4 An exemption may be granted by the state health commissioner if it can be shown that an unwarranted hardship is caused by the requirements in section 9.2.2.

9.3 Concentrations of effluent to uncontrolled areas.

9.3.1 There must be included in any registration, proposed limits of concentrations of registered radioactive material released into the air in uncontrolled areas as a result of the registrant's proposed activity. Such registration should include information as to anticipated average concentrations and anticipated occupancy time for each uncontrolled area involved. The state health commissioner will approve the proposed limits if the registrant demonstrates that it is not probable that any individual will be exposed to concentrations in excess of the limits specified in appendix B, table II, column 1. For purposes of this section concentrations may be averaged over periods not greater than 1 year.

9.3.2 Except as authorized by the state health commissioner pursuant to paragraph 9.3.1 no registrant shall possess, use or transfer registered material in such a manner as to release into air in any uncontrolled area any concentration of radioactive material in excess of the limits specified in appendix B, table II, column 1. For purposes of this section concentrations may be averaged over a period not greater than 1 year.

Part 4. Excessive Exposures

R 325.1310. Sec. 10. Excessive exposures.

10.1 Measures to be taken in event of excessive exposures.

10.1.1 In the event that any individual in a controlled area receives a dose or is exposed to concentrations of radioactive material in excess of the permissible limits established in part 3, section 9.1, the registrant shall limit the weekly dose or exposure of the individual to 10% of such permissible limits until such time as the average weekly dose or exposure to the individual for the period beginning the week the excessive dose or exposure occurred is less than the permissible limit established in part 3, section 9.1.

10.2 Emergency exposure for firemen, policemen and other emergency personnel.

10.2.1 Emergency work involving high level exposure to radiation from external sources with photon energy less than 3,000,000 electron volts shall be carried out on the basis that the person will not receive doses higher than the following:

(1) Exposure of the whole body—any adult—total dose measured in air up to 25 r.

(2) Local exposure—any adult—dose measured in air and additional to whole-body doses:

Hands and forearms, up to 100 roentgens

Feet and ankles, up to 100 roentgens

10.2.2 The responsibility for monitoring of the area or the personnel subjected to emergency exposure shall be assigned to a person designated by the registrant to be responsible for the radiological health phase of the operation and said person shall not be assigned other duties during the emergency.

10.2.3 Women shall not be subjected to emergency exposure unless physically incapable of reproduction.

10.2.4 The following incidents shall be reported to the state health department within 6 hours by phone and telegram of any incident involving registered material possessed by him and which may have caused or threatens to cause:

(1) Exposure of any individual to 25 rems or more, including any radioactive material taken into the body; or

(2) The release of radioactive material in concentrations which, if averaged over a period of 24 hours, would exceed 5,000 times the limits specified for such materials in appendix B, table II.

10.2.5 The following incidents must be reported to the state health department within 24 hours by phone and telegram of any incident involving registered material possessed by him and which may have caused or threatens to cause:

(1) Exposure of any individual to 3 rems or more, including any radioactive material taken into the body, or

(2) The release of radioactive materials in concentrations which, if averaged over a period of 24 hours, would exceed 500 times the limits specified for such materials in appendix B, table II.

10.2.6 Those incidents requiring 30 day reports

(1) Each registrant shall make a report in writing within 30 days to the state health department of each incident involving a registered facility owned or leased by the

registrant, which has caused an exposure of an individual to radiation or concentrations of radioactive material or have resulted in levels of radiation or concentrations of radioactive material in excess of applicable limits set forth in these regulations.

Part 5. Precautionary Procedures

R 325.1311. Sec. 11. Precautionary procedures.

11.1 Surveys.

11.1.1 Each registrant shall make or cause to be made such surveys as may be necessary for him to comply with the regulations.

11.2 Personnel monitoring.

11.2.1 Each registrant shall supply appropriate personnel monitoring equipment to, and shall require the use of such equipment by:

(1) Each individual who enters a controlled area under such circumstances that he receives, or is likely to receive, a dose in excess of 25% of the limits specified in appendix A of these regulations.

(2) Each individual who enters a high radiation area.

11.3 Caution signs, labels, and signals.

11.3.1 Except as otherwise authorized by the state health commissioner, symbols prescribed by this section shall use the conventional radiation caution colors (magenta or purple on yellow background). The symbol prescribed by this section is the conventional 3-bladed design:

Radiation Symbol

(1) Cross-hatched area is to be magenta or purple.

(2) Background is to be yellow.

11.3.1.1 In addition to the contents of signs and labels prescribed in this section, registrants may provide on or near such signs and labels any additional information which may be appropriate in aiding individuals to minimize exposure to radiation or to radioactive material.

11.3.2 Radiation area. Each radiation area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words (medical installations may be exempted from this posting):

Caution—Radiation Area

11.3.3 High radiation areas.

11.3.3.1 Each high radiation area shall be conspicuously

posted with a sign or signs bearing the radiation caution symbol and the words:

Caution
High Radiation Area

11.3.3.2 Each high radiation area shall be equipped with a control device which shall either cause the level of radiation to be reduced below that at which an individual might receive a dose of 100 millirem in 1 hour upon entry into the area or shall energize a conspicuous visible or audible alarm signal in such a manner that the individual entering and the registrant or a supervisor of the activity are made aware of the entry.

11.3.4 Air-borne radioactivity areas.

11.3.4.1 Each air-borne radioactivity area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words:

Caution
Air-borne Radioactivity Area

11.3.5 Additional requirements.

11.3.5.1 Each area or room in which registered material is used or stored and which contains any radioactive material (other than natural uranium or thorium) in an amount exceeding 10 times the quantity of such material specified in appendix C of this part shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words:

Caution
Radioactive Material (s)

11.3.5.2 Each area or room in which natural uranium or thorium is used or stored in an amount exceeding 100 times the quantity specified in appendix C shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words:

Caution
Radioactive Material (s)

11.3.6 Containers.

11.3.6.1 Each container in which is transported, stored, or used a quantity of any registered material (other than natural uranium or thorium) greater than the quantity of such material specified in

appendix C shall bear a durable, clearly visible label bearing the radiation caution symbol and the words:

Caution
Radioactive Material

11.3.6.2 Each container in which natural uranium or thorium is transported, stored, or used in a quantity greater than 10 times the quantity specified in appendix C shall bear a durable, clearly visible label bearing the radiation caution symbol and the words:

Caution
Radioactive Material

11.3.6.3 Notwithstanding the provisions of subparagraphs (1) and (2) a label shall not be required:
(1) If the concentration of the material in the container does not exceed that specified in appendix B, table I, column 2 or
(2) For laboratory containers, such as breakers, flasks, and test tubes, used transiently in laboratory procedures, when the user is present.

11.3.6.4 Where containers are used for storage, the labels required in this paragraph shall state also the quantities and kinds of radioactive materials in the containers and the date of measurements of the quantities.

11.4 Exceptions from posting requirements. (Notwithstanding the provisions of 11.3.)

11.4.1 A room or area is not required to be posted with a caution sign because of the presence of a sealed source provided the radiation level 12 inches from the surface of the source container or housing does not exceed 5 millirem per hour.

11.4.2 Rooms or other areas in hospitals are not required to be posted with caution signs because of the presence of patients containing byproduct material provided that there are personnel in attendance who shall take the precautions necessary to prevent the exposure of any individual to radiation or radioactive material in excess of the limits established in the regulations.

11.4.3 Caution signs are not required to be posted at areas or rooms containing radioactive materials for periods of less than 8 hours provided that (1) the materials are constantly

attended during such periods by an individual who shall take the precautions necessary to prevent the exposure of any individual to radiation or radioactive materials in excess of the limits established in the regulations, and, (2) such area or room is subject to the registrant's control.

11.5 Instruction of personnel.

11.5.1 All individuals working in or frequenting any portion of a controlled area shall be informed of the presence of radioactive materials or of radiation in such area, and shall be instructed in the hazards of excessive exposure to such materials or radiation and in precautions or procedures to minimize exposure.

11.5.2 Each registrant shall have on file and available 1 or more copies of these regulations and of the appropriate national bureau of standards radiation protection handbooks.

11.6 Storage of registered material.

11.6.1 Registered material stored in an uncontrolled area shall be secured against unauthorized removal from the place of storage.

11.7 No x-ray apparatus shall be left unattended without locking the apparatus itself, or the room or building in some manner which will prevent its use by unauthorized persons.

Part 6. Waste Disposal

R 325.1312. Sec. 12. Waste disposal.

12.1 General requirements—No registrant shall dispose of registered waste material except:

12.1.1 By transfer to an authorized recipient, or

12.1.2 As authorized pursuant to 12.2, or

12.1.3 As provided in 12.3 or 12.4 applicable respectively to the disposal of registered material by release into sanitary sewerage systems or burial in soil, or in 9.3.

12.1.4 In accordance with Act 245, Public Acts of 1929 (CL 1948, § 323.1 et seq.), as amended by Act 117, Public Acts of 1949.

12.2 Method for obtaining approval of proposed disposal procedures.

12.2.1 Any registrant may apply to the state health commissioner for approval of proposed procedures to dispose of registered material in a manner not otherwise authorized in the regulations except for disposal to surface waters. Each application should include a description of the registered material and any other radioactive material involved, including the quantities and kinds of such material, the levels

of radioactivity involved, and the proposed manner and conditions of disposal. The application should also include an analysis and evaluation of pertinent information as to the nature of the environment, including topographical, geological, meteorological, and hydrological characteristics; usage of ground and surface waters in the general area; the nature and location of other potentially affected facilities; and procedures to be observed to minimize the risk of unexpected or hazardous exposures.

12.3 Disposal by release into sanitary sewerage systems.

12.3.1 No registrant shall discharge registered material into a sanitary sewerage system unless:

(1) It is readily soluble or dispersible in water; and

(2) The quantity of any registered material released into the system by the registrant in any 1 day does not exceed the larger of subparagraphs (a) or (b) of this paragraph.

(a) The quantity, which if diluted by the average daily quantity of sewage released into the sewer by the registrant, will result in an average concentration equal to the limits specified in appendix B, table I, column 2, or

(b) Ten times the quantity of such material specified in appendix C, and

(3) The quantity of any registered material released in any 1 month, if diluted by the average monthly quantity of water released from the premises of the registrant, will not result in an average concentration exceeding the limits specified in appendix B, table I, column 2, and

(4) The gross quantity of registered material released into the sewerage system by the registrant does not exceed 1 curie per year.

12.4 Disposal by burial in soil. No registrant shall dispose of registered material by burial in soil unless:

12.4.1 The total quantity of registered materials buried at any 1 location and time does not exceed, at the time of burial, 1,000 times the amount specified in appendix C of these regulations, and

12.4.2 Burial is at a minimum depth of 4 feet, and

12.4.3 Successive burials are separated by distances of at least 6 feet and not more than 12 burials are made in any year.

12.4.4 Burial of registered materials in amounts exceeding 1,000 times the amounts specified in appendix C may be per-

mitted in a controlled and posted area at the discretion of and with the express permission of the state health commissioner. Applications for the establishment of controlled burying grounds must be reviewed by the advisory committee.

12.4.5 Burial sites shall be approved and registered with the state health commissioner. Burial shall be in a controlled area.

Part 7. Industrial Radiographic Installations

R 325.1313. Sec. 13. Industrial radiographic installations; classification.

For the purpose of registering and approving industrial radiographic installations all industrial installations shall be classified as either class A, class B, class C or class D. This section is to include isotopic sources in which case appropriate requirements under each installation class shall be applied.

13.1 Class A installation requirements for unlimited use at maximum capacity.

13.1.1 The x-ray source and objects exposed thereto must be contained within a permanent enclosure.

13.1.2 The enclosure shall be constructed

(1) So that the primary and secondary x-rays are attenuated to a dose rate as measured in air at any accessible external point not to exceed 7 mr/hr when the x-ray beam is adjusted to give maximum dose rate with the x-ray generator running at maximum operating conditions and the x-ray tube placed in the shortest "tube to wall" radiographically usable position. Mechanical or electrical limiters may be placed on the x-ray apparatus to restrict the movement of the beam to an area which will result in a dose rate not in excess of 7 mr/hr measured in air at any accessible point. Personnel working adjacent to the enclosure area shall not be exposed to a dose greater than 100 mr/week.

(2) With reliable interlocks which will either prevent anyone from entering the enclosure while the x-ray generator is in operation or will terminate the generation of x-rays should anyone enter the enclosure.

(3) So that persons may at all times be able to escape from within the enclosure.

(4) With visible and/or audible signals within the enclosure which are actuated a minimum of 5 seconds before the generation of x-rays.

(5) When the ceiling barrier does not meet the dose rate as indicated in the part above, a barrier such as a fence may be used to restrict access to the area on the roof.

13.1.3 No person is to be permitted to remain within the enclosure while the x-ray generator is in operation.

13.1.4 All protective enclosures and equipment shall be kept in good repair.

13.2 Class B installations for unlimited use under normal operating conditions as specified by the registrant at the time of registration.

13.2.1 The x-ray source and objects exposed thereto must be contained within a permanent enclosure.

13.2.2 The enclosure shall be constructed

(1) So that the primary and secondary x-rays are attenuated to a dose rate as measured in air at any accessible external point not to exceed 7 mr/hr when the x-ray beam is adjusted to give maximum dose rate with the x-ray generator running at normal operating conditions and the x-ray tube placed in the shortest "tube to wall" radiographically usable position. Mechanical or electrical limiters may be placed on the x-ray apparatus to restrict the movement of the beam to an area which will result in a dose rate not in excess of 7 mr/hr measured in air at any accessible point. Personnel working in the immediate enclosure area shall not be exposed to a dose greater than 100 mr/week.

(2) With reliable interlocks which will either prevent anyone from entering the enclosure while the x-ray generator is in operation or will terminate the generation of x-rays should anyone enter the enclosure.

(3) So that persons may at all times be able to escape from within the enclosure.

(4) With visible and/or audible signals within the enclosure which are actuated a minimum of 5 seconds before the generation of x-rays.

(5) When the ceiling barrier does not meet the dose rate as indicated in the part above, a barrier such as a fence may be used to restrict access to the area on the roof.

13.2.3 The controls for the kilovoltage and milliamperage shall be limited by mechanical or electrical means so as not to exceed the normal operating conditions as specified by the registrant at the time of registration.

13.2.4 No person is to be permitted to remain within the enclosure while the x-ray generator is in operation.

13.2.5 All protective enclosures and equipment shall be kept in good repair.

13.3 Class C installations for limited use under conditions specified by the registrant at the time of registration.

13.3.1 The x-ray source and objects exposed thereto must be contained within a permanent enclosure.

13.3.2 The enclosure shall be constructed

(1) So that the primary and secondary x-rays are attenuated to a dose rate as measured in air at any accessible external point not to exceed 50 mr/hr when the x-ray beam is adjusted to give a maximum dose rate with the x-ray generator running at its maximum rated capacity and the x-ray tube placed in the shortest "tube to wall" radiographically usable and/or limited position.

(2) With reliable interlocks which will either prevent anyone from entering the enclosure while the x-ray generator is in operation or will terminate the generation of x-rays should anyone enter the enclosure.

(3) So that persons may at all times be able to escape from within the enclosure.

13.3.3 The workload of the machine shall be restricted so that the dose at any accessible point outside the protective enclosure does not exceed 100 mr/week with the x-ray generator running at its maximum capacity.

13.3.4 The number of hours per day or week for permissible operation shall be established for the x-ray generator by the state health commissioner under the conditions established by the registrant at the time of registration.

13.3.5 Warning signs should be posted in those areas outside the protective barriers in which the dose rate in air at any accessible external point exceeds 2 mr/hr with the generator operating at its maximum rated capacity and the x-ray beam adjusted to give its maximum dose rate and the x-ray tube placed in the shortest "tube to wall" usable and/or limited radiographic position.

13.3.6 Mechanical or electrical limiters shall be placed on the x-ray apparatus to restrict its movement to an area which will result in a dose rate not in excess of 50 mr/hr measured in air at any accessible point.

13.3.7 All protective enclosures and equipment shall be kept in good repair.

13.3.8 No person is to be permitted to remain within the enclosure while the x-ray generator is in operation.

13.3.9 Film badges or other permanent recording instruments shall be provided and required to be worn continuously by persons in the area at all times.

13.4 Class D installations for limited use and for temporary operation (to include portable or mobile industrial x-ray installations).

13.4.1 An x-ray installation not meeting the conditions and specifications as described as class A, class B, or class C may be operated for a period not to exceed 30 days or when it is impractical or when an undue and unnecessary hardship is involved, it may be extended by the state health commissioner for a period longer than 30 days. In either case such installation and operation of such installation shall have the approval of the state health commissioner and shall be classified as a class D installation.

13.4.2 All such installations shall have the radiation area in excess of 5 mr/hr barricated by a fence, a rope or other suitable barriers erected along the 5 mr/hr contour line.

13.4.3 The area described by the temporary barricade shall be suitably posted with caution signs.

13.4.4 Film badges or other permanent recording instruments shall be provided and required to be properly used on a continual basis for personnel in the area at all times.

13.5 Industrial radiographic installations utilizing high intensity sealed sources of radioactive material shall meet all appropriate requirements for radiological safety specified for x-ray installations of class A, B, C, or D, whichever may be applicable.

13.5.1 The source when not in use shall be enclosed within a protective housing such that the dose rate does not exceed an average of 2 mr/hr or a maximum of 10 mr/hr at 1 meter from the source.

13.5.2 If the source is permanently mounted in a housing with a beam control device or extended from and retracted into a housing, this device shall be of positive design capable of acting in any position of the housing. It shall also be possible to move the source to a shielded position manually with a minimum risk of exposure in the event of the failure of the automatic mechanism. There shall be on the housing and on the control panel, a warning device which plainly indicates whether the apparatus is "on" or "off."

13.5.3 If the apparatus is of a type in which the source is removed from the shield when in use, transfer shall be accomplished

by a remote control mechanism. Transfer mechanisms shall be so designed as to minimize the possibility of damage to the source in transit.

PART 8. MEDICAL INSTALLATIONS

(Not Reproduced)

PART 9. DENTAL RADIOGRAPHIC INSTALLATIONS

(Not Reproduced)

PART 10. FLUOROSCOPIC SHOE X-RAY MACHINES

(Not Reproduced)

PART 11. MISCELLANEOUS TYPES OF X-RAY INSTALLATIONS

(Not Reproduced)

APPENDIXES

APPENDIX A—Permissible Total Weekly Doses in Significant Volumes of Critical Organs Under Various Conditions of Exposure
APPENDIX B—Maximum Permissible Average Concentrations of Radioactive Materials in Air and Water
APPENDIX C—Permissible Levels for Burials and Labelling Requirements
APPENDIX D—List of Maximum Quantities of Radioactive Material Exemptions
APPENDIX E—Protection Requirements for Fluorographic Installations
APPENDIX F—Protection Requirement for Fluoroscopic Installations
APPENDIX G—Protection Requirements for Radiographic Installations
APPENDIX H—Protection Requirements for Dental Installations
APPENDIX I—Protection Requirements for Therapeutic Installations

APPENDIX "A"

PERMISSIBLE TOTAL WEEKLY DOSES IN SIGNIFICANT VOLUMES OF CRITICAL ORGANS UNDER VARIOUS CONDITIONS OF EXPOSURE

Conditions of Exposure		Dose in Critical Organs (mrem) per week			
Part of Body	Radiation	Skin, at Basal Layer of Epidermis	Blood Forming Organs	Gonads	Lens of Eye
Whole Body	Any radiation with half-value-layer greater than 1 mm of soft tissue	600[a]	300	300	300
Whole Body	Any radiation with half-value-layer less than 1 mm of soft tissue	1500	300	300	300
Hands and Forearms or Feet and Ankles or Head and Neck	Any radiation	1500[b]			

[a] For exposures of the whole body to X or gamma rays up to 3 Mev, this condition may be assumed to be met if the exposure dose does not exceed 300 mr, provided the dose to the gonads does not exceed 300 mrem.

[b] Exposure of these limited portions of the body under these conditions does not alter the total weekly dose of 300 mrem permitted to the bloodforming organs in the main portion of the body, to the gonads, or to the lens of the eye.

APPENDIX "B"

MAXIMUM PERMISSIBLE AVERAGE CONCENTRATIONS OF RADIOACTIVE MATERIALS IN AIR AND WATER

Note: In applying table I, exposures in any week should be averaged over 40 hours. In applying table II, concentrations of radioactive material should be averaged over 1 year.

Material	Half-Life (1) (Days)	Controlled (40 hrs.-week) Table I Column 1 Air (2)	Table I Column 2 Water (3)	Uncontrolled Table II Column 1 Air (2)	Table II Column 2 Water (3)
A^{41}	0.074	1.6×10^{-6}	1.4×10^{-3}	5×10^{-6}	5×10^{-5}
Ag^{105}	2.8	3.6×10^{-5}	5	1.2×10^{-6}	1.6×10^{-1}
Ag^{111}	2.1	1×10^{-4}	13	3×10^{-6}	4×10^{-1}
Am^{241}	890	8×10^{-11}	4×10^{-4}	3×10^{-12}	1.3×10^{-5}
As^{76}	1.09	7×10^{-6}	6×10^{-1}	2×10^{-7}	2×10^{-2}
At^{211}	0.31	9×10^{-10}	6×10^{-6}	3×10^{-11}	2×10^{-7}
Au^{198}	2.6	3.4×10^{-7}	9×10^{-3}	1.1×10^{-8}	3×10^{-4}
Au^{199}	3.1	8×10^{-7}	2×10^{-2}	2.5×10^{-8}	7×10^{-4}
$Ba^{140} + La^{140}$	12	2×10^{-7}	6×10^{-3}	6×10^{-9}	2×10^{-4}
Be^{7}	48	1.3×10^{-5}	3	4×10^{-7}	1×10^{-1}
C^{14}	180	1.4×10^{-6}	1×10^{-2}	5×10^{-8}	3.6×10^{-4}
Ca^{45}	151	9×10^{-8}	1.5×10^{-3}	3×10^{-9}	5×10^{-5}
$Cd^{109} + Ag^{109}$	77	2×10^{-7}	2×10^{-1}	7×10^{-9}	7×10^{-3}
$Ce^{144} + Pr^{144}$	180	2×10^{-8}	1×10^{-1}	7×10^{-10}	3.6×10^{-3}
Cl^{36}	29	1×10^{-6}	7×10^{-3}	4×10^{-8}	2.4×10^{-4}
Cm^{242}	120	5×10^{-10}	2.7×10^{-3}	1.8×10^{-11}	1×10^{-4}
Co^{60}	8.4	3.4×10^{-6}	5×10^{-2}	1.2×10^{-7}	1.8×10^{-3}
Cr^{51}	22	2.4×10^{-5}	1.4	8×10^{-7}	5×10^{-2}
$Cs^{137} + Ba^{137}$	17	6×10^{-7}	4.5×10^{-3}	2×10^{-8}	1.5×10^{-4}
Cu^{64}	0.53	2×10^{-5}	2.5×10^{-1}	6×10^{-7}	8×10^{-3}
Eu^{154}	820	2×10^{-8}	1×10^{-1}	6×10^{-10}	3×10^{-3}
F^{18}	.078	3.5×10^{-4}	2.6	1.2×10^{-5}	9×10^{-2}
Fe^{55}	61	1.8×10^{-6}	1.3×10^{-2}	6×10^{-8}	4×10^{-4}
Fe^{59}	27	5×10^{-8}	3.3×10^{-4}	1.5×10^{-9}	1.1×10^{-5}
Ga^{72}	0.59	1×10^{-5}	26	3.4×10^{-7}	9×10^{-1}
Ge^{71}	3.9	1×10^{-4}	27	3.6×10^{-6}	9×10^{-1}
H^{3} (HTO or T_2O)	19	7×10^{-5}	5×10^{-1}	2.5×10^{-6}	1.6×10^{-2}
Ho^{166}	1.1	1×10^{-5}	70	3×10^{-7}	2.3
I^{131}	7.7	9×10^{-9}	9×10^{-5}	3×10^{-10}	3×10^{-6}
Ir^{190}	7.3	2.2×10^{-6}	4×10^{-2}	7×10^{-8}	1.3×10^{-3}
Ir^{192}	17	1.5×10^{-7}	2.7×10^{-3}	5×10^{-9}	9×10^{-5}
K^{42}	0.51	6×10^{-6}	4×10^{-2}	2×10^{-7}	1.4×10^{-3}
La^{140}	1.6	4×10^{-6}	3.4	1.4×10^{-7}	1.1×10^{-1}
Lu^{177}	3.2	1.5×10^{-5}	70	5×10^{-7}	2.4
Mn^{56}	0.106	8×10^{-6}	5×10^{-1}	3×10^{-7}	1.5×10^{-2}
Mo^{99}	2.8	5×10^{-8}	40	1.8×10^{-4}	1.4
Na^{24}	0.61	5×10^{-6}	2.4×10^{-2}	1.6×10^{-7}	8×10^{-4}
Nb^{95}	21	1.3×10^{-6}	1.2×10^{-2}	4×10^{-8}	4×10^{-4}
Ni^{59}	8	5×10^{-5}	7×10^{-1}	1.6×10^{-6}	2.5×10^{-3}
P^{32}	14	4×10^{-7}	6×10^{-4}	1.4×10^{-8}	2×10^{-5}
Pb^{203}	2.16	2×10^{-5}	4×10^{-1}	6×10^{-7}	1.4×10^{-2}
$Pd^{103} + Rh^{103}$	4.4	2×10^{-6}	3×10^{-2}	7×10^{-8}	1×10^{-3}
Pm^{147}	140	6×10^{-7}	3	2×10^{-8}	1×10^{-1}
Po^{210} (sol.)	40	6×10^{-10}	9×10^{-5}	2×10^{-11}	3×10^{-6}
Po^{210} (insol.)	31	2×10^{-10}	..	7×10^{-12}	..

Continued

APPENDIX "B"—Continued

MAXIMUM PERMISSIBLE AVERAGE CONCENTRATIONS OF RADIOACTIVE MATERIALS IN AIR AND WATER

Material	Half-Life (1) (Days)	Controlled (40 hrs.-week) Table I Column 1 Air (2)	Controlled (40 hrs.-week) Table I Column 2 Water (3)	Uncontrolled Table II Column 1 Air (2)	Uncontrolled Table II Column 2 Water (3)
Pr^{143}	11	2.3×10^{-6}	1	7×10^{-8}	3.6×10^{-2}
Pu^{239} (sol.)	43000	6×10^{-12}	4.5×10^{-6}	2×10^{-12}	1.5×10^{-7}
Pu^{239} (insol.)	360	6×10^{-12}	..	2×10^{-12}	..
$Ra^{226} + \frac{1}{2}$ dr.	16000	2.4×10^{-11}	1.2×10^{-7}	8×10^{-12}	4×10^{-9}
Rb^{86}	7.8	1.1×10^{-6}	9×10^{-6}	4×10^{-8}	3×10^{-4}
Re^{183}	0.5	2.4×10^{-6}	2.4×10^{-1}	8×10^{-7}	8×10^{-6}
Rh^{105}	1.4	3×10^{-6}	5×10^{-2}	1×10^{-7}	1.6×10^{-3}
Rn^{222} + dr.	...	1×10^{-7}	6×10^{-6}	3.3×10^{-9}	2×10^{-7}
$Ru^{106} + Rh^{106}$	19	8×10^{-8}	4×10^{-1}	2.6×10^{-9}	1.3×10^{-2}
S^{35}	18	3×10^{-6}	1.5×10^{-2}	1×10^{-7}	5×10^{-4}
Sc^{46}	13	2×10^{-7}	1	7×10^{-9}	3.6×10^{-2}
Sm^{151}	39000	4×10^{-8}	6×10^{-1}	1.3×10^{-9}	2×10^{-2}
Sn^{113}	44	1.7×10^{-6}	5×10^{-1}	6×10^{-8}	1.6×10^{-2}
Sr^{89}	52	6×10^{-8}	2×10^{-4}	2×10^{-9}	7×10^{-6}
$Sr^{90} + Y^{90}$	2700	6×10^{-10}	2.4×10^{-6}	2×10^{-11}	8×10^{-8}
Tc^{96}	2.1	8×10^{-6}	8×10^{-2}	3×10^{-7}	3×10^{-3}
Te^{127}	13	3×10^{-7}	8×10^{-2}	4×10^{-8}	3×10^{-3}
Te^{129}	10	1.2×10^{-7}	3.3×10^{-2}	4×10^{-9}	1.1×10^{-3}
Th^{234}	24.1	2×10^{-6}	10	6×10^{-8}	3×10^{-1}
Th-natural (sol.)	...	5×10^{-11}	1.5×10^{-6}	1.7×10^{-12}	5×10^{-8}
Th-natural (insol.)	...	5×10^{-11}	..	1.7×10^{-12}	..
Tm^{170}	59	1.5×10^{-7}	8×10^{-4}	5×10^{-9}	2.5×10^{-5}
U-natural (sol.)*	30	5×10^{-11}	2×10^{-4}	1.7×10^{-12}	7×10^{-6}
U-natural (insol.)*	120	5×10^{-11}	..	1.7×10^{-12}	..
U^{238} (sol.)	300	4×10^{-10}	4.5×10^{-4}	1×10^{-11}	1.5×10^{-5}
U^{238} (insol.)	120	5×10^{-11}	..	1.6×10^{-12}	..
V^{48}	12	3×10^{-6}	1.5	1×10^{-7}	5×10^{-2}
Xe^{128}	5.27	1.3×10^{-5}	1.3×10^{-2}	4×10^{-7}	4×10^{-4}
Xe^{135}	0.38	5×10^{-6}	4×10^{-8}	1.7×10^{-7}	1.4×10^{-4}
Y^{91}	51	1.2×10^{-7}	6×10^{-1}	4×10^{-9}	2×10^{-2}
Zn^{65}	21	6×10^{-6}	2×10^{-1}	2×10^{-7}	6×10^{-3}
Unidentified beta or gamma emitters or any undetermined mixtures of beta or gamma emitters				1×10^{-9}	1×10^{-7}
Unidentified alpha emitters or any undetermined mixtures of alpha emitters				5×10^{-12}	1×10^{-7}

(1) Effective half-life in body.

(2) Air concentrations are given in microcuries per milliliter of air.

(3) Water concentrations are given in microcuries per milliliter of water. Those figures also apply to foodstuff in microcuries per gram (wet weight).

* For enriched uranium the same radioactivities per unit volume as those for natural uranium are applicable. It should be noted that the contribution of U^{234} to the gross activity of enriched uranium is 20–40 times that of the U^{235}.

APPENDIX "C"

PERMISSIBLE LEVELS FOR BURIALS AND LABELLING REQUIREMENTS

	Micro-curies		Micro-curies		Micro-curies
Ag^{106}	1	Ir^{192}	10	Sm^{153}	10
Ag^{111}	10	K^{42}	10	Sn^{113}	10
As^{76}, As^{77}	10	La^{140}	10	Sr^{89}	1
Au^{196}	10	Mn^{52}	1	$Sr^{90} + Y^{90}$	0.1
Au^{199}	10	Mn^{56}	50	Ta^{182}	10
$Ba^{140} + La^{140}$	1	Mo^{99}	10	Tc^{96}	1
Be^{7}	50	Na^{22}	10	Tc^{99}	1
C^{14}	50	Na^{24}	10	Te^{127}	10
Ca^{45}	10	Nb^{95}	10	Te^{129}	1
$Cd^{109} + Ag^{109}$	10	Ni^{59}	1	Th (natural)	50
$Ce^{144} + Pr^{144}$	1	Ni^{63}	1	Tl^{204}	50
Cl^{36}	1	P^{32}	10	Tritium—See H^{3}	250
Co^{60}	1	$Pd^{103} + Rh^{103}$	50	U (natural)	50
Cr^{51}	50	Pd^{109}	10	U^{233}	1
$Cs^{137} + Ba^{137}$	1	Pm^{147}	10	U^{234}—U^{235}	50
Cu^{64}	50	Po^{210}	0.1	V^{48}	1
Eu^{154}	1	Pr^{143}	10	W^{185}	10
F^{18}	50	Pu^{239}	1	Y^{90}	1
Fe^{55}	50	Ra^{226}	0.1	Y^{91}	1
Fe^{59}	1	Rb^{86}	10	Zn^{65}	10
Ga^{72}	10	Re^{186}	10	Unidentified radioactive materials or any of the above in unknown mixtures.	0.1
Ge^{71}	50	Rh^{105}	10		
H^{3} (HTO or $H^{3}_{2}O$)	250	$Ru^{106} + Rh^{106}$	1		
I^{131}	10	S^{35}	50		
In^{114}	1	Sb^{124}	1		
		Sc^{46}	1		

Note: For purposes of paragraphs 10.3 and 11.4 where there is involved a combination of isotopes in known amounts the limit for the combination should be derived as follows:

Determine for each isotope in the combination, the ratio retween the quantity present in the combination and the limit otherwise established for the specific isotope when not in combination. The sum of each ratios for all the isotopes in the combination may not exceed "1" (i.e. "unity").

Example: For purposes of paragraph 11.4, if a particular batch contains 2,000 μ of Au^{196} and 25,000 μ of C^{14}, it may also include not more than 3,000 μ of I^{131}. This limit was determined as follows:

$$\frac{2{,}000\ \mu\ Au^{196}}{10{,}000\ \mu} + \frac{25{,}000\ \mu\ C^{14}}{50{,}000\ \mu} + \frac{3{,}000\ \mu\ I^{131}}{10{,}000\ \mu} = 1$$

The denominator in each of the above ratios was obtained by multiplying the figure in the table by 1,000 as provided in paragraph 11.4.

Limits listed are for radiological health reasons only. Other considerations such as chemical toxicity may require lower limits.

APPENDIX "D"

LIST OF MAXIMUM QUANTITIES OF RADIOACTIVE MATERIAL EXEMPTIONS

Byproduct Material	Column No. I Not as a Sealed Source (Microcuries)	Column No. II As a Sealed Source (Microcuries)
Antimony (Sb^{124})	1	10
Arsenic 76 (As^{76})	10	10
Arsenic 77 (As^{77})	10	10
Barium 140-Lanthanum 140 ($BaLa^{140}$)	1	10
Beryllium (Be^{7})	50	50
Cadmium 109-Silver 109 ($CdAg^{109}$)	10	10
Calcium 45 (Ca^{45})	10	10
Carbon 14 (C^{14})	50	50
Cerium 144-Praseodymium ($CePr^{144}$)	1	10

Continued

APPENDIX "D"—Continued

LIST OF MAXIMUM QUANTITIES OF RADIOACTIVE MATERIAL EXEMPTIONS

Byproduct Material	Column No. I Not as a Sealed Source (Microcuries)	Column No. II As a Sealed Source (Microcuries)
Cesium-Barium 137 ($CaBa^{137}$)	1	10
Chlorine 36 (Cl^{36})	1	10
Chromium 51 (Cr^{51})	50	50
Cobalt 60 (Co^{60})	1	10
Copper 64 (Cu^{64})	50	50
Europium 154 (Eu^{154})	1	10
Fluorine 18	50	50
Gallium 72 (Ga^{72})	10	10
Germanium 71 (Ge^{71})	50	50
Gold 198 (Au^{198})	10	10
Gold 199 (Au^{199})	10	10
Hydrogen 3 (Tritium) (H^3)	250	250
Indium 114 (In^{114})	1	10
Iodine 131 (I^{131})	10	10
Iridium 192 (Ir^{192})	10	10
Iron 55 (Fe^{55})	50	50
Iron 59 (Fe^{59})	1	10
Lanthanum 140 (La^{140})	10	10
Manganese 52 (Mn^{52})	1	10
Manganese 56 (Mn^{56})	50	50
Molybdenum 99 (Mo^{99})	10	10
Nickel 59 (Ni^{59})	1	10
Nickel 63 (Ni^{63})	1	10
Niobium 95 (Nb^{95})	10	10
Palladium 109 (Pd^{109})	10	10
Palladium 103-Rhodium 103 ($PdRh^{103}$)	50	50
Phosphorus 32 (P^{32})	10	10
Polonium 210 (Po^{210})	0.1	1
Potassium 42 (K^{42})	10	10
Praseodymium 143 (Pr^{143})	10	10
Promethium 147 (Pm^{147})	10	10
Radium 226 (Ra^{226})	0.1	1
Rhenium 186 (Re^{186})	10	10
Rhodium 105 (Rh^{105})	10	10
Rubidium 86 (Rb^{86})	10	10
Ruthenium 106-Rhodium 106 ($RuRh^{106}$)	1	10
Samarium 153 (Sm^{153})	10	10
Scandium 46 (Sc^{46})	1	10
Silver 105 (Ag^{105})	1	10
Silver 111 (Ag^{111})	10	10
Sodium 22 (Na^{22})	10	10
Sodium 24 (Na^{24})	10	10
Strontium 89 (Sr^{89})	1	10
Strontium 90-Yttrium 90 (SrY^{90})	0.1	1
Sulfur 35 (S^{35})	50	50
Tantalum 182 (Ta^{182})	10	10
Technetium 96 (Tc^{96})	1	10
Technetium 99 (Tc^{99})	1	10
Tellurium 127 (Te^{127})	10	10
Tellurium 129 (Te^{129})	1	10
Thallium 204 (Tl^{204})	50	50
Thorium (natural)	50	50
Tin 113 (Sn^{113})	10	10
Tungsten 185 (W^{185})	10	10
Vanadium 48 (V^{48})	1	10
Yttrium 90 (Y^{90})	1	10
Yttrium 91 (Y^{91})	1	10
Zinc 65 (Zn^{65})	10	10
Beta and/or Gamma emitting byproduct material not listed above	1	10

APPENDIX "E"

PROTECTION REQUIREMENTS FOR FLUOROGRAPHIC INSTALLATIONS

Tube potential[1]	WUT[2]	Useful beam protection: Lead thickness required for primary barrier at a target-to-occupied-area distance of—						Useful beam protection: Concrete thickness[3] required for primary barrier at a target-to-occupied-area distance of—						Distance without barrier[4]	Lead thickness required for secondary barrier[5] at a target-to-occupied-area distance of—				Concrete thickness[3] required for secondary barrier[5] at a target-to-occupied-area distance of—			
		3 ft.	5 ft.	8 ft.	10 ft.	15 ft.	20 ft.	3 ft.	5 ft.	8 ft.	10 ft.	15 ft.	20 ft.		3 ft.	5 ft.	8 ft.	10 ft.	3 ft.	5 ft.	8 ft.	10 ft.
kep	ma.-min. per. wk.	mm.	mm.	mm.	mm.	mm.	mm.	in.	in.	in.	in.	in.	in.	ft.	mm.	mm.	mm.	mm.	in.	in.	in.	in.
100	[6]2,000	2.1	1.7	1.4	1.3	1.0	0.9	6.3	5.4	4.5	4.1	3.3	2.8	110	0.6	0.4	0.2	0.1	1.8	1.1	0.7	0.1
	500	1.6	1.3	1.0	0.9	0.7	.5	5.0	4.1	3.2	2.8	2.0	1.6	60	.3	.2	0	0	0.8	0.1	0	0
	125	1.2	0.9	0.6	.5	.4	.3	3.7	2.8	2.0	1.6	1.0	0.6	35	0	0	0	0	0	0	0	0
	30	0.8	.5	.3	.2	.1	0	2.4	1.6	0.9	0.6	0.2	0	20	..	..	..	..	..	..	..	..
	7	.4	.2	.1	0	0	0	1.2	0.6	.1	0	0	0	10	..	..	..	..	..	..	..	..
150	1,000	2.5	2.1	1.8	1.6	1.3	1.1	8.7	7.4	6.2	5.7	4.7	4.0	120	0.8	0.5	0.2	0	2.4	1.8	0.3	0
	250	2.0	1.6	1.3	1.1	0.9	0.7	7.0	5.7	4.5	4.0	3.0	2.3	65	.3	0	0	0	1.0	0	0	0
	60	1.4	1.1	0.8	0.7	.5	.3	5.2	3.9	2.8	2.3	1.5	0.9	35	0	0	0	0	0	0	0	0
	15	1.0	0.7	.5	.3	.2	0	3.4	2.3	1.3	0.9	0.3	0	20	..	..	..	..	..	..	..	..
	4	0.6	.3	.1	0	0	0	2.0	1.0	0.2	0	0	0	10	..	..	..	..	..	..	..	..

[1] Constant potentials may require 15 to 25% larger thicknesses of lead and 5 to 15% larger thicknesses of concrete than those given here for pulsating potentials. These differences were estimated from the data of Miller and Kennedy at 275 to 525 kvcp and from the data of Trout at 50 to 250 kvp. As these experimenters used very different filtrations, the differences indicated here may be high, especially for concrete.

[2] W = workload, U = use factor, T = occupancy factor. Use factor for secondary barrier is always 1.

[3] The concrete requirements are based on a concrete density of 2.35 g/cm^3.

[4] Distance from target at which the weekly useful beam dose will not exceed 0.3r. These distances were computed from the outputs at zero barrier thickness and the air absorption coefficient for double the minimum wave length.

[5] Note that a target-to-skin distance of 50 cm is assumed.

[6] Equivalent to 3,000 40-ma-sec exposures per week.

Note: 1.5 hvl should be added for controlled areas and 5 hvl outside the controlled area to each of the tabular barrier thicknesses.

APPENDIX "F"

PROTECTION REQUIREMENTS[1] FOR FLUOROSCOPIC INSTALLATIONS

Tube potential[2]	Workload x occupancy factor (WT)	Lead thickness required for secondary barrier[3] at a target-to-occupied-area distance of—						Concrete thickness required for secondary barrier[3] at a target-to-occupied-area distance of—					
		3 ft.	5 ft.	8 ft.	10 ft.	15 ft.	20 ft.	3 ft.	5 ft.	8 ft.	10 ft.	15 ft.	20 ft.
kvp	ma.-min./wk.	mm.	mm.	mm.	mm.	mm.	mm.	in.	in.	in.	in.	in.	in.
100	4,000	0.8	0.5	0.3	0.2	0.1	0	2.6	1.9	1.3	0.8	0.2	0
	1,000	.5	.2	.1	0	0	0	1.6	0.8	0.2	0	0	0
	250	.2	0	0	0	0	0	0.5	0	0	0	0	0
125	4,000	1.1	0.8	0.5	0.3	0.2	0	3.6	2.4	1.4	1.0	0.4	0
	1,000	0.7	.4	.2	0	0	0	2.0	1.0	0.3	0	0	0
	250	.3	0	0	0	0	0	0.8	0	0	0	0	0
150	4,000	1.3	1.0	0.7	0.5	0.2	0	4.3	3.3	2.4	1.7	0.4	0
	1,000	0.9	0.5	.2	0	0	0	2.9	1.7	0.4	0	0	0
	250	.4	0	0	0	0	0	1.2	0	0	0	0	0

[1] As the useful beam is always intercepted by the protective fluoroscopic screen cover, only secondary barriers are required.

[2] Constant potentials may require 15 to 25% larger thicknesses of lead and 5 to 15% larger thicknesses of concrete than those given here for pulsating potentials. These differences were estimated from the data of Miller and Kennedy at 275 to 525 kvcp and from the data of Trout at 50 to 250 kvp. As these experimenters used very different filtrations, the differences indicated here may be high, especially for concrete.

[3] Note that a target-to-skin distance of 50 cm is assumed.

Note: 1.5 hvl should be added for controlled areas and 5 hvl outside the controlled areas to each of the tabular barrier thicknesses.

APPENDIX "G"

PROTECTION REQUIREMENTS FOR RADIOGRAPHIC INSTALLATIONS

Tube potential[1]	WUT[2]	Useful beam protection: Lead thickness required for primary barrier at a target-to-occupied-area distance of—					Useful beam protection: Concrete thickness[3] required for primary barrier at a target-to-occupied-area distance of—					Distance without barrier[4]	Lead thickness required for secondary barrier[5] at a target-to-occupied-area distance of—				Concrete thickness[3] required for secondary barrier[5] at a target-to-occupied-area distance of—			
		5 ft.	8 ft.	10 ft.	15 ft.	20 ft.	5 ft.	8 ft.	10 ft.	15 ft.	20 ft.		3 ft.	5 ft.	8 ft.	10 ft.	3 ft.	5 ft.	8 ft.	10 ft.
kvp	ma.-min. per wk	mm.	mm.	mm.	mm.	mm.	in.	in.	in.	in.	in.	ft.	mm.	mm.	mm.	mm.	in.	in.	in.	in.
100	1,000	1.5	1.2	1.1	0.8	0.7	4.8	3.9	3.5	2.7	2.2	90	0.5	0.2	0.1	0	1.6	0.8	0.4	0
	250	1.1	0.8	0.7	0.5	0.3	3.5	2.6	2.2	1.5	1.2	50	0.2	0	0	0	0.5	0	0	0
	60	0.7	0.5	0.3	0.2	0.1	2.2	1.4	1.2	0.6	0.3	25	0	0	0	0	0	0	0	0
	15	0.3	0.2	0.1	0	0	1.2	0.5	0.3	0	0	15	..	..	..	..	..	..	..	..
	4	0.1	0	0	0	0	0.4	0	0	0	0	8	..	..	..	..	..	..	..	..
125	400	1.5	1.2	1.1	0.8	0.7	5.1	4.0	3.6	2.7	2.1	70	0.5	0.3	0	0	1.5	0.5	0	0
	100	1.1	0.8	0.7	0.5	0.4	3.6	2.6	2.1	1.3	0.9	40	0.2	0	0	0	0.3	0	0	0
	25	0.7	0.5	0.4	0.2	0	2.1	1.2	0.9	0.3	0	20	0	0	0	0	0	0	0	0
	6	0.4	0.2	0	0	0	0.9	0.2	0	0	0	10	..	..	..	..	..	..	..	..
	1½	0	0	0	0	0	0	0	0	0	0	5	..	..	..	..	..	..	..	..
150	200	1.5	1.2	1.1	0.8	0.7	5.6	4.2	3.7	2.7	2.1	60	0.2	0	0	0	0.9	0	0	0
	50	1.1	0.8	0.7	0.5	0.3	3.7	2.6	2.1	1.3	0.8	30	0	0	0	0	0	0	0	0
	12	0.7	0.5	0.3	0.2	0	2.1	1.1	0.8	0.1	0	16	0	0	0	0	0	0	0	0
	3	0.3	0	0	0	0	0.8	0	0	0	0	8	..	..	..	..	..	..	..	..
	1	0	0	0	0	0	0	0	0	0	0	4	..	..	..	..	..	..	..	..

[1] Constant potentials may require 15 to 25% larger thicknesses of lead and 5 to 15% larger thicknesses of concrete than those given here for pulsating potentials. These differences were estimated from the data of Miller and Kennedy at 275 to 525 kvcp and from the data of Trout at 50 to 250 kvp. As these experimenters used very different filtrations, the differences indicated here may be high, especially for concrete.

[2] W = workload, U = use factor, T = occupancy factor. Use factor for secondary barrier is always 1.

[3] The concrete requirements are based on a concrete density of 2.35 g/cm³.

[4] Distance from target at which the weekly useful beam dose will not exceed 0.3r. These distances were computed from the outputs at zero barrier thickness and the air absorption coefficient for double the minimum wave length.

[5] Note that a target-to-skin distance of 50 cm is assumed.

Note: 1.5 hvl should be added for controlled areas and 5 hvl outside the controlled areas to each of the tabular barrier thicknesses.

Appendix "H"

Protection requirements for dental institutions

Tube[1] potential	WUT[2]	Useful beam protection: Lead thickness required for primary barrier at a target-to-occupied area distance of— 3 ft.	4 ft.	5 ft.	6 ft.	8 ft.	10 ft.	20 ft.	Useful beam protection: Concrete thickness[3] required for primary barrier at a target-to-occupied-area distance of— 3 ft.	4 ft.	5 ft.	6 ft.	8 ft.	10 ft.	20 ft.	Distance without barrier[4]	Lead thickness required for secondary barrier[5] at a target-to-occupied-area distance of— 3 ft.	4 ft.	5 ft.	Concrete thickness,[3] required for secondary barrier[5] at a target-to-occupied-area distance of— 3 ft.	4 ft.	5 ft.
kvp	ma.-min. per wk.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	in.	in.	in.	in.	in.	in.	in.	ft.	mm.	mm.	mm.	in.	in.	in.
70	800	0.8	0.8	0.7	0.6	0.5	0.4	0.3	3.0	2.7	2.4	2.1	1.8	1.5	0.8	65	0.3	0.2	0.1	0.7	0.4	0.1
	200	.6	.5	.4	.4	.3	.3	.1	2.1	1.8	1.5	1.3	1.0	0.8	.3	35	0	0	0	0	0	0
	50	.4	.3	.3	.2	.2	.1	0	1.3	1.0	0.8	0.6	0.4	.3	0	20	0	0	0	0	0	0
	12	.2	.2	.1	.1	0	0	0	0.6	0.4	.3	.2	0	0	0	10	..	..	..	..	..	..
100	800	1.8	1.6	1.4	1.3	1.1	1.0	0.6	5.5	4.9	4.5	4.2	3.6	3.2	2.0	80	0.5	0.2	0.3	1.2	0.7	0.5
	200	1.3	1.1	1.0	0.9	0.7	0.6	.3	4.2	3.6	3.2	2.9	2.4	2.0	0.9	40	.1	0	0	0.4	0	0
	50	0.9	0.7	0.6	.5	.4	.3	.1	2.9	2.4	2.0	1.7	1.2	0.9	.2	25	0	0	0	0	0	0
	12	.5	.4	.3	.2	.2	.1	0	1.6	1.2	0.9	0.7	0.4	.2	0	13	..	..	..	..	..	..

[1] Constant potentials may require 15 to 25% larger thicknesses of lead and 5 to 15% larger thicknesses of concrete than those given here for pulsating potentials. These differences were estimated from the data of Miller and Kennedy at 275 to 525 kvcp and from the data of Trout at 50 to 250 kvp. As these experimenters used very different filtrations, the differences indicated here may be high, especially for concrete.

[2] W = workload, U = use factor, T = occupancy factor. Use factor for secondary barrier is always 1.

[3] The concrete requirements are based on a concrete density of 2.35 g/cm³.

[4] Distance from target at which the weekly useful beam dose will not exceed 0.3r. These distances were computed from the outputs at zero barrier thickness and the air absorption coefficient for double the minimum wave length.

[5] Note that a target-to-skin distance of 50 cm is assumed.

Note: 1.5 hvl should be added for controlled areas and 5 hvl outside the controlled areas to each of the tabular barrier thicknesses.

APPENDIX "I"

PROTECTION REQUIREMENTS FOR THERAPEUTIC INSTALLATIONS

Tube potential	WUT[1]	Useful beam protection: Lead thickness required for primary barrier at a target-to-occupied-area distance of—						Useful beam protection: Concrete thickness[2] required for primary barrier at a target-to-occupied-area distance of—						Distance without barrier[3]	Lead thickness required for secondary barrier[4] at a target-to-occupied-area distance of—					Concrete thickness[2] required for secondary barrier[4] at a target-to-occupied-area distance of—				
		3 ft.	5 ft.	8 ft.	10 ft.	15 ft.	20 ft.	3 ft.	5 ft.	8 ft.	10 ft.	15 ft.	20 ft.		3 ft.	5 ft.	8 ft.	10 ft.	15 ft.	3 ft.	5 ft.	8 ft.	10 ft.	15 ft.
krp[5]	ma.-min. per wk.	mm.	mm.	mm.	mm.	mm.	mm.	in.	in.	in.	in.	in.	in.	ft.	mm.	mm	mm.	mm.	mm.	in.	in.	in.	in.	in.
50	1,000	0.3	0.2	0.2	0.2	0.1	0.1	1.2	1.0	0.7	0.6	0.4	0.3	40	0.2	0.1	0	0	0	0.8	0.5	0	0	0
	250	.2	.2	.1	.1	.1	.1	0.8	0.6	.4	.3	.2	.1	25	.1	0	0	0	0	.4	0	0	0	0
	60	.2	.1	.1	.1	0	0	.6	.3	.2	.1	0	0	13	0	0	0	0	0	0	0	0	0	0
	15	.1	.1	0	0	0	0	.3	.1	0	0	0	0	7	...	...	...	...	...	...	...	...	...	...
	4	0	0	0	0	0	0	0	0	0	0	0	0	4	...	...	...	...	...	...	...	...	...	...
100	4,000	2.3	2.0	1.7	1.5	1.3	1.1	7.0	6.0	5.2	4.7	4.0	3.4	150	1.3	1.0	0.7	0.5	0.3	4.0	3.3	2.7	2.2	1.5
	1,000	1.8	1.5	1.2	1.1	0.8	0.7	5.7	4.7	3.9	3.4	2.7	2.2	90	0.9	0.5	.3	.3	0	3.0	2.2	1.3	0.8	0
	250	1.4	1.1	0.8	0.7	.5	.4	4.4	3.4	2.6	2.2	1.5	1.1	50	.4	.3	0	0	0	1.9	0.8	0	0	0
	60	1.0	0.7	.5	.4	.2	.2	3.0	2.1	1.4	1.1	0.6	0.3	25	...	...	...	...	...	...	...	...	...	...
	15	0.6	.4	.2	.2	0	0	1.8	1.1	0.6	0.3	0	0	15	...	...	...	...	...	...	...	...	...	...
150	4,000	3.1	2.7	2.3	2.1	1.8	1.6	10.4	9.2	8.0	7.4	6.4	5.7	180	1.7	1.3	0.9	0.7	0.5	5.0	3.8	2.6	2.0	1.3
	1,000	2.5	2.1	1.8	1.6	1.3	1.1	8.7	7.4	6.2	5.7	4.7	4.0	110	1.1	0.7	.4	.3	0	3.3	2.0	1.2	0.9	0
	250	2.0	1.6	1.3	1.1	0.9	0.7	7.0	5.7	4.5	4.0	3.0	2.3	65	0.5	.3	0	0	0	1.7	0.9	0	0	0
	60	1.4	1.1	0.8	0.7	.5	.3	5.2	3.9	2.8	2.3	1.5	0.9	35	...	...	...	...	...	...	...	...	...	...
	15	1.0	0.7	.4	.3	.2	0	3.4	2.3	1.3	0.9	0.3	0	20	...	...	...	...	...	...	...	...	...	...
200	40,000	6.4	5.7	5.0	4.7	4.1	3.7	16.9	15.3	14.0	13.2	12.0	11.2	440	4.1	3.4	2.7	2.4	1.8	9.7	8.1	6.6	6.0	4.9
	10,000	5.4	4.7	4.0	3.7	3.2	2.9	14.8	13.2	11.8	11.2	10.0	9.1	300	3.1	2.4	1.7	1.4	1.1	7.5	6.0	4.7	4.1	3.0
	2,500	4.4	3.7	3.1	2.9	2.4	2.1	12.7	11.2	9.7	9.1	7.9	7.0	200	2.1	1.4	1.0	0.7	0.5	5.5	4.1	2.9	2.4	1.6
	600	3.5	2.8	2.3	2.0	1.6	1.3	10.6	9.0	7.6	6.9	5.7	4.8	120	...	...	...	...	...	...	...	...	...	...
	150	2.6	2.0	1.5	1.3	1.0	0.8	8.4	6.9	5.5	4.8	3.7	2.9	70	...	...	...	...	...	...	...	...	...	...
250	40,000	11.3	10.0	8.7	8.2	7.2	6.5	19.0	17.4	15.9	15.2	13.8	12.9	500	6.4	5.3	4.4	3.8	3.1	11.3	9.6	8.0	7.4	6.1
	10,000	9.5	8.2	7.0	6.5	5.6	5.0	16.8	15.2	13.6	12.9	11.6	10.6	350	5.0	3.8	2.9	2.4	1.8	9.1	7.4	5.9	5.3	4.1
	2,500	7.7	6.5	5.5	5.0	4.2	3.6	14.6	12.9	11.4	10.6	9.3	8.4	220	3.5	2.4	1.7	1.3	0.9	6.9	5.3	3.9	3.3	2.3
	600	6.1	5.0	4.0	3.6	2.9	2.4	12.2	10.5	9.1	8.4	7.1	6.1	130	...	...	...	...	...	...	...	...	...	...
	150	4.6	3.6	2.7	2.4	1.8	1.4	10.0	8.4	6.8	6.1	4.8	4.0	80	...	...	...	...	...	...	...	...	...	...

APPENDIX "I"—Continued

PROTECTION REQUIREMENTS FOR THERAPEUTIC INSTALLATIONS

Tube potential	WUT[1]	Useful beam protection: Lead thickness required for primary barrier at a target-to-occupied-area distance of— 3 ft.	5 ft.	8 ft.	10 ft.	15 ft.	20 ft.	Useful beam protection: Concrete thickness[2] required for primary barrier at a target-to-occupied-area distance of— 3 ft.	5 ft.	8 ft.	10 ft.	15 ft.	20 ft.	Distance without barrier[3]	Lead thickness required for secondary barrier[4] at a target-to-occupied-area distance of— 3 ft.	5 ft.	8 ft.	10 ft.	15 ft.	Concrete thickness[2] required for secondary barrier[4] at a target-to-occupied-area distance of— 3 ft.	5 ft.	8 ft.	10 ft.	15 ft.
kvcp[6]	ma.-min. per wk.	mm.	mm.	mm.	mm.	mm.	mm.	in.	in.	in.	in.	in.	in.	ft.	mm.	mm.	mm.	mm.	mm.	in.	in.	in.	in.	in.
	40,000	21.6	19.0	16.5	15.4	13.5	12.1	...	19.8	18.2	17.4	15.9	15.0	500	12.0	10.0	8.0	7.0	5.5	12.5	10.8	9.2	8.4	7.1
300	10,000	18.0	15.4	13.1	12.1	10.5	9.2	...	17.4	15.7	15.0	13.5	12.6	350	9.0	7.0	5.5	4.5	3.0	10.1	8.4	6.7	5.9	4.7
	2,500	14.5	12.1	10.1	9.2	7.6	6.5	...	15.0	13.4	12.6	11.2	10.2	220	6.5	4.5	3.0	2.5	1.5	7.8	6.0	4.3	3.5	2.4
	600	11.3	9.0	7.3	6.5	5.1	4.2	...	12.5	11.0	10.2	8.9	7.9	130	...	...	...	...	...	...	...	...	...	...
	150	8.5	6.5	4.9	4.2	3.0	2.3	...	10.2	8.6	7.9	6.5	5.5	80	...	...	...	...	...	...	...	...	...	...
400	12,000	32.5	28.0	25.0	23.2	20.4	18.5	...	20.6	18.9	18.1	16.5	15.5	450	18.0	14.5	11.5	10.0	8.0	13.4	11.4	9.8	8.9	7.4
	3,000	27.0	23.2	20.0	18.5	15.6	14.0	...	18.1	16.4	15.5	14.0	13.0	300	13.0	10.0	7.5	6.5	4.5	10.8	8.8	7.2	6.2	5.8
	750	22.0	18.5	15.1	14.0	11.5	10.0	...	15.5	13.8	13.0	11.5	10.5	190	8.5	6.0	4.0	3.5	2.0	8.2	6.2	4.4	3.6	0
	200	17.3	14.1	11.4	10.1	8.0	6.5	...	13.1	11.4	10.5	9.0	8.0	120	...	...	...	...	...	...	...	...	...	...
	50	13.0	10.1	7.6	6.6	4.7	3.6	...	10.5	8.9	8.0	6.5	5.5	60	...	...	...	...	...	...	...	...	...	...

[1] W = workload, U = use factor, T = occupancy factor. Use factor for secondary barrier is always 1.

[2] The concrete requirements are based on a concrete density of 2.35 g/cm³.

[3] Distance from target at which the weekly useful beam dose will not exceed 0.3r.

[4] Note that a target-to-skin distance of 50 cm is assumed.

[5] Constant potentials may require 15 to 25% larger thicknesses of lead and 5 to 15% larger thicknesses of concrete than those given here for pulsating potentials. These differences were estimated from the data of Miller and Kennedy at 275 to 525 kvcp and from the data of Trout at 50 to 250 kvp. As these experimenters used very different filtrations, the differences indicated here may be high, especially for concrete.

[6] Pulsating potentials may require 10 to 20% smaller thicknesses of lead and 5 to 15% smaller thicknesses of concrete than those given here for constant potentials. These differences were estimated from the data of Miller and Kennedy at 275 to 525 kvcp and from the data of Trout at 50 to 250 kvp. As these experimenters used very different filtrations, the differences indicated here may be high, especially for concrete.

Note: 1.5 hvl should be added for controlled areas and 5 hvl outside the controlled areas to each of the tabular barrier thicknesses.

Appendix B

ITEM 1

Report of the New England Committee on Atomic Energy to the New England Governors' Conference

Draft of an Act to Coordinate Development and Regulatory Activities Relating to the Peaceful Uses of Atomic Energy

Be it enacted by, etc.

Section 1. Declaration of Policy

a. The State of.....endorses the action of the Congress of the United States in enacting the Atomic Energy Act of 1954 to institute a program to encourage the widespread participation in the development and utilization of atomic energy for peaceful purposes to the maximum extent consistent with the common defense and security and with the health and safety of the public; and therefore declares the policy of the State to be—

1. To cooperate actively in the program thus instituted; and
2. To the extent that the regulation of special nuclear materials and by-product materials, of production facilities and utilization facilities, and of persons operating such facilities may be within the jurisdiction of the State, to provide for the exercise of the State's regulatory authority so as to conform, as nearly as may be, to the Atomic Energy Act of 1954 and regulations issued thereunder, to the end that there may, in effect, be a single harmonious system of regulation within the State.

b. The State of.....recognizes that the development of industries producing or utilizing atomic energy may result in new conditions calling for changes in the laws of the State and in regulations issued thereunder with respect to health and safety, working conditions, workmen's compensation, transportation, public utilities, life, health, accident, fire, and casualty insurance, the conservation of natural resources, including wildlife, and the protection of streams, rivers, and airspace from pollution, and therefore declares the policy of the State to be—

1. To adapt its laws and regulations to meet the new conditions in ways that will encourage the healthy development of industries producing or utilizing atomic energy while at the same time protecting the public interest; and
2. To initiate continuing studies of the need for changes in the relevant laws and regulations of the State by the respective departments and agencies of the State which are responsible for their administration; and
3. To assure the coordination of the studies thus undertaken,

particularly with other atomic industrial development activities of the State and with the development and regulatory activities of other States and of the Government of the United States.

Section 2. United States Licenses or Permits Required

No person shall manufacture, construct, produce, transfer, acquire or possess any special nuclear material, by-product material, production facility, or utilization facility, or act as an operator of a production or utilization facility, wholly within this State unless he shall have first obtained a license or permit for the activity in which he proposes to engage from the United States Atomic Energy Commission if, pursuant to the Atomic Energy Act of 1954, the Commission requires a license or permit to be obtained by persons proposing to engage in activities of the same type over which it has jurisdiction.

Section 3. Conduct of Studies Concerning Changes in Laws and Regulations with a View to Atomic Industrial Development

Each of the following departments and agencies of the State Government is directed to initiate and to pursue continuing studies as to the need, if any, for changes in the laws and regulations administered by it that would arise from the presence within the State of special nuclear materials and by-product materials and from the operation herein of production or utilization facilities, and, on the basis of such studies, to make such recommendations for the enactment of laws or amendments to law administered by it, and such proposals for amendments to the regulations issued by it, as may appear necessary and appropriate.

a. The Department of Public Health, particularly as to hazards, if any, to the public health and safety.

b. The Department of Labor, particularly as to hazardous working conditions, if any.

c. The Workmen's Compensation Commission, particularly as to the time and character of proof of claims of injuries and the extent of the compensation allowable therefor.

d. The Department of Public Highways, particularly as to the transportation of special nuclear materials and by-product materials on highways of the State.

e. The Public Utilities Commission, particularly as to the transportation of special nuclear materials and by-product materials by common carriers not in interstate commerce and as to the participation by public utilities subject to its jurisdiction in projects looking to the development of production or utilization facilities for industrial or commercial use.

f. The Department of Insurance, particularly as to the insurance of

persons and property from hazards to life and property resulting from atomic development.

g. The Department of Conservation, particularly as to the hazards, if any, to the natural resources of the State, including wildlife, and as to the protection, if necessary, of rivers, streams, and airspace from pollution.

h. Such other departments and agencies (including departments and agencies of political subdivisions of the State) as the Governor may direct and for the purposes specified by him.

Section 4. Coordination of Studies and Development Activities

a. The Governor and Council shall appoint a citizen of this State to serve as adviser to the Governor with respect to atomic industrial development within the State; as coordinator of the development and regulatory activities of the State relating to the industrial and commercial uses of atomic energy; and as deputy of the Governor in matters relating to atomic energy, including participation in the activities of any committee formed by the New England States to represent their interest in such matters and also cooperation with other States and with the Government of the United States. The person so appointed shall have the title of Coordinator of Atomic Development Activities.

b. The Coordinator of Atomic Development Activities shall have the duty of coordinating the studies, recommendations, and proposals of the several departments and agencies of the State (and its political subdivisions) required by Section 3 of this Act with each other and also with the programs and activities of the Department of Industrial Development of the State. So far as may be practicable, he shall coordinate the studies conducted, and the recommendations and proposals made, in this State with like activities in the New England and other States and with the policies and regulations of the United States Atomic Energy Commission. In carrying out his duties, he shall proceed in close cooperation with the Department of Industrial Development.

c. The several departments and agencies of the State (and its political subdivisions) which are directed by Section 3 of this Act to initiate and pursue continuing studies are further directed to keep the Coordinator of Atomic Development Activities fully and currently informed as to their activities relating to atomic energy. No regulation or amendment to a regulation applying specifically to an atomic energy matter which any such department or agency may propose to issue shall become effective until 30 days after it has been submitted to the Coordinator, unless, upon a finding of emergency need, the Governor by order waives all or any part of this 30-day period.

d. The Coordinator of Atomic Development Activities shall keep the Governor and Council and the several interested departments and agencies

informed as to private and public activities affecting atomic industrial development and shall enlist their cooperation in taking action to further such development as is consistent with the health, safety and general welfare of this State.

e. The Coordinator of Atomic Development Activities shall be paid a salary of $——— per annum.

Section 5. Injunction Proceedings

Whenever, in the opinion of the Attorney General, any person is violating or is about to violate Section 2 of this Act, the Attorney General may apply to the appropriate court for an order enjoining the person from engaging or continuing to engage in the activity violative of this Act and upon a showing that such person has engaged, or is about to engage in any such activity, a permanent or temporary injunction, restraining order, or the other order may be granted.

Section 6. Funds Provided

There is hereby authorized to be appropriated the sum of $——— for the salary of the Coordinator of Atomic Development Activities and for secretarial, travel, printing, and other necessary expenses incurred by him in the performance of his duties.

Section 7. Definitions

As used in this Act,

a. The term "atomic energy" means all forms of energy released in the course of nuclear fission or nuclear transformation.

b. The term "by-product material" means any radioactive materials (except special nuclear materials) yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear materials.

c. The term "production facility" means (1) any equipment or device capable of the production of special nuclear material in such quantity as to be of significance to the common defense and security, or in such manner as to affect the health and safety of the public; or (2) any important component part especially designed for such equipment or device.

d. The term "special nuclear material" means (1) plutonium and uranium enriched in the isotope 233 or in the isotope 235, and any other material which the Governor declares by order to be special nuclear material after the United States Atomic Energy Commission has determined the material to be such; or (2) any material artificially enriched by any of the foregoing.

e. The term "utilization facility" means (1) any equipment or device,

except an atomic weapon, capable of making use of special nuclear materials in such quantity as to be of significance to the common defense and security, or in such manner as to affect the health and safety of the public, or peculiarly adapted for making use of atomic energy in such quantity as to be of significance to the common defense and security, or in such manner as to affect the health and safety of the public; or (2) any important component part especially designed for such equipment or device.

f. The term "operator" means any individual who manipulates the controls of a utilization or production facility.

ITEM 2

A Suggested State Radiation Protection Act

From the National Bureau of Standards Handbook No. 61, "Regulation of Radiation Exposure by Legislative Means." (December 9, 1955)

"AN ACT for the Control of Radiations from Machines and Radioactive Materials, for the Purpose of Protecting Health."

Short Title. This Act may be referred to as the ..... Radiation Hygiene Act. (State)

Section 1. *Statement of Policy.* Whereas, radiation can be instrumental in the improvement of health, welfare, and productivity of the public if properly utilized, and may impair the health of the people and the industrial and agricultural potentials of the State if improperly utilized, it is hereby declared to be the public policy of this State to encourage the constructive uses of radiation and to control any associated harmful effects.

Section 2. *Definitions.* For the purposes of this Act, the following words and phrases are defined:

(a) *Radiation* is gamma rays and X-rays, alpha and beta particles, high-speed electrons, neutrons, protons, and other nuclear particles; but not sound or radio waves, or visible, infrared, or ultraviolet light.

(b) *Radiation machine* is any device that produces radiations when the associated control devices are operated.

(c) *Radioactive material* is any material, solid, liquid, or gas, that emits radiation spontaneously.

Additional definitions may be included.

Section 3. *Creation and Organization of Agency: Advisory Board, Meetings, Employees.*

(a) There is hereby created and established a State Radiation-Control Agency hereinafter referred to as the Agency. The Agency shall be an

organizational component of the State Department of ..... (Alternate: There is hereby created and established an independent State Radiation Control Agency, hereinafter referred to as the Agency.)

(b) The Governor shall appoint a Director of the Agency (hereinafter called the Director) who shall perform and carry out all functions and duties given to the Agency under this Act, and shall direct, carry out, and enforce all radiation safety control activities and measures vested in the Agency. The Director shall be a person having extensive training and experience in the field of health and of radiation protection.

(c) In accordance with the laws of the State, the Agency may employ, compensate, and prescribe the powers and duties of such persons as may be necessary to carry out the provisions of this Act. However, technical, legal, and other services shall be performed, insofar as practicable, by personnel of existing State departments, agencies, and offices.

(d) The Director may delegate to officers and employees of the Agency such function, duties, and authority as are vested in the Agency by this Act; except the authority to adopt and promulgate standards, rules, and regulations, and to issue or modify orders.

(e) There is hereby established within the Agency a State Radiation Technical Advisory Board, hereinafter referred to as the "Board," consisting of five members. The Director of the Agency shall be a member of the Board. The other four members shall be persons with scientific training in one or more of the following fields: health, agriculture, medicine, radiology, radiation physics, biology, industry, labor, atomic energy. The Governor shall appoint these four members after seeking recommendations of established authorities or organizations in the above-specified fields. The members' term of office shall be four years, except that the terms of those first appointed shall expire as follows:

1 at the end of 1 year after such date,
1 at the end of 2 years after such date,
1 at the end of 3 years after such date, and
1 at the end of 4 years after such date

as designated by the Governor at the time of appointment. If a vacancy occurs, the Governor shall appoint a member for the remaining portion of that term. The Director of the Agency shall be Chairman of the Board. The Board shall hold four regular meetings each calendar year, and special meetings as deemed necessary by the Board or the Director. It shall be the duty of the Board to review the policies and program of the Agency as developed under authority of this Act; to make recommendations thereon to the Agency; to provide the Agency with such technical advice and assistance as may be required relative to permissible exposure levels, standards of practice, radiation instrumentation, and other technical matters. Members of the Board, other than the Director, shall be entitled to receive compensation

at ..... dollars per diem and reimbursement for actual and necessary traveling and subsistence expenses while engaged in the business of the Board.

Section 4. *Powers and Duties of the Agency.* The Agency shall have the following powers and duties:

(a) Shall develop comprehensive policies and programs for the evaluation and determination of hazards associated with the use of radiation, and for their amelioration;

(b) Shall advise, consult, and cooperate with other agencies of the State, the Federal Government, other States and interstate agencies, and with affected groups, political subdivisions, and industries in furtherance of the purposes of this Act;

(c) May accept and administer loans, grants, or other funds or gifts from the Federal Government and from other sources, public or private, for carrying out any of its functions;

(d) May encourage, participate in, or conduct studies, investigations, training, research, and demonstrations relating to the control of radiation hazard, the measurement of radiation, the effects on health of exposure to radiation, and related problems as it may deem necessary or advisable for the discharge of its duties under this Act;

(e) Shall collect and disseminate information relating to the determination and control of radiation exposure and hazard;

(f) Shall adopt and promulgate such rules and regulations as may be necessary to further the purposes of this Act; such rules and regulations may incorporate by reference the recommended standards of nationally recognized bodies in the field of radiation protection such as the National Committee on Radiation Protection or the American Standards Association;

(g) Shall devise, modify, repeal, promulgate, and enforce rules and regulations as necessary to implement or effectuate the powers and duties of the Agency under this Act;

(h) May issue, modify, or revoke orders prohibiting or abating the discharge of radioactive material or waste into the ground, air, or waters of the State in accordance with the provisions of this Act and rules and regulations adopted thereunder;

(i) Upon request, shall render opinion concerning such plans and specifications on the design and shielding for radiation sources as may be submitted before or after construction, for the purpose of determining the possible radiation hazard;

(j) May make inspections of radiation sources shielding, and immediate surroundings for the determination of any possible radiation hazard; and shall provide the owner, user, or operator thereof with a report of any known or suspected deficiencies;

(k) May exercise all incidental powers necessary to carry out the purposes of this Act.

Section 5. *Registration*

(a) It shall be unlawful for any person to produce radiation, or to produce, use, store, or dispose of radioactive materials, or to modify, extend, or alter such activities, unless he registers in writing with the Agency in accordance with the procedures prescribed by such Agency, except that a period of 90 calendar days shall be allowed for such registration after the effective date of this Act.

(b) It shall be unlawful for any person to produce radiation, or to produce, use, store, or dispose of radioactive materials, except in accordance with the provisions of this Act and rules and regulations promulgated thereunder.

Section 6. *Classification of Sources and Hazards and Standards of Protection*

(a) The Agency is authorized, with the concurrence of the Board, to classify radiation sources, exposures, and hazards for the purpose of (1) making inspections, (2) determining the competence of the radiation users, (3) determining the adequacy of radiation-protective devices and procedures, and (4) other purposes compatible with the present and future utilization of all forms of radiation, taking into account the protection of the health of the people of this State.

(b) Prior to the establishment of a system of classification of sources or uses, or setting standards of protection, or modifying such classifications or standards, the Agency shall conduct public hearings in connection therewith. Notice shall be given of time, date, and place of public hearing and shall specify the technical area in which a classification is sought to be made or for which standards are sought to be adopted. Such notice shall be published at least twice in a newspaper of general circulation in the area affected, and shall be mailed at least 20 days before such public hearing to the chief executive of each political subdivision of the geographical area affected, and may be mailed to such other persons as the Agency has reason to believe may be affected by such classification and the setting of such standards. The Agency shall utilize the assistance of the Board in connection with such hearings.

(c) The adoption of standards of protection and the classification of radiation sources, or any modification or change thereof, shall, upon approval of the Board, be issued as an order of the Agency and shall be published in a newspaper of general circulation in the area affected. In classifying sources and setting radiation-protection standards, or making any modification thereof, the Agency shall permit and announce a reasonable

time for the persons or users involved to comply with such classification and standards, if their operations create a known hazard to health; except that a user may be directed to abate without delay a serious known hazard to health.

Section 7. *Examination for Compliance: Statement of Non-compliance*

(a) The Agency shall itself, or by its duly designated representatives, inspect and examine such sources of radiation as it desires, in order to determine their compliance with the adopted classification and radiation-protection standards of the Agency.

(b) If such inspection and examination indicates that the source of radiation is not in compliance with the adopted classification and radiation-protection standards, the owner, operator, or user shall be so notified in writing, with full particulars regarding any deficiencies.

Section 8. *Proceedings Before Board*

(a) Whenever the Agency determines there are reasonable grounds to believe that there has been a violation of any of the provisions of this Act or of any order of the Agency, it may give written notice to the alleged violator or violators specifying the causes of complaint. Such notice shall require that the alleged violations be corrected or that the alleged violator appear before the Agency at a time and place specified in the notice, and answer the charges. The notice shall be delivered to the alleged violator or violators in accordance with the provisions of subsection (d) of this section not less than .... days before the time set for the hearing.

(b) The Agency shall afford the alleged violator or violators an opportunity for a fair hearing in accordance with the provisions of section 9 at the time and place specified in the notice or any modification thereof. On the basis of the evidence produced at the hearing the Agency shall make findings of fact and conclusions of law and enter such order as in its opinion will best further the purposes of this Act and shall give written notice of such order to the alleged violator and to such other persons as shall have appeared at the hearing and made written request for notice of the order. If the hearing is held before any person other than the Agency itself, such person shall transmit the record of the hearing together with recommendations for findings of fact and conclusions of law to the Agency, which shall thereupon enter its order on the basis of such record and recommendations. The order of the Agency shall become final and binding on all parties unless appealed to the courts as provided in section 12 within .... days after notice has been sent to the parties.

(c) Whenever the Agency finds that an emergency exists requiring immediate action to protect the public health or welfare, it may, without

notice or hearing, issue an order reciting the existence of such an emergency and requiring that such action be taken as it deems necessary to meet the emergency. Notwithstanding the provisions of subsection (b) of this section, such order shall be effective immediately. Any person to whom such order is directed shall comply therewith immediately, but on application to the Agency shall be afforded a hearing as soon as possible. On the basis of such hearing the Agency shall continue such order in effect, revoke it, or modify it.

(d) Except as otherwise expressly provided, any notice, order, or other instrument issued by or under authority of the Agency may be served, personally or by publication, on any person affected thereby, and proof of such service may be made in like manner as in case of service of a summons in a civil action, such proof to be filed in the office of the Agency; or such service may be made by mailing a copy of the notice, order, or other instrument by registered mail, directed to the person affected at his last known post office address as shown by the files or records of the Agency, and proof of such service may be made by the affidavit of the person who did the mailing, such proof to be filed in the office of the Agency.

(e) Every certificate or affidavit of service made and filed as herein provided shall be *prima facie* evidence of the facts therein stated, and a certified copy thereof shall have like force and effect.

Section 9. *Hearings.* The hearings herein provided may be conducted by the Director, or the Director may designate hearing officers who shall have the power and authority to conduct such hearings in the name of the Agency, at any time and place. A record or summary of the proceedings of such hearings shall be made and filed with the Agency, together with findings of fact and conclusions of law made by the Agency. A member of the Agency or a hearing officer, designated by the Agency, shall have the power to issue in the name of the Agency notice of the hearings or subpoenas requiring the testimony of witnesses and the production of evidence relevant to any matter involved in such hearing, and to administer oaths and examine witnesses during such hearings. Witnesses who are subpoenaed shall receive the same fees and mileage as in civil actions. In case of contumacy or refusal to obey a notice of hearing or subpoena issued under this section, the ..... Court shall have jurisdiction, upon application of the Agency or its representative, to issue an order requiring such person to appear and testify or produce evidence as the case may require, and any failure to obey such order of the court may be punished by such court as contempt thereof.

Section 10. *Inspections and Investigations: Maintenance of Records.* The Agency or its duly authorized representative shall have the power to enter at reasonable times, and after prior notice of at least 2 days, upon any

private or public property for the purpose of inspecting and investigating conditions relative to the purposes of this Act; except that such entry into security areas under the direct or indirect jurisdiction of the Federal Government shall be permitted only by and with the concurrence of the Federal Government Agency or its duly designated representative.

Any authorized representative of the Agency may examine any records or memoranda pertaining to the operation of radiation machines and radioactive materials. The Agency may require the maintenance of records relating to the operation of disposal systems. Copies of such records must be submitted to the Agency on request.

Section 11. *Penalties: Injunctions*

(a) Any person who violates any of the provisions of, or who fails to perform any duty imposed by, this Act, or who violates any order of the Agency promulgated pursuant to this Act, shall be guilty of a misdemeanor, and in addition thereto may be enjoined from continuing such violation. Each day upon which such violation occurs shall constitute a separate violation.

(b) It shall be the duty of the Attorney General on the request of the Agency to bring any action for an injunction against any person violating the provisions of this Act, or violating any order of the Agency. In any action for an injunction brought pursuant to this section, any findings of the Agency after hearing or due notice shall be *prima facie* evidence of the fact or facts found therein.

Section 12. *Review*

(a) An appeal may be taken from any final order, or other final determination of the Agency, by any person who believes himself adversely affected thereby, or by the Attorney General on behalf of the State of the ..... Court of ..... Within 30 days after
(Seat of Government)
receipt of a copy of the order, or other determination, or after service of notice thereof by registered mail, the appellant or his attorney shall serve a notice of appeal on the Agency through its (Director) provided that during such 30-day period the court may, for good cause shown, extend such time for an additional period not to exceed 60 days. The notice of appeal shall refer to the action of the Agency appealed from, shall specify the grounds of appeal, including both points of law and fact which are asserted or questioned by the appellant. A copy of the original notice of appeal with proof of service shall be filed by the appellant or his attorney with the clerk of the court within 10 days of the service of the notice and thereupon the court shall have jurisdiction of the appeal.

(b) The appellant and the Agency shall in all cases be deemed the original

parties to an appeal. The State, through the Attorney General or any other person affected, may become a party by intervention, as in a civil action, upon showing cause therefor. The Attorney General shall represent the Agency, if requested, upon all such appeals unless he appeals or intervenes in behalf of the State. If the Attorney General or a member of his staff is not available to represent the Agency in any particular proceeding, the Agency is empowered to appoint special counsel for such proceeding. No bond or deposit for costs shall be required of the State or Agency upon any such appeal or upon any subsequent appeal to the Supreme Court or other court proceedings pertaining to the matter.

(c) The appeal shall be heard and determined by the court upon the issues raised by the notice of appeal and the answer thereto according to the rules relating to a trial in the nature of an appeal in equity of an administrative determination. All findings of fact by the Agency are to be deemed final, unless it is shown that such findings were not supported by substantial evidence produced before the Agency at the hearing. In any appeal or other proceeding involving any order, or other determination of the Agency, the action of the Agency shall be *prima facie* evidence reasonable and valid and it shall be presumed that all requirements of the law pertaining to the taking thereof have been complied with. A copy of the proceedings before the Agency shall be certified to the court in connection with each appeal.

(d) A further appeal may be taken to the Supreme Court of the State in the same manner as appeals in equity are taken.

Section 13. *Conflicting Laws.* This Act shall not be construed as repealing any laws of the State relating to radiation sources, exposures, radiation protection, and professional licensure, but shall be held and construed as auxiliary and supplementary thereto, except to the extent that the same are in direct conflict herewith.

Section 14. *Existing Rights and Remedies Preserved.* It is the purpose of this Act to provide additional and cumulative remedies to evaluate, control, and prevent impairment to health from radiation and to encourage the constructive use of radioactive materials and radiation machines. Nothing herein contained shall be construed to abridge or alter rights of action or remedies in equity or under the common law or statutory law, criminal or civil, nor shall any provision of this Act, or any act done by virtue thereof, be construed as estopping the State, or any municipality or person, in the exercise of their rights in equity or under the common law or statutory law to protect the public health and encourage commerce and industry.

Section 15. *Severability.* If any section, subsection, sentence, clause, phrase, or word of this Act is for any reason held to be unconstitutional, such decree shall not affect the validity of any remaining portion of this Act.

PART IV

FEDERAL STATUTORY AND ADMINISTRATIVE LIMITATIONS UPON ATOMIC ACTIVITIES

Federal Statutory and Administrative Limitations Upon Atomic Activities

COURTS OULAHAN *

I. INTRODUCTION

Scientific and technological considerations heretofore have dominated the interest and work of the United States government and private American business in the field of atomic energy. This major preoccupation with research and engineering problems in the development of a new source of energy for peacetime uses is understandable. The product of the exigencies of World War II and the post-war arms race between the Soviet bloc and the United States and its allies, the atomic bomb and its proliferations as a hydrogen and cobalt weapon constitute an important factor in the present balance—or imbalance—of world power. Adopting a new source of energy developed in the context of conflict and of government monopoly to the peacetime needs of medicine, public utilities, and industry may well comprise the beginning of a new industrial revolution of which the scientist and engineer are the principal architects.

A. Scope and Policy of AEC Regulation

In their preoccupation with technology, private industry and the American public have tended to overlook the problems of, and the present justification for, government regulation which covers every facet of the field of atomic energy.[1] The Atomic Energy Act of 1954[2] establishes the broadest control ever exercised by the federal government over any one industry in the United States.[3] The statutory provisions en-

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[1] ". . . [T]he dictatorship of the technically competent" must not over-shadow "the importance of developing procedural formalities as a means of assuring just administration." Plaine, "Atomic Energy—A New Body of Administrative Law," 24 D.C. Bar A.J. 71, 75 (1957).

[2] 68 Stat. 921 (1954), 42 U.S.C.A. §§2011 *et seq.*

[3] The Civil Aeronautics Board is "[n]ext to the AEC . . . perhaps the administrative agency with the widest and most complex range of responsibility," Joint Committee on Energy, "A Study of AEC Procedures and Organization in the Licensing of Reactor

acted by Congress are the framework of this control, which is, in turn, implemented and effected by the administrative regulation and policy of the Atomic Energy Commission.

The Atomic Energy Act of 1946,[4] otherwise known as the McMahon Act, was enacted to substitute civilian for military control over the application of atomic energy largely to the field of warfare. The "primary purpose" of the Atomic Energy Act of 1954 was "to make our Nation's legislative controls better conform with the scientific, technical, economic, and political facts of atomic energy as they exist today," principally in the field of its peaceful uses.[5] Thus, the Atomic Energy Act of 1954 states:

> *Atomic energy is capable of application for peaceful as well as military purposes.* It is therefore declared to be the policy of the United States that—
> a. the development, use, and control of atomic energy shall be directed so as to make the maximum contribution to the general welfare, subject at all times to the paramount objective of making the maximum contribution to the common defense and security; and
> b. *the development, use, and control of atomic energy shall be directed so as to promote world peace, improve the general welfare, increase the standard of living, and strengthen free competition in private enterprise.* (Emphasis supplied.)[6]

Of course, the 1954 statute was not enacted without wide differences of opinion between both major political parties. The debate continues, especially concerning the extent to which government should participate in the process of industrial exploitation of atomic energy.[7] Indeed, tech-

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Facilities," 85th Cong., 1st Sess. 41 (1957) (hereafter cited as Joint Committee Staff Study). This document is perhaps the most useful and comprehensive ever published by the Joint Committee with respect to administrative law problems of the atomic energy field. Findings of the Staff Study are summarized in BNA, Atomic Industry Reporter 3: 115.

[4] 60 Stat. 755 (1946), 42 U.S.C.A., §§1801 *et seq.*

[5] H.R. Rep. No. 2181, 83d Cong., 2d Sess. 1 (1954).

[6] 42 U.S.C.A. §2011. See Cole, "The Power and the Prize—Development of Civilian Nuclear Power in the United States," 25 Geo. Wash. L. Rev. 471, 475, 478 (1957).

[7] Spokesmen for opposing points of view with respect to the means whereby American development of atomic energy for peaceful uses shall be fostered have disclaimed any desire to plunge this field of regulation into the controversy between so-called "public" and "private" power policy adherents. See remarks of Rep. Holifield (Dem., Cal.), *Hearings before Joint Committee on Atomic Energy, "Development, Growth and State of the Atomic Energy Industry,"* 85th Cong. 1st Sess. 65 (1957) (hereafter cited as 1957 Section 202 Hearings); and remarks of AEC Chairman Strauss, Nov. 9, 1955, claiming the Commission "has no philosophy as regards the issue of Public versus Private Power" (BNA, *Atomic Industry Reporter* 1: 187). However, the issue clearly

nological and scientific developments, with attendant economic effects, may well require a reappraisal from time to time of the respective roles of government and private business. However, the fact is that Congress has enacted a statute, and the Commission is bound by a policy, which stresses that

> . . . the goal of atomic power at competitive prices will be reached more quickly if private enterprise, using private funds, is now encouraged to play a far larger role in the development of atomic power than is permitted under existing legislation. In particular, we do not believe that any developmental program carried out solely under governmental auspices, no matter how efficient it may be, can substitute for the cost-cutting and other incentives of free and competitive enterprise.[8]

Prior to 1956 only a limited recognition had been given to the effect of the statutory and administrative restraints imposed under atomic

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was raised in the 85th Congress with the introduction of S. 151 and H.R. 2154, introduced, respectively, by Sen. Gore (Dem., Tenn.) and Rep. Holifield, requiring the Commission to launch an accelerated program of reactor building for the generation of electrical energy, by means of government construction, ownership, and operation of plants. See, *e.g.*, Report of the Standing Committee on Commerce concerning "Federal v. Private and Local Atomic Power for Civilian Use," 82 A.B.A. Rep. 426 (1957); *Hearings before Joint Committee on Atomic Energy on "Authorizing Legislation,"* 85th Cong., 1st Sess. 594-595 (1957) (hereafter cited as 1957 Authorizing Legislation Hearings); Cole, *supra* note 6 at 477-478; remarks of Rep. Holifield, *Hearings before Joint Committee on Atomic Energy on "Congressional Review of Atomic Power Program,"* 85th Cong., 1st Sess. 11 (1957) (hereafter cited as 1957 Congressional Review Hearings); Winsbrough, "A Partnership Plan for Atomic Power Development," 59 P.U. Fort. 217, 219 (1957). The principal attack upon the Atomic Energy Commission program to date was made by Rep. Cannon (Dem., Mo.), Chairman of the House Appropriations Committee, April 16, 1957, charging that "[t]he Commission's atomic electric power program is in some respects in contravention of the law," "[t]he program from a factual viewpoint is practically nonexistent," "[t]he atomic giveaway under the independent industrial program is not authorized by law," and "[t]he whole power-demonstration program is nothing but paper hopes" (103 Cong. Rec. 5188, 5189, 5195, and 5196 (1957)).

[8] H.R. Rep. No. 2181, *supra* note 5 at 3. The majority report on H.R. 9757 to amend the Atomic Energy Act of 1946 further stated (p. 9): "It is our firmly held conviction that increased private participation in atomic power development, under the terms stipulated in this proposed legislation, will measurably accelerate our progress toward the day when economic atomic power will be a fact. . . . We do not believe that the efforts of free enterprise, using its own resources and money, are by themselves adequate to achieve the speediest possible attack on the goal of peacetime power. Neither do we believe that maximum progress toward this objective will be afforded by an effort relying exclusively on governmental research and development, using the public's moneys. We believe, rather, that teamwork between Government and industry—teamwork of the type encouraged by these amendments—is the key to optimum progress, efficiency, and economy in this area of atomic endeavor. . . ."

energy legislation upon the hopes and expectations of the American public with respect to the benefits realizable from the peaceful uses of this energy, as clearly intended by the Congress when it enacted the Atomic Energy Act of 1954.[9] Early in 1956, in its important report on the "Peaceful Uses of Atomic Energy" to the Joint Congressional Committee on Atomic Energy, the McKinney Panel on the Impact of the Peaceful Uses of Atomic Energy pointed out that "the role of the Federal Government in this field [atomic energy] could strongly influence, if not control, the rate of future development" of its peaceful uses.[10] Indeed, with respect to the administrative controls exercised by the Atomic Energy Commission through its licensing and rule-making powers and its ownership of special nuclear material, the Panel found:

> One of the consequences of regulatory systems is a tendency toward overregulation. This is particularly true where all initiative for making determinations rests with the regulatory body.[11]

The Atomic Energy Commission has, to a certain extent, recognized the dangers inherent in "overregulation" and claims that it "has sought, within the limits required for the protection of the public, to impose no unnecessary restrictions upon the developing industry."[12] In a major statement of policy contained in its semiannual report to Congress for the last six months of 1957, the agency said:

> Development of the atomic energy industry necessarily has depended primarily upon the initiative of private enterprise organizations. The Commission has played a principal role also because of the peculiar nature of the special nuclear material on which the industry rests, its military importance, the Government activities and industry based on its processing and

[9] See, *e.g.*, Atomic Industrial Forum, Inc., "A Growth Survey of The Atomic Industry 1955-1965" (1955) (hereafter cited as AIF Growth Survey) (p. 10): "Further, in using the data presented in this report, . . . it is suggested that the reader take into account, as they may affect his own situation, such factors as . . . [t]he possible effect of future . . . federal regulatory actions. . . ."

[10] "Report of the Panel on Impact of Peaceful Uses of Atomic Energy to Joint Committee on Atomic Energy," 84th Cong., 2d Sess. xi (1956) (hereafter cited as McKinney Panel Report). The panel consisted of Robert McKinney, Chairman, Ernest R. Breech, George R. Brown, Sutherland C. Dows, John R. Dunning, Frank M. Folsom, T. Keith Glennan, Samuel B. Morris, and Walter P. Reuther.

[11] *Id.* at 129.

[12] AEC, Twenty-third Semi-Annual Report 175 (1958). See also *id.* at 138: "It has been the policy of the Commission to encourage industry to carry on the various phases of industrial participation in atomic energy with a minimum of Governmental financial assistance and controls."

use, the secrecy that necessarily surrounded so much of the technology and cost data, and the possible hazards to public health and safety created by radioactivity. *Much of the Commission's efforts . . . have been directed toward helping private enterprise groups to overcome the obstacles created by Federal dominance of the field and by the continuing paramount position of national defense considerations.*[13] [Emphasis supplied.]

B. Encouragement of Private Industrial Development

In carrying out what it conceives to be its mandate under the 1954 act, the Commission has established several programs for the development of civilian power reactors, utilizing the resources and experience of private industry but assuring the cooperation of government in connection with certain important phases of research and development. The Commission has summarized the general principles governing the reactor programs, as follows:

1. Developing economically competitive nuclear power for civilian use will be aided by maximum practical utilization of the financial incentive common to business ventures in order to stimulate ingenuity and imagination and the assumption of calculated technical and economic risks.

2. The Commission's role should be to develop advanced technology at Government expense and to stimulate outside groups to undertake developmental or demonstration power projects primarily with non-Commission financing.

In general, the application of these principles has involved:

(a) Financing almost entirely by the Commission of experimental reactors and studies whose primary aim is to develop and prove out basic technology;

(b) Limited financial help by the Commission to industrial, cooperative, or public power groups in construction and operation of reactor demonstration projects which build on the technology developed in the experiments and add operational and economic data.

(c) Complete financing by industry of certain independent projects which also contribute further to technology and add operational and economic data.[14]

The first of these three branches of the power reactor program, which is concerned with Commission-financed development of basic reactor

[13] *Id.* at 161.

[14] AEC Statement Feb. 1957 to Joint Committee, 1957 Section 202 Hearings, *supra* note 7 at 113.

types, has produced twelve reactor experiments, with four under construction and one planned.[15]

Of more direct importance to private and public power groups has been the power demonstration reactor program inaugurated in January, 1955, and involving three so-called "rounds" or invitations to negotiate with the government.[16] This program has the principal aim of developing joint participation by "private, cooperative, and public power groups and the Commission . . . to develop prototype power reactor plants to demonstrate technical and economic feasibility of various reactor concepts." [17]

Under the first round invitation, issued in January, 1955,[18] the Commission called for proposals from private industry without limitation as to size of plant and has approved three proposals as bases for contracts.[19] The second round invitation, issued in September, 1955,[20] proposed the development, design, and construction of smaller reactors ranging from 5,000 to 40,000 kilowatts of electricity, which program has been confined to date to proposed publicly and cooperatively owned facilities.[21] It has produced seven proposals, four of which initially were approved by the Commission as bases for contract negotiations.

[15] AEC, Twenty-third Semi-Annual Report 101-123, 358 (1958); see AEC, Twenty-second Semi-Annual Report 49-54 (1957); 1957 Section 202 Hearings, *supra* note 7 at 114-117.

[16] AEC, Twenty-third Semi-Annual Report 16, 99-100 (1958); AEC, Twenty-second Semi-Annual Report 54 (1957); 1957 Section 202 Hearings, *supra* note 7 at 117; Cole, *supra* note 6 at 479.

[17] AEC Statement Feb. 1957 to Joint Committee, 1957 Section 202 Hearings, *supra* note 7 at 117; AEC, Twenty-second Semi-Annual Report vii, 49 (1957); Cole, *supra* note 6 at 472-480; statement of W. K. Davis, Director, AEC Division of Reactor Development, 1957 Authorizing Legislation Hearings, *supra* note 7 at 158: ". . . [W]e have a rather unique situation where the Government, through AEC, is developing an industry which in the end has to be supplied to the utilities by private industry. There is no way the Government is going to supply the reactors themselves to the utilities who are going to use them . . ."; statement of K. E. Fields, AEC General Manager, *id.* at 143-144, 146-148.

[18] AEC Press Rel. No. 589 (Jan. 10, 1955); 1957 Authorizing Legislation Hearings, *supra* note 7 at 512.

[19] Yankee Atomic Electric Co., Rowe, Mass., contract signed June 6, 1956; Consumers Public Power District, Hallam, Nebraska, Sept. 20, 1957; and Power Reactor Development Co., Monroe, Michigan, Mar. 26, 1957. See 1957 Section 202 Hearings, *supra* note 7 at 117.

[20] AEC Press Rel. No. 695 (Sept. 21, 1955); 1957 Authorizing Legislation Hearings, *supra* note 7 at 513-515; see Statement of K. E. Fields, AEC General Manager, *id.* at 144-146, 148-152.

[21] These projects are "almost entirely a Government program," since the Rural Electrification Administration (REA) furnished loans for each such project; state-

As the result of strong representations to the Joint Committee in 1957,[22] Congress included special provisions in the appropriations act for fiscal year 1958 with respect to contracting for such publicly and cooperatively owned projects.[23] This legislation also contained provision, at an initial cost of $18,000,000, for the institution of a prototype power reactor facilities program by the AEC itself involving the construction of a natural uranium, graphite-moderated, gas-cooled power reactor facility and a plutonium recycle experimental reactor.[24]

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ment of Sen. Gore, 1957 Authorizing Legislation Hearings, *supra* note 7 at 145. For a list of the projects accepted and the three rejected, see 1957 Section 202 Hearings, *supra* note 7 at 117-118. In May 1958, the Commission announced that, "in and because of 'little or no early economic promise,' consultation with Wolverine's management" the agency had decided to discontinue consideration of the aqueous homogeneous power reactor project submitted by Wolverine Electric Cooperative, Big Rapids, Michigan (BNA, Atomic Industry Reporter 4: 165).

[22] Section 202 of the 1954 act, 42 U.S.C.A. §2252, requires the Joint Committee during the first 60 days of each session of Congress to "conduct hearings in either open or executive session for the purpose of receiving information concerning the development, growth, and state of the atomic energy industry."

[23] This is the so-called "cooperative power reactor demonstration program," provided in Section 111 of Pub. L. 85-162, 85th Cong., 1st Sess. (1957). Under this program, $129,915,000 initially was authorized for use in a program not to exceed $149,915,000 for, among other purposes, "arrangements for projects sponsored under the second round of the Commission's power reactor demonstration programs by cooperatives and publicly owned agencies under which the reactor is financed in major part by the Government." In connection with these projects, the Commission is required to contract directly with the private manufacturers of facilities, rather than have the utility make the contract. After operation for five years by the Commission under contract with the utility, the latter has the option to purchase the plant; if such a purchase is not made, the plant must be dismantled. This special treatment for publicly or cooperatively owned utilities was held warranted by the policy consideration that "the need for advancing the small or intermediate reactor art should be the AEC's primary interest and negotiations with cooperatives and publicly owned organizations should take into consideration basic differences in their size, financial structures, and capacity for participation" without "jeopardizing the financial integrity of cooperatives and publicly owned organization" (Sen. Rep. No. 791, 85th Cong., 1st Sess. 16-17 (1957)). In its authorization legislation for fiscal year 1959, the Joint Committee on Atomic Energy increased the amounts authorized for the next 12 months from $129,915,000 to $155,113,000 and increased the over-all program totals from $129,915,000 to $155,113,000; H.R. Rep. No. 2108, 85th Cong., 2d Sess. 20-21 (1958).

[24] Sections 101(e)(14)-(15) and 110, Pub. L. 85-162, 85th Cong., 1st Sess. (1957); see Sen. Rep. No. 791, *supra* note 23 at 21-33. This program is based on the Joint Committee contention that the Commission has not "been making sufficient progress in the development of prototype power reactors to test and demonstrate the practical problems of achieving economic nuclear power," *id.* at 21. In a statement issued when he approved Pub. L. 85-162, Aug. 21, 1957, President Eisenhower stated that, while he was "not opposed to such projects [for natural uranium and plutonium production reactors] as studies by the Commission, . . . I will oppose the expenditure of public money for the construction and operation by the Government of any large-scale power reactor, or

The third round announced by the Commission on January 7, 1957, and requiring proposals by December 31, 1958 (later extended to June 30, 1959), placed no limitation on the types or sizes of plants which may be proposed, except that "they should make significant contributions toward the achievement of commercial utilization of nuclear power and that construction will be completed by June 30, 1962," which date apparently will be extended in the case of individual proposals.[25] The third round contemplates assistance in the form of:

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any prototype thereof, unless private enterprise has first received reasonable opportunity to bear or share the cost" (N.Y. Times, Aug. 22, 1957). In a letter to Rep. Cole, Aug. 3, 1957, prior to enactment of the legislation, AEC Chairman Strauss charged that the provision for reactor prototypes in the appropriation legislation "would constitute a substantial start toward a program for Government-owned atomic power facilities" and that "a congressional direction to the Commission to proceed with particular reactor concepts would set an unwise precedent" (103 Cong. Rec. A6319-21 (Aug. 5, 1957)). Sections 101(e) and 110 of Pub. L. 85-162 represented considerably diluted versions of continuous attempts in recent years to require the Commission to develop a prototype reactor program with an initial expenditure of as high as $400,000; see 1957 Section 202 Hearings, *supra* note 7 at 41, 58; S. 151, 85th Cong., 1st Sess. (Jan. 7, 1957); Winsbrough, *supra* note 7 at 219; BNA, Atomic Industry Reporter 2: 171-179 and 2: 211; Cole, *supra* note 6 at 487-488.

[25] AEC Statement, 1957 Section 202 Hearings, *supra* note 7 at 118-119. See BNA, Atomic Industry Reporter 3: 11, 13 and 15; statement of AEC General Manager Fields, 1957 Authorization Legislation Hearings, *supra* note 7 at 145-146, 152-153; Cole, *supra* note 6 at 480-482. As of Jan. 1, 1958, four utilities or groups of utilities had submitted proposals under this round, one of which (Northern States Power Co., Sioux Falls, Iowa) signed a contract with the AEC on Nov. 19, 1957; AEC, Twenty-third Semi-Annual Report 101 (1958). Extension of the termination date of this round from Dec. 31, 1958, to June 30, 1959, was agreed to by the Joint Committee in its proposed appropriation legislation for fiscal year 1959, H.R. 13121, Section 109; see H.R. Rep. No. 2108, *supra* note 23 at 21 and 31. The Commission itself early recognized the difficulty of meeting the completion deadline of June 30, 1962 (BNA, Atomic Industry Reporter 4: 19) and has sought extension of the deadline with respect to two particular projects. These are (1) the proposal of East Central and Florida West Coast Nuclear Groups for a gas-cooled reactor, to be completed by June 30, 1963, the basis for the arrangement for which the Joint Committee approved in the 1959 authorization legislation (H.R. 13121, Section 109 Pub. L. 85-590, 85th Cong., 2d Sess. (1958); see H.R. Rep. No. 2108, *supra* note 23 at 21 and 31, and BNA, Atomic Industry Reporter 4: 75 and 4: 94) and (2) the proposal of Pennsylvania Power & Light Co. and Westinghouse Electric Corp. for a homogeneous reactor project, with no firm construction date. The latter proposal was the subject of critical concurrent resolutions introduced in April 1958, by Sen. Anderson (Dem., N.M.) and Rep. Holifield (Dem., Cal.), S. Con. Res. 78 and H. Con. Res. 307, 85th Cong., 2d Sess., and an adverse decision by the Comptroller General, April 8, 1958, Dec. B-135649, BNA, Atomic Industry Reporter 4: 123 and 221: 827. The Commission thereupon made a specific submission of the proposed contract, in restricted form, to the Joint Committee, which approved such submission as the basis for an arrangement in the proposed appropriation legislation for fiscal year 1959 (Sec. 109, Pub. L. 85-590, *supra;* see H.R. Rep. No. 2108, *supra* note 23 at 21-22 and 32).

(1) Waiver of established Commission charges for use of source and special nuclear materials over a specified period of time; (2) performance either without cost or at less than full cost in Commission laboratories of mutually agreed-upon research and development not reasonably available elsewhere; and (3) support of research and development required to advance the technology of projects which promise to make a significant contribution toward achieving cheap, abundant, and safe nuclear power.[26]

Criticism of the Commission's program, which became particularly acute in the 1957 session of Congress,[27] resulted in the amendment of the appropriations provisions of the Atomic Energy Act of 1954. Under Section 261 [28] of that statute as then amended, any arrangement between the Commission and a private party must be reviewed and specifically authorized by the Joint Committee.[29] This provision conceivably could permit congressional review of all expenditures heretofore made under the first and second rounds,[30] a development which has been termed an attempt to effect *ex post facto* application of a statute.[31]

[26] AEC Statement, 1957 Section 202 Hearings, *supra* note 7 at 118.

[27] A principal criticism has been that the third round invitation would permit applicants under the other two rounds to "get more money even though it previously had been limited to a fixed amount" (Rep. Cannon, 103 Cong. Rec. 5195-5196 (1957)). Sen. Gore characterized this invitation as a Commission attempt "to further feather the bed of private concerns in order to entice them to submit proposals" and "to add feathers to the bed of those with whom you [AEC] entered into contracts even as far back as 1956" (1957 Section 202 Hearings, *supra* note 7 at 35-36). In its report authorizing appropriations for the AEC in accordance with Section 261, as amended in 1957, the Joint Committee stated (Sen. Rep. No. 791, *supra* note 23 at 20): "During the hearings it was also brought out that the language of the third round might make available third round funds to the first and second round participants and to other reactor projects already under construction. The committee does not approve the implications of this language. Such language would permit the transference of funds authorized by Congress for specific future projects retroactively to past projects which were proposed under different terms and conditions. . . . Provision is made in the third round for postconstruction research and development assistance which, if attempted to be applied as proposed in the second round . . . could result in outright subsidies to the operators of private reactors."

[28] 42 U.S.C.A. §2017.

[29] Pub. L. 85-162, 85th Cong., 1st Sess. (1957). In the AEC authorization legislation for fiscal year 1959, Congress provided that, "[b]efore the Commission enters into any arrangement the basis of which has not been previously submitted to the Joint Committee . . ., it shall make public announcement of each particular reactor project it considers technically desirable for construction and shall set reasonable dates for submission, approval of the proposal and negotiations of the basis of the arrangement, and commencement of construction" (Section 109, Pub. L. 85-590, *supra;* see H.R. Rep. No. 2108, *supra* note 23 at 22 and 32).

[30] See statement of Rep. Holifield, 1957 Congressional Review Hearings, *supra* note 7 at 69.

[31] See statement of AEC Chairman Strauss, *supra* note 7 at 69.

C. Development of Private Industry

Although confronted with numerous technical and financial problems [32] which may presage "lean and trying years" in the foreseeable future,[33] the private industry regulated by the 1954 statute is no mere economic fledgling. Even prior to 1954 approximately $50 millions were spent by private sources for nuclear research and development.[34] Between 1954 and 1958, it is reliably estimated that some $300 millions of non-government funds will have been spent for such research and development,[35] of which approximately $115 millions will go into capital facilities.[36]

As the peaceful uses of atomic energy are expanded, private industry should assume an increasingly important role. In 1952, for example, the research institutions spent $1.2 millions, and industry $4.8 millions, for facilities and equipment and operations in the field. During 1956-1958, however, such industrial expenditures are expected to reach $44.1 millions annually, compared with $3.7 millions for the institutions.[37] These efforts are believed capable of producing nuclear power on a nearly commercial basis sometime between 1965 and 1970.[38]

[32] 1957 Section 202 Hearings, *supra* note 7 at 58-59; 1957 Authorizing Legislation Hearings, *supra* note 7 at 203, 331-339; Sen. Rep. No. 296, 85th Cong., 1st Sess. 1 (1957). See AEC Twenty-third Semi-Annual Report 7 (1958): "Late in 1957, some readjustment was going on in that part of the atomic energy industry concerned with civilian power reactors. Some firms had dropped out, or reduced their undertakings. Current economic trends undoubtedly were a partial factor in some cases. While this adjustment may temporarily deter new firms from entering the industry, the hard core of the atomic energy business is already established and growth is steady. . . ." For a discussion of technological and economic factors affecting industry, including reduction in capital, fuel, and maintenance costs, see *id.* at 94-98; for the point of view of industry concerning retrenchment during 1957, see *Hearings Before Joint Committee on Atomic Energy on "Development, Growth and State of the Atomic Energy Industry,"* 85th Cong., 2d Sess. 218, 270 (1958) (hereafter cited as 1958 Section 202 Hearings).

[33] C. L. Wilson, President, Metals & Controls Corp., BNA, Atomic Industry Reporter 3: 51.

[34] AIF Growth Survey, *supra* note 9 at 6.

[35] *Id.* at 11.

[36] *Id.* at 26. According to former AEC Chairman Strauss, "industry's share . . . represents about one-third of the total national effort to develop economic nuclear power" (BNA, Atomic Industry Reporter 4: 21).

[37] AIF Growth Survey, *supra* note 9 at 14.

[38] See *id.* at 35; Cole, *supra* note 6 at 475-476. The McKinney Panel Report, *supra* note 10 at 2, states that "[b]y 1975 atomic power could amount to 20 to 40 per cent of presently installed electric generating capability in the United States. If this occurs, however, it will be in the context of a total generating capability of 3 to 4 times present levels." The goal of the AEC itself is achieving "competitive nuclear power in the United States during the next ten years," according to a statement by the Commission

Progress in the atomic energy industry is, in the opinion of the Atomic Energy Commission, "without precedent," due to the fact that "[n]o other major scientific discovery has ever before been applied so quickly to so many practical uses." [39] The Commission has thus described the condition of this industry at the end of 1957:

> Since 1953, an atomic energy industry has come into being, though still on [a] relatively small scale for a major industry in the United States, and a foundation has been laid for healthy growth and expansion.
>
> Basically, the industry has two main divisions—that which purchases and uses atomic energy products, such as the companies processing radioisotopes, and the manufacturers of such devices as thickness or density gauges that incorporate radioisotopes; and the section which designs, constructs, and operates or sells research and power reactors, plus the suppliers of materials, components, and services for Federal or private reactors. The radioisotope part of the industry is older and better developed, and still is rapidly expanding. The reactor part, a composite of Federal and private activities, is mostly new since 1953, but already has attracted considerable risk capital.
>
> Private companies have entered many phases of the reactor part of the industry, particularly where there was a promising market for products or services. Industry has assumed heavy outlays in designing, building, and operating nuclear reactors to produce electric power. A foreign market is developing for United States built research and power reactors. Heavy expense has been incurred in nuclear research, development, and engineering.

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submitted June 4, 1958, to the Joint Committee on Atomic Energy (BNA, Atomic Industry Reporter 54:39). This statement was made in connection with a program for projecting the civilian power reactor development effort through fiscal year 1963 and clearly was formulated in the light of continuous criticism of the AEC for its alleged failure to prepare and announce a long-range program in the civilian power reactor field. See, *e.g.*, H.R. Rep. No. 2108, *supra* note 23 at 9-10; 1958 Section 202 Hearings, *supra* note 32 at 209. As of January 1, 1958, actual or potential electrical capacity of civilian nuclear power projects aggregated 1,306,500 kilowatts, of which 65,000 kilowatts were being produced by plants then in operation, 689,000 kilowatts were planned to be produced by plants then being built, and 552,500 kilowatts were proposed for plants then being planned. AEC, Twenty-third Semi-Annual Report 77, 357 (1958). The two plants in operation at the end of 1957 were the Vallecitos boiling water reactor at Pleasanton, Cal., operated by Pacific Gas & Electric Co., which achieved criticality in Oct. 1957 and has a capacity of 5,000 kilowatts, and the pressurized water reactor operated by the AEC and Duquesne Light Co. at Shippingport, Pa., which achieved criticality Dec. 2, 1957, and has a capacity of 60,000 kilowatts.

[39] AEC, Twenty-third Semi-Annual Report 3 (1958).

> Private organizations and Government were constructing 89 reactors as of the end of 1957. Including 7 critical assemblies, there were 43 research, training, and test reactors (11 of them for the foreign market). The 46 power reactors, of which 36 were military machines, included 10 civilian powerplants, 1 for overseas sale.
>
> Expenditures or obligations by the Federal Government for research and development and construction of civilian and military power and propulsion reactors are estimated at more than $500 million for the fiscal year ending June 30, 1958. Estimates were that private industry was spending about $64 million on civilian power reactors during the same period.[40]

D. Role of Administrative Law

Federal administrative law includes those statutes and regulations governing the departments, agencies, and regulatory commissions of the Executive Branch of the Government, as well as those rules made by such organizations to govern private activity. This branch of the law can and does have a widespread impact upon citizens and businesses in every state of the Union.[41] The field is as broad as the field of national government. By enacting the Atomic Energy Acts of 1946 and 1954, Congress brought the control of the peaceful uses of atomic energy into an area where the established agencies and the courts have been guided by fairly well-defined concepts of administrative due process consistent with the needs and powers of government.

Except for unique scientific, technological, and economic problems which will be solved by the passage of time, the atomic energy field is no different from any other area of government regulation. The Atomic Energy Commission uses traditional forms of administrative controls, such as rule-making and licensing, to carry out its powers. In addition, that Commission has utilized conditions in contract awards as a means of industry control to a very great extent, probably more than heretofore used by any other federal agency.

Although special problems concerning atomic energy must be given due consideration in establishing a system of administrative regulation, a moratorium should not be declared in that area on Congressionally enacted and judicially developed concepts of due process and delegated

[40] *Id.* at 6; for a detailed list of the reactors and projects involved, see 1958 Section 202 Hearings, *supra* note 32 at 36ff.

[41] Cooper, The Lawyer and Administrative Agencies 1-2 (1957); Cragun and de Seife, "A Skeptic Views 25 Years of Administrative Process," 16 Fed. Bar J. 556 (1956); Oulahan, "A Challenge to the American Bar," 51 The Brief 101, 103-104 (1956).

power otherwise applicable to an agency of the United States government. In passing the Atomic Energy Acts of 1946 and 1954, Congress, instead of conferring a special status upon administrative procedures of the Atomic Energy Commission, expressly made applicable thereto the provisions of the Federal Administrative Procedure Act of 1946.[42] As Congress has recognized in passing atomic energy legislation, the Administrative Procedure Act

> . . . was enacted by the Congress in 1946 to regulate and make uniform, where practicable, the administrative process, particularly in the control of private and property rights by agencies of the executive branch. That statute represented the culmination of nearly two decades of effort on the part of the Congress, the executive branch, members of the Judiciary, and the organized bar to meet the numerous problems of procedure and substantive rights which have arisen out of the multiplication of Federal administrative agencies and the expansion of their functions.[43]

However, Congress took cognizance of situations where so-called Restricted Data or defense information was involved in connection with atomic energy. As more fully discussed hereafter, special provision was made in the 1954 statute for parallel non-public procedures in such cases.[44]

In this study, the procedures used by the Atomic Energy Commission will be considered with particular regard to the philosophy and provisions of the Administrative Procedure Act and to the special problems of administrative law which have arisen under the atomic energy statutes of 1946 and 1954. Rule making (the procedure whereby the Commission largely effects and implements controlling legislation) and licensing and contracting (the administrative means for enforcing the rules) comprise the three major categories of administrative activity carried on by the Atomic Energy Commission. Accordingly, these three subjects are treated separately.

[42] 60 Stat. 237 (1946), 5 U.S.C.A. §§1001 *et seq.*

[43] Commission on Organization of Executive Branch of the Government, Task Force Report on Legal Services and Procedure, 137 (1955) (hereafter cited as Hoover Commission Legal Task Force Report). See Statement of Chairman of the Senate Judiciary Committee, Sen. Doc. No. 248, 79th Cong., 2d Sess. 311 (1946): ". . . I do not believe a more important piece of legislation has been or will be presented to the Congress of the United States . . . because it deals with something which touches the most lowly as well as the most elevated and lofty citizen in the land. It touches every phase and form of human activity. . . ."

[44] Section 181, 42 U.S.C.A. §2231. For a summary of the legislative history of this section, see Joint Committee Staff Study, *supra* note 3 at 67-69.

II. RULE-MAKING PROCEDURES

A. Rule Making in Administrative Law

Rule making, sometimes called subordinate legislation, results from a delegation of legislative power to an administrative agency to implement the basic law established by Congress. Although "a normal feature of Federal administration ever since the Government was established," [45] the rule-making process has assumed its present importance only with the development of numerous federal regulatory agencies and the increasingly common practice of Congress "to establish legislative standards [for agency rule making] in broad, vague and general terms." [46]

The power of agencies to issue rules is in many respects more important than the legislative authority of the Congress in creating the rule-making power. Rules, no less than statutes, establish standards of conduct for all to whom their terms apply.[47] It was in recognition of this important role of rule making in the federal administrative process [48] that Congress in 1946 included special provisions with respect thereto in the Administrative Procedure Act.[49]

This statute establishes two categories of rule making, formal and informal. It specifies procedures applicable to rule making except where "there is involved any military, naval, or foreign affairs function of the United States or . . . any matter relating to agency management or personnel or to public property, loans, grants, benefits, or contracts." [50]

Informal rule making is required to be effected by publishing notice thereof in the Federal Register [51] and by giving interested persons an opportunity to submit written or oral views with respect to the subject

[45] Administrative Procedure in Government Agencies—Report of the Attorney General's Committee on Administrative Procedure, Sen. Doc. No. 8, 77th Cong., 1st Sess. 78 (1941).

[46] Cooper, Administrative Agencies and the Courts 259 (1951). For a discussion of legislative delegations of authority, see Hoover Commission Legal Task Force Report, *supra* note 43 at 133-136.

[47] Columbia Broadcasting System, Inc. v. United States, 316 U.S. 407, 418 (1942).

[48] Sen. Doc. No. 248, *supra* note 43 at 18, 194-195, 251-252, 304-305, 353-354, and 358. See Cooper, *supra* note 46 at 253-302.

[49] Sections 2(c), 4, and 7(c), 5 U.S.C.A. §§1001(c), 1003, and 1006(c).

[50] Section 4(1) and (2), 5 U.S.C.A. §1003(1) and (2). These exceptions assume importance in the light of the military and international aspects of the Atomic Energy Commission's authority and of its powers with respect to leasing atomic materials, providing grants for research and development by contract or otherwise, and making contracts to implement the Government's atomic energy program.

[51] Section 4(a), 5 U.S.C.A. §1003(a).

matter under consideration.[52] Notice of proposed rule making may be omitted, however, where "the agency for good cause finds . . . that notice and public procedure thereon are impracticable, unnecessary, or contrary to the public interest." Except where the agency otherwise provides "upon good cause found and published with the rule," proposed rules must be published at least thirty days before their effective date.[53]

In addition to informal rule making, the Atomic Energy Commission is authorized, together with nine other federal agencies and departments,[54] to engage in formal rule making. Such rule making is involved wherever the statutes require that regulations be made on the record after opportunity for agency hearing in an adjudicatory proceeding.[55] Under such procedure, an opportunity for a hearing must be afforded before the agency, a member thereof, or a hearing examiner [56] appointed in accordance with the requirements of the Administrative Procedure Act.[57] The presiding officer is authorized to issue a recommended decision based on the evidence; or the agency may issue a tentative decision or order the record certified to it for immediate final decision when it finds "upon the record that due and timely execution of its functions imperatively or unavoidably so requires." [58] The parties to

[52] Section 4(b), 5 U.S.C.A. §1003(b).

[53] Section 4(c), 5 U.S.C.A. §1003(c).

[54] These agencies are the Department of Argiculture, 7 U.S.C.A. §§181 *et seq.* (rate making under Packers and Stockyards Act), 7 U.S.C.A. §§601 *et seq.* (marketing orders under Agricultural Marketing Agreement Act), and 7 U.S.C.A. §§1115(a) and 1131(c) (sugar quotas and wage standards under Sugar Act of 1948); Food and Drug Administration, Department of Health, Education, and Welfare, 21 U.S.C.A. §§301 *et seq.* (Federal Food, Drug, and Cosmetic Act); Department of Labor, 29 U.S.C.A. §§201 *et seq.* (wage orders under Fair Labor Standards Act) and 41 U.S.C.A. §35 (wage determinations under Walsh-Healey Act); Army Corps of Engineers, Department of Defense, 33 U.S.C.A. §§503 and 504 (reasonableness of bridge tolls); Civil Aeronautics Board, 49 U.S.C.A. §486 (mail rate proceedings) and 49 U.S.C.A. §642(d)-(h) (rates, fares, and charges); Federal Communications Commission, 47 U.S.C.A. §§204, 205, and 222(e)(3) (charges, classifications, and practices) and §303(f) (frequencies and authorized power); Federal Power Commission, 16 U.S.C.A. §824a(b) and 15 U.S.C.A. §717f(a) (interconnection of facilities), 16 U.S.C.A. §§824d-824e and 15 U.S.C.A. §§717c-717d (fixing rates), 16 U.S.C.A. §825 and 15 U.S.C.A. §717g (accounting entries), and 16 U.S.C.A. §825a and 15 U.S.C.A. §717h (depreciation and amortization); Interstate Commerce Commission, 49 U.S.C.A. §§15(1), 316(e), 318(b), 907(b), 907(h), 915(b), and 1006(b) (rates and practices); Securities and Exchange Commission, 15 U.S.C.A. §§77a, 78a, 79, 77aaa, 80a-1, and 80b-1 *et seq.* (corporate and financial structures and practices).

[55] Administrative Procedure Act, Section 4(b), 5 U.S.C.A. §1003(b).

[56] *Id.*, Section 7(a), 5 U.S.C.A. §1006(a).

[57] *Id.*, Section 11, 5 U.S.C.A. §1010.

[58] *Id.*, Section 8(a)(1)-(2), 5 U.S.C.A. §1007(a)(1)-(2).

the proceeding are afforded opportunity for the submission of evidence and the taking of exceptions to the decisions of the hearing officer equivalent to that afforded in formal adjudication.[59]

B. Rule Making under the Atomic Energy Act of 1946

The Atomic Energy Act of 1946 contained few statutory references to the rule-making authority of the Atomic Energy Commission.[60] Indeed, provision for general rule-making authority was not made in that statute until 1953.[61] However, a number of regulations of wide scope and importance were developed under the Atomic Energy Act of 1946.[62]

In order to assure continuity of regulation, the transition from the 1946 to the 1954 statute required special action by the Commission when the President signed the present legislation on August 30, 1954. This was effected the same day by a "note . . . promulgated as a rule" in which the Atomic Energy Commission announced:

> Until further order of the . . . Commission, all provisions of rules, regulations and notices, published . . . under the authority of the Atomic Energy Act of 1946 and in effect immediately prior to the effective date of the Atomic Energy Act of 1954, are continued in force and effect to the extent that they are not inconsistent with the Atomic Energy Act of 1954.[63]

Thus, a possible inconsistency between the definition of "fissionable material," the term used in the 1946 statute,[64] and "special nuclear material," the equivalent term used in the 1954 statute,[65] as well as the regulatory hiatus which might have otherwise resulted, were avoided. The Commission resorted to provision in the Administrative Procedure

[59] *Id.*, Sections 7(c) and 8(a) and (b), 5 U.S.C.A. §§1006(c) and 1007 (a) and (b).

[60] Sections 5(a)(4), 5(c)(2), 7(c), and 12(a)(2), 42 U.S.C. §§1805(a)(4), 1805(c)(2), 1807(c), and 1812(a)(2)(1946).

[61] Section 12(a)(10), as added by Pub. L. 164, 83d Cong., 1st Sess. (1953).

[62] *E.g.*, "Control of Source Material," 10 Code Fed. Regs. Pt. 40.

[63] The Commission filed this "Note" on September 2, 1954. It was published in the Federal Register the following day, 19 Fed. Reg. 5628.

[64] Section 5(a)(1), 42 U.S.C.A. §1805(a)(1)(1946), which provided, in part, that ". . . the term 'fissionable material' means plutonium, uranium enriched in the isotope 235, any other material which the Commission determines to be capable of releasing substantial quantities of energy through nuclear chain reaction of the material, or any material artificially enriched by any of the foregoing. . . ."

[65] Section 11y, 42 U.S.C.A. §2014(y): "The term 'special nuclear material' means (1) plutonium, uranium enriched in the isotope 233 or in the isotope 235, and any other material which the Commission . . . determines to be a special nuclear material . . . ; or (2) any material artificially enriched by any of the foregoing. . . ."

Act authorizing adoption of a rule without resort to public rule-making procedures on the ground that such procedures "would be contrary to the public interest by reason of the fact that the public health and safety and the national defense necessitate the uninterrupted continuation of the effectiveness of all existing controls." [66] The Commission indicated its intention in the future to secure wide public and industry participation in rule making when it stated that the provisions of the "Note" were considered "interim" only and that "comments by all interested parties are invited." [67]

C. Rule Making under Atomic Energy Act of 1954

1. General Authority

The rule-making authority of the Atomic Energy Commission under the 1954 legislation is one of the keystones of the system of controls contemplated by that statute.[68] Under Section 161q of that act, the Commission is given general authority to "make, promulgate, issue, rescind, and amend such rules and regulations as may be necessary to carry out the purposes of this Act." [69] Seven other sections of the 1954 statute confer specific authority upon the Commission with respect to rule making in matters of safety,[70] issuance of licenses,[71] and definition of materials.[72]

[66] Section 4(a), 5 U.S.C.A. §1003(a).

[67] By additional rule announced September 3, 1956 (19 Fed. Reg. 5628) and made effective Aug. 30, the Commission also amended its prior rules (10 Code Fed. Regs. §50.2) to make the term "production facility" under Section 11p of the new act (now Section 11t, 42 U.S.C.A. §2014t) include all facilities for the production of "fissionable material." Such rule making also was effected without notice and public procedure "for good cause found by the Commission on the ground that such are impracticable by reason of the fact that due and timely execution of the Commission's functions in giving effect to the Atomic Energy Act would be impeded by such notice and procedure." As in the case of the "Note" published Aug. 30, 1954, this rule was stated to be "interim" only, and comments by interested parties were invited.

[68] See McKinney Panel Report, *supra* note 10 at 21: "This sweeping revision [the 1954 Act] replaced a relatively simple Government monopoly with a complex structure for regulation of private activities. At the same time, it gave wide discretionary authority to the Commission to stimulate and aid private development. . . . Many new provisions required Commission interpretation and action before industry could tell what it could or could not do. . . ."

[69] 42 U.S.C.A. §2201(q), which section is identical with Section 12(a)(10) of the 1946 act, added by Pub. L. 164, 83d Cong., 1st Sess. (1953).

[70] Section 53e(7), 42 U.S.C.A. §2073(e)(7) (distribution of special nuclear material "only pursuant to such safety standards as may be established by rule . . . to protect health and to minimize danger to life or property").

[71] Sections 53b and 63b, 42 U.S.C.A. §§2073(b) and 2093(b) (establishing "by

Although an improvement in degree of specificity over the 1946 legislation, the Atomic Energy Act of 1954 exemplifies a tendency of Congress at times to give administrative agencies unusually broad latitude in effectuating Congressional policies, without providing clear and precise standards to channel and govern administrative implementation of such policies.[73] With a few exceptions the formulation of Commission rules is limited only by vague and general concepts of "common defense and security" or "health and safety of the public." [74] The statute, however wise its administration has been to date, represents an extreme example of so-called "skeleton legislation," which must be clothed by executive regulations.[75]

2. Informal Rule-Making Procedures

Section 181 of the Atomic Energy Act of 1954 applies the Federal Administrative Procedure Act of 1946 "to all agency action taken under this [Atomic Energy] Act," except where Restricted Data and defense information are involved.[76] In the latter event, "parallel procedures" are permitted, preserving administrative due process but at the same time precluding unauthorized disclosure of secret information.

Although the Commission has, by regulation and in apparent good faith, sought to implement these requirements with respect to rule making, the regulations governing rule making clearly emphasize informal procedures and do not encourage an opportunity for oral hearing. Indeed, it is Commission policy that

> Informal hearings will normally be held for the purposes of obtaining necessary or useful information, and affording par-

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rule, minimum criteria for the issuance of . . . licenses for the distribution of . . . [special nuclear material and source material respectively] depending upon the degree of importance to the common defense and security or to the health and safety of the public of . . . [its] physical characteristics . . . , the quantities . . . to be distributed . . . , and . . . [its] intended use . . ."); and Section 103a, 42 U.S.C.A. §2133(a) (commercial licenses to be issued "subject to such conditions as the Commission may by rule or regulation establish to effectuate the purposes and provisions of this Act").

[72] Sections 11x, 42 U.S.C.A. §2014(x) (formerly Section 11s); Section 11y, 42 U.S.C.A. §2014(y) (formerly Section 11t); Section 51, 42 U.S.C.A. §2071; and Section 61, 42 U.S.C.A. §2091.

[73] See Hoover Commission Legal Task Force Report, *supra* note 43, at 133-136.

[74] *E.g.*, Sections 53b and 63b, *supra* note 71.

[75] Sen. Doc. No. 8, *supra* note 45, at 98.

[76] 42 U.S.C.A. §2231, comparable to Section 14 of the 1946 act, 42 U.S.C. §1814 (1946).

> ticipation by interested persons, in the formulation, amendment, or rescission of rules and regulations.[77]

Thus, in the case of "informal hearings," the procedure to be followed

> . . . shall be such as will best serve the purpose of the hearing. For example, an informal hearing may consist of the submission of written data, views, or arguments with or without oral argument, or may partake of the nature of a conference, or may assume some of the aspects of a formal hearing in which the subpoena of witnesses and the production of evidence may be permitted or directed.[78]

Informal public rule-making procedure is further covered in the Commission's Rules of Practice,[79] which relate to "the issuance, amendment, or rescission of substantive rules in which participation by interested persons is prescribed under Section 4 of the Administrative Procedure Act." [80] This procedure for "substantive rules" conforms to the provisions of the Administrative Procedure Act concerning hearing requirements for such rules.[81]

Under the Commission procedure, rule making is commenced by an "initiation petition" made upon the agency's own motion, the recommendation of another federal agency, or the request of "any other in-

[77] 10 Code Fed. Regs. §2.708. See Plaine, "Rules of Practice of Atomic Energy Commission," 34 Tex. L. Rev. 801, 818 (1956): "Because hearings for rule-making under the Atomic Energy Act are not 'on the record,' trial-type hearings, but are hearings in the legislative sense, the public rule-making procedure will normally be an informal hearing. Thus interested persons will be provided the opportunity, as the Commission determines and states in the notice, to submit written views or arguments, or to participate in a conference, or in an oral hearing as the case may be. . . ." House Committee on Government Operations, "Survey and Study of Administrative Organization, Procedure, and Practice in the Federal Agencies—Agency Response to Questionnaire," Part 11A—Independent Agencies (1957) (hereafter cited as AEC Response to Questionnaire), in which the AEC stated (p. 1081): ". . . [E]ven if an oral hearing [for rule making] were held, it would be most likely to be informal, in the nature of a conference so that formal procedures would not be necessary. . . ."

[78] 10 Code Fed. Regs. §2.720.

[79] 10 Code Fed. Regs. §§2.780-2.787.

[80] 10 Code Fed. Regs. §2.780.

[81] Under the Administrative Procedure Act, an agency rule is considered "substantive" unless it relates to "any military, naval or foreign affairs function of the United States," "any matter relating to agency management or personnel or to public property, loans, grants, benefits, or contracts," "interpretative rules," "general statements of policy," and "rules of agency organization, procedure or practice." See Section 4(1), (2), and (a), 5 U.S.C.A. §1003 (1), (2), and (a); Sen. Doc. No. 248, *supra* note 43 at 199-200. The Commission believes that "public participation in these matters [nonsubstantive rule making] to the extent of commenting on proposed regulations is generally desirable" (AEC Response to Questionnaire, *supra* note 77, at 1082).

terested person." [82] Petitions by such persons for the issuance, amendment, or rescission of AEC rules are required (1) to state "the substance or text of any proposed rule or regulation, or amendment thereof" or to "specify the rule or regulation the rescission of which is desired," and (2) to "state the basis for the request." Such petitions are to be given "a docket or other identifying number" and to become a matter of public record,[83] except where Restricted Data or defense information is involved.[84] In the latter event the Commission presumably will resort to "parallel procedures."

A hearing on a petition filed by an interested person is not held "unless the Commission deems it advisable," in which event notice of public rule making is given. Where "the Commission determines that the petition does not disclose sufficient reasons to justify instituting the public rule making procedure," the petitioner is so notified "with a simple statement of the grounds" for the agency's failure to act.[85]

The notice provisions of the Commission's rules with respect to institution of public rule-making proceedings [86] conform to those of the Administrative Procedure Act.[87] The latter statute does not contain a provision with respect to the minimum time required for the giving of such notice. However, the Commission in its rules specifies a 15-day

[82] 10 Code Fed. Regs. §2.781. See Section 4(d) of the Administrative Procedure Act, 5 U.S.C.A. §1003(d), which provides: "Every agency shall accord any interested person the right to petition for the issuance, amendment, or repeal of a rule."

[83] 10 Code Fed. Regs. §2.782. See notice of petition requesting amendment of 10 Code Fed. Regs. §2.301 concerning the definition of a "patent owner," assigned Docket No. PRM-1, 22 Fed. Reg. 524 (Jan. 26, 1957). The docket number indicates that this petition either is the first ever to be formally filed with the Commission or is the first document to be considered by the agency as falling within the meaning of "petition for rule making," as set forth in §2.782. However, the Commission ordered no hearing on the petition but merely stated that it could be examined in the public document room. Changes in the Commission's rules to date apparently have been made as the result of conferences between the agency and interested parties, rather than by petition, see Statement of AEC to Joint Congressional Committee on Atomic Energy, 1957 Section 202 Hearings, *supra* note 7 at 148.

[84] As defined in Sections 11h, 42 U.S.C.A. §2014(h), and 11w, 42 U.S.C.A. §2014(w) (formerly Section 11r) of the 1954 act.

[85] 10 Code Fed. Regs. §2.783.

[86] 10 Code Fed. Regs. §2.784.

[87] Section 4(a), 5 U.S.C.A. §1003(a), which states: "General notice of proposed rule making shall be published in the Federal Register (unless all persons subject thereto are named and either personally served or otherwise have actual notice thereof in accordance with law) and shall include (1) a statement of the time, place, and nature of public rule making proceedings; (2) reference to the authority under which the rule is proposed; and (3) either the terms or substances of the proposed rule or a description of the subjects and issues involved."

notice "provided that a lesser time may be prescribed upon good cause found and incorporated with a brief statement of the reasons in the notice." [88]

As noted previously, the hearing itself may not necessarily include the taking of testimony before a designated Commission officer but may be limited merely to the submission of views in writing.[89] However, the interests of participating parties appear to be adequately protected by provisions in the rules that "opportunity to participate may include an opportunity to comment upon or respond to the data, views, or arguments submitted by others" and that additional time therefor may be granted at the discretion of the Commission.[90]

Adoption of a rule under Commission procedure, as provided in the Administrative Procedure Act,[91] requires consideration of relevant information by the Commission and publication of the rule with "a concise general statement of its basis and purpose." [92] Such publication must be made at least 30 days before the effective date of the rule "unless the Commission may provide otherwise upon good cause found and published with the rule." [93]

3. Formal Rule-Making Procedures

Under Section 189a of the 1954 act, the Commission must, "upon the request of any person whose interest may be affected by the proceeding," grant a hearing "in any proceeding for the issuance or modification of rules and regulations dealing with the activities of licensees." [94] The term "dealing with the activities of licensees" relates clearly to those rules and regulations which prescribe the terms and conditions imposed

[88] 10 Code Fed. Regs. §2.784.

[89] 10 Code Fed. Regs. §§2.720 and 2.785.

[90] 10 Code Fed. Regs. §2.785. According to the Commission, its practice is "to publish all regulations, procedural or otherwise, as notices of proposed rulemaking with a request for comments"; however, in actual practice, the Commission has used in rule making "the professional knowledge of the AEC staff and the knowledge and experience which AEC has acquired since its establishment in 1946 . . . supplemented by comments of advisory groups and the public (and by studies of independent experts when available)" (AEC Response to Questionnaire, *supra* note 77, at 1080).

[91] Section 4(b) and (c), 5 U.S.C.A. §1003(b) and (c).

[92] 10 Code Fed. Regs. §2.786; see, to the same effect, Section 4(b) of the Administrative Procedure Act, 5 U.S.C.A. §1003(b).

[93] 10 Code Fed. Regs. §2.787.

[94] 42 U.S.C.A. §2239(a).

upon licensees,[95] and also, it is believed, to those which set forth the grounds for suspending, revoking, or amending any license.[96]

Although Section 189a does not specifically prescribe either a "formal" hearing or one "on the record" for rules affecting licensing, the section undoubtedly applies to such rule-making procedures where regulations involving licensing are concerned, particularly in view of Section 189b which provides for judicial review of "any final order entered in any proceeding" under Section 189a.[97] In order for court review to be effected under Section 189b, there must be a record made under Section 189a. For the Commission to take any other position would be to open the door to possible use of rule making by informal procedure without hearing to affect the substantive rights of existing licensees, where a formal licensing proceeding would otherwise be required by Section 189a.[98]

As provided under the Administrative Procedure Act [99] and the pro-

[95] *E.g.*, maintenance of records and making of reports by licensees of production and utilization facilities, 10 Code Fed. Regs. §50.71.

[96] *E.g.*, grounds for revocation, suspension, or modification of a license, 10 Code Fed. Regs. §70.61(b).

[97] Although the issue has not yet arisen, the Commission may well take a position restricting the application of formal hearing procedures to the second clause of Section 189a of the 1954 statute requiring a "hearing" upon request of any party "in any proceeding for the issuance or modification of rules and regulations dealing with the activities of licensees." See Plaine, *supra* note 77 at 811: "Section 189a of the Atomic Energy Act is the provision governing the grant of hearings by the Atomic Energy Commission, in particular affecting licensing. It provides opportunity for hearings in both adjudicative cases (*e.g.*, the granting or revoking of licenses) and sublegislative matters (*e.g.*, the issuance of rules dealing with the activities of licensees). It is silent respecting an 'on the record' requirement for hearings. Nothing in the text or history of Section 189 indicates that Congress intended to depart from the dichotomy under the Administrative Procedure Act between adjudication and sublegislation. The AEC has therefore quite properly followed the accepted interpretation that an 'on the record' requirement is implied in adjudicative proceedings, but not in sublegislative proceedings involving rule-making."

[98] See Zenith Radio Corp. v. Federal Communications Commission, 211 F. 2d 629, 633-634 (D.C. Cir. 1954) (". . . Such an established statutory right [to a license] requires adjudicatory disposition, and the procedure which is sufficient for the rule making is not sufficient for that purpose. . . .") The fact that Section 189a of the 1954 act does not contain the words "on the record" should be immaterial in the context of the provisions for adjudication and judicial review contained therein and the broad interpretation placed upon Section 5 of the Administrative Procedure Act, 5 U.S.C.A. §1004, prescribing opportunity for a hearing in cases of adjudication "required by statute to be determined on the record" and upon Section 4(b), 5 U.S.C.A. §1003(b), requiring a formal hearing for rule making "required by statute to be made on the record after opportunity for an agency hearing" (Wong Yang Sung v. McGrath, 339 U.S. 33, 48 (1950), as modified, 339 U.S. 908 (1950)).

[99] Sections 7, 8, and 10, 5 U.S.C.A. §§1006, 1007, and 1009.

cedure of the Commission,[100] a "formal" rule-making proceeding includes the use of a hearing officer or of the agency itself, the conduct of the hearing along lines of judicial procedure where practicable, and the rendering of a decision by such presiding officer, with appropriate review by the agency and by a court.[101]

The inclusion of the requirement for "formal" rule making in areas in which that process closely resembles adjudication[102] represents a salutary legislative policy. This policy does much to protect the interests of atomic energy licensees in administrative due process, as well as to advance the interests of the Commission in orderly procedures which inspire public confidence.

4. Public Rule-Making Hearings[103]

On only one occasion has the Commission announced and held public hearings in connection with rule making. Notice of this proceeding was given February 26, 1955, for the purpose of obtaining the views of all interested persons with respect to procedures and methods for awarding leases for the mining of uranium on federal lands under the control of the Atomic Energy Commission.[104] In commenting on this proceeding, the Commission has stated:

> No oral hearing has ever been requested on proposed rules nor has the Commission ever felt it desirable to initiate such a hearing. In one case, oral hearings were held to determine the advisability of changing our source material purchasing practices.[105]

5. Written Submissions

On numerous occasions the Commission has published a notice of "contemplated" rule making without public hearing but requesting that

[100] 10 Code Fed. Regs. §§2.780-2.787.

[101] These procedures are described in detail in Section C, "Licensing," *infra*.

[102] "To assert that formal rule making is, unlike adjudication, not an adversary proceeding is to have regard only to the form of the proceeding and to ignore realities. In many respects, where rules are promulgated on the basis of a record made at a formal hearing involving sharply contested issues of fact, the agency is, in effect, prosecuting the proceeding against private parties to be affected in the future by the rules" (Hoover Commission Legal Task Force Report, *supra* note 43, at 164).

[103] The rule making described in subsections d-i generally covers the period through June 30, 1957.

[104] 20 Fed. Reg. 1227 (Feb. 26, 1955). The hearings were to be held Mar. 29-31, 1955, at Grand Junction, Colorado, under the supervision of the AEC's Manager, Grand Junction Operations Office.

[105] AEC Response to Questionnaire, *supra* note 77 at 1080-1081.

"[i]nterested persons . . . submit their views or other relevant information" concerning proposed changes in rules within thirty days [106] or, in one instance, within fifteen days.[107] With respect to the licensing of by-product material [108] and also in connection with so-called "parallel procedures" for licensing involving classified information,[109] the Commission has promulgated rules to be effective within thirty days but requested written submittals thereon in the meanwhile. Such comments and submittals usually are directed to be sent to the chief of the division, branch, or field office of the Commission which will administer the rules involved.

6. Promulgation of Rules

As a general, although not necessarily a uniform, policy, the Commission gives thirty days' notice of the promulgation of final rules as required by the Administrative Procedure Act.[110] However, no such notice has been given in a number of cases.

[106] See, *e.g.*, "Notice of Proposed Rule Making—General Rules of Procedure on Applications for Determination of Reasonable Royalty Fee, Just Compensation, or Grant of Award for Patents, Inventions, or Discoveries," 10 Code Fed. Regs. Pt. 80, 20 Fed. Reg. 2193 (April 7, 1955). Similar procedure has been utilized with respect to "Standard Specifications for Granting of Patent Licenses," 10 Code Fed. Regs. Pt. 81, 20 Fed. Reg. 2283 (April 8, 1955); "Control of Facilities for the Production of Fissionable Materials," 10 Code Fed. Regs. Pt. 50, 20 Fed. Reg. 2486 (April 15, 1955); "Definition of Fissionable Material," 10 Code Fed. Regs. Pt. 70, 20 Fed. Reg. 2491 (April 15, 1955); "Safeguarding of Restricted Data," 10 Code Fed. Regs. Pt. 95, 20 Fed. Reg. 2495 (April 15, 1955); "Access to Restricted Data," 10 Code Fed. Regs. Pt. 25, 20 Fed. Reg. 3634 (May 24, 1955); "Operators Licenses," 10 Code Fed. Regs. Pt. 55, 20 Fed. Reg. 4658 (June 30, 1955); "Standards for Protection Against Radiation," 10 Code Fed. Regs. Pt. 20, 20 Fed. Reg. 5101 (July 16, 1955); "Rules of Practice," 10 Code Fed. Regs. Pt. 2, 20 Fed. Reg. 5786 (Aug. 10, 1955); "Priorities Regulations," 10 Code Fed. Regs. Pt. 130, 20 Fed. Reg. 8608 (Nov. 22, 1955); "Waiver of Patent Rights," 10 Code Fed. Regs. Pt. 83, 21 Fed. Reg. 7007 (Sept. 18, 1956); "Rules of Practice," 10 Code Fed. Regs. §2.102, 22 Fed. Reg. 2433 (April 11, 1957); and "Intervention in Proceedings on Application for Facility Export License," 10 Code Fed. Regs. §2.705, 22 Fed. Reg. 4054 (June 8, 1957).

[107] "Public Records," 10 Code Fed. Regs. Pt. 9, 21 Fed. Reg. 8464 (Nov. 3, 1956).

[108] "Licensing of Byproduct Material," 10 Code Fed. Regs. Pt. 30, 21 Fed. Reg. 213 (Jan. 11, 1956).

[109] "Rules of Practice," 10 Code Fed. Regs. Pt. 2, Subpt. H, 21 Fed. Reg. 8594 (Nov. 8, 1956).

[110] "Control of Facilities for Production of Fissionable Materials," 10 Code Fed. Regs. Pt. 50, 20 Fed. Reg. 6676 (Sept. 10, 1955), published in proposed form, 20 Fed. Reg. 2486 (April 15, 1955); "Operator's Licenses," 10 Code Fed. Regs. Pt. 55, 21 Fed. Reg. 6 (Jan. 4, 1956), published in proposed form, 20 Fed. Reg. 4658 (June 30, 1955); "Licensing of Production and Utilization Facilities," 10 Code Fed. Regs. Pt. 50, 21 Fed. Reg. 355 (Jan. 19, 1956), published in proposed form, 20 Fed. Reg. 2486 (April

Promulgation of regulations on the date of the notice of final formulation or prior thereto has been justified by the Commission on the grounds that such rules involved non-substantive or security matters not required to be developed according to the Administrative Procedure Act.[111] In such cases the Commission usually has found merely that "good cause exists why the regulations . . . should be made effective without the customary thirty-day period of notice." [112] "Good cause" for dispensing with the thirty-days requirement of the Administrative Procedure Act also has been found where rules are needed in pending proceedings [113] or because of safety considerations.[114] Also, the Com-

15, 1955); "Licensing of Byproduct Materials," 10 Code Fed. Regs. Pt. 30, 21 Fed. Reg. 213 (Jan. 11, 1956); "Priorities Regulation," 10 Code Fed. Regs. Pt. 130, 21 Fed. Reg. 1005 (Feb. 14, 1956), published in proposed form, 20 Fed. Reg. 8608 (Nov. 22, 1955); "Rules of Practice," 10 Code Fed. Regs. Pt. 2, 21 Fed. Reg. 804 (Feb. 4, 1956), published in proposed form, 20 Fed. Reg. 5786 (Aug. 10, 1955); "Special Nuclear Material," 10 Code Fed. Regs. Pt. 70, 21 Fed. Reg. 764 (Feb. 3, 1956), published in proposed form, 20 Fed. Reg. 2491 (April 15, 1955); and "Standard Specifications for Granting of Patent Licenses," 10 Code Fed. Regs. Pt. 81, 21 Fed. Reg. 606 (Jan. 27, 1956), published in proposed form, 20 Fed. Reg. 2283 (April 8, 1955); miscellaneous amendments to "Priorities Regulations," 10 Code Fed. Regs. Pt. 130, 21 Fed. Reg. 10267 (Dec. 21, 1956); "Procedures on Declaring Patents Affected with the Public Interest and Licensing of Patents," 10 Code Fed. Regs. Pt. 2, Subpt. C, 21 Fed. Reg. 9764 (Dec. 11, 1956); and "Standards for Protection Against Radiation," 10 Code Fed. Regs. Pt. 20, 22 Fed. Reg. 548 (Jan. 29, 1957). Proposed rules for Part 20 previously were published for comment July 16, 1955, *supra* note 106.

[111] *E.g.*, "General Rules of Procedure on Applications for Determination of Reasonable Royalty Fee, Just Compensation, or Grant of Award for Patents, Inventions, or Discoveries," 10 Code Fed. Regs. Pt. 80, 20 Fed. Reg. 3931 (June 7, 1955), published in proposed form, 20 Fed. Reg. 2193 (April 7, 1955); "Unclassified Activities in Foreign Atomic Energy Programs," 10 Code Fed. Regs. Pt. 110, 21 Fed. Reg. 418 (Jan. 20, 1956), not published in proposed form except as a "Determination and Authorization" under Section 57a(3) (B) of the 1954 Act, 20 Fed. Reg. 7399 (Oct. 5, 1955); "Safeguarding of Restricted Data," 10 Code Fed. Regs. Pt. 95, 21 Fed. Reg. 718 (Feb. 2, 1956), published in proposed form, 20 Fed. Reg. 2495 (April 15, 1955); "Access to Restricted Data," 10 Code Fed. Regs. Pt. 25, 21 Fed. Reg. 810 (Feb. 4, 1956), published in proposed form, 20 Fed. Reg. 3634 (May 24, 1955); amendment to "Access to Restricted Data," 10 Code Fed. Regs. §25.11(b)(7), 21 Fed. Reg. 5733 (Aug. 1, 1956); and "Criteria and Procedures for Determining Eligibility for Security Clearance," 10 Code Fed. Regs. Pt. 4, 21 Fed. Reg. 3103 (May 10, 1956), as amended, 21 Fed. Reg. 7147 (Sept. 20, 1956).

[112] *E.g.*, 10 Code Fed. Regs. Pt. 110, 21 Fed. Reg. 418 (Jan. 20, 1956), *supra* note 111.

[113] "Public Records," 10 Code Fed. Regs. Pt. 9, 21 Fed. Reg. 9743 (Dec. 8, 1956), as corrected 22 Fed. Reg. 2005 (Mar. 27, 1957). Fifteen days' notice has been given for the same reason where the Rules of Practice have been amended, 10 Code Fed. Regs. Pt. 2, 21 Fed. Reg. 8594 (Nov. 8, 1956) and 21 Fed. Reg. 9741 (Dec. 8, 1956).

[114] Amendments to "Standards for Protection Against Radiation," 10 Code Fed. Regs. Pt. 20, 22 Fed. Reg. 3389 (May 14, 1957).

mission has utilized the exceptions contained in the Administrative Procedure Act [115] permitting promulgation, without notice, of rules "recognizing exemption or relieving restriction" [116] and dealing with public property and personnel.[117]

Where the Commission publishes an advance statement of the proposed rules, which rules are later promulgated without thirty days' notice, interested persons have some degree of prior notice. However, this is not the case where the rules are not published in proposed form but are nevertheless made immediately effective.

7. Special Non-Public Procedures

Under the 1954 statute, the Commission is authorized to promulgate certain rules by special non-public procedures involving the President and the Joint Congressional Committee on Atomic Energy. These procedures are used when the Commission desires to add "other material" to the categories of "special nuclear material" [118] or "source material." [119]

Pursuant to these procedures, the Commission is required to make findings (1), with respect to "special nuclear material," that the material to be added to that category "is capable of releasing substantial quantities of atomic energy"; and (2), with respect to "source material," that such additional material "is essential to the production of special nuclear material." In both cases, the Commission also must find that its determination "is in the interest of the common defense and security." Express Presidential assent to each such determination then is required, whereupon

> The Commission's determination, together with the assent of the President, shall be submitted to the Joint Committee and

[115] Sections 4(2) and 4(c), 5 U.S.C.A. §§1003(2) and 1003(c).

[116] Amendments to "Licensing of Byproduct Material," 10 Code Fed. Regs. §§30.22(c), 30.71-30.72, 21 Fed. Reg. 7265 (Sept. 25, 1956) and 21 Fed. Reg. 7503 (Oct. 3, 1956); amendments to "Operators' Licenses," 10 Code Fed. Regs. §55.10(d), 21 Fed. Reg. 7265 (Sept. 25, 1956); and amendments to "Control of Source Materials," 10 Code Fed. Regs. §40.12, 22 Fed. Reg. 1318 (March 2, 1957).

[117] See, *e.g.*, "Radioisotope Research Support Program," 10 Code Fed. Regs. Pt. 37, 20 Fed. Reg. 4712 (July 2, 1955) and 20 Fed. Reg. 6604 (Sept. 9, 1955); "Uranium Leases on Lands Controlled by the Commission," 10 Code Fed. Regs. §60.8, 21 Fed. Reg. 5259 (July 14, 1956) and 10 Code Fed. Regs. §60.9, 22 Fed. Reg. 1326 (March 5, 1957); and "Advisory Boards," 10 Code Fed. Regs. Pt. 7, 20 Fed. Reg. 6515 (Sept. 3, 1955) and 21 Fed. Reg. 4271 (June 19, 1956).

[118] Section 11y, 42 U.S.C.A. §2014(y) (formerly Section 11t) and Section 51, 42 U.S.C.A. §2071.

[119] Section 11x, 42 U.S.C.A. §2014(x) (formerly Section 11s) and Section 61, 42 U.S.C.A. §2091.

> a period of thirty days shall elapse while Congress is in session . . . before the determination of the Commission may become effective: *Provided, however,* That the Joint Committee, after receiving such determination, may by resolution in writing, waive the conditions of all or any portion of such thirty-day period.[120]

These special procedures represent an innovation in the 1954 statute as compared with the 1946 act. They were intended to permit the Commission "to enlarge the traditional scope of materials covered under the [1954] Act, but only after appropriate safeguards are provided for careful review." [121] The first such determination by the Commission under Section 51 was announced on June 30, 1955,[122] when, effective that date, Uranium 233 was declared to be "special nuclear material." [123] The fact that these highly important definitions of "special nuclear material" and "source material" can be expanded by essentially secret rule-making procedures, without notice to interested persons who might comment thereon, has been criticized.[124]

8. Miscellaneous Rule-Making Procedures

a. Policy Determinations

The Commission has published, by notice effective immediately, important policy decisions affecting the civilian reactor program. Thus, on March 3, 1956, the agency announced a classified schedule of guaranteed fair prices for special nuclear material lawfully produced under

[120] Sections 51 and 61, 42 U.S.C.A. §§2071, 2091.

[121] Statement of Mr. William Mitchell, former AEC General Counsel, Oct. 13, 1954, 1 CCH Atomic Energy Law Rep. ¶508. See H.R. Rep. No. 2181, *supra* note 5 at 15: "In view of the potentially great impact any future declaration of the addition of further materials to the category of special nuclear material [under Section 51 of the 1954 act] could have on the economy of the Nation, these statutory steps were deemed to be necessary. . . . It is believed that this provision gives the Commission the statutory basis it needs for including new materials within this category, and still provides adequate safeguards to assure that this power is not abused. . . ."

[122] 20 Fed. Reg. 4664. The notice stated that the Commission's determination, with Presidential approval, was submitted to the Joint Committee on April 12, 1955. This indicates considerable negotiation between the Commission and the Committee before the latter gave its approval. The 30-day limitation in the statute appears meaningless, because the Committee could take adverse action prior to the expiration thereof, to forestall a promulgation of the determination by the Commission without the Committee's complete approval.

[123] Section 11y(1), 42 U.S.C.A. §2014(y)(1) (formerly Section 11t(1)), merely defines "special nuclear material" as including "uranium enriched in the isotope 233."

[124] 1 CCH Atomic Energy Law Reporter ¶1175a.

license, such prices to take effect July 1, 1955, and to be effective until June 30, 1962.[125] The basis for the determination was not disclosed and the schedule was at that time classified.[126] On November 17, 1956,[127] and June 6, 1957,[128] the Commission announced nonclassified guaranteed fair prices to be paid for plutonium and uranium 233 produced in licensed reactors and delivered to the Commission for one year after July 1, 1962.[129]

Other policy decisions affecting the domestic reactor program also have been announced by notice rather than by rule.[130] The Commission has indicated that the practice of making such decisions by automatic notice without opportunity for rule-making procedures might be changed.[131]

b. Interpretations

The Commission has recognized as rules certain interpretations of the Atomic Energy Act. This has been effected by the creation of a special Part 8 of its regulations "to contain interpretations of the . . . Act of 1954 . . . and of regulations . . . issued thereunder." [132] Only one such interpretation, however, has been issued.[133]

c. Special Determinations and Authorizations

Under the 1954 act, before proposing or receiving written submittals with respect to draft regulations, the Commission has adopted the prac-

[125] 21 Fed. Reg. 1421 (Mar. 3, 1956).

[126] See Section C, "Licensing," *infra*.

[127] AEC Press Rel. No. 930 (Nov. 17, 1956), BNA, Atomic Industry Reporter 223: 16.

[128] 22 Fed. Reg. 3985 (June 6, 1957).

[129] See Section C, "Licensing," *infra*.

[130] Extension of access permits for two years, 21 Fed. Reg. 2389 (April 12, 1956); fuel reprocessing by Commission, 22 Fed. Reg. 1591 (March 12, 1957); and work experience program for civilian application, 22 Fed. Reg. 2139 (Mar. 30, 1957).

[131] See Statement of former AEC General Counsel Mitchell, June 10, 1957, before Joint Committee, 1957 Congressional Review Hearings, *supra* note 7 at 47: "Representative HOLIFIELD: . . . [W]ould you consider publishing in the Federal Register such fair prices and such guaranteed fair prices, as a part of your criteria? There has been some criticism . . . that in the establishment of criteria you have established it by notice rather than by rule published in the Federal Register. . . . Mr. MITCHELL: I think a more formal statement, by publishing in the Federal Register, would be desirable, and we do propose to do that."

[132] 10 Code Fed. Regs. Pt. 8.

[133] "Interpretation of Section 152 of the Atomic Energy Act," 10 Code Fed. Regs. §8.1, 21 Fed. Reg. 1414 (Mar. 3, 1956).

tice in a few instances of announcing a policy determination preliminary to public rule making.

This was first done by the Commission to meet the need for clarifying and regularizing the status of American consultants who were called upon to advise concerning atomic energy projects and plants abroad.[134] On October 5, 1955,[135] the Commission announced that "any activity which . . . constitutes directly or indirectly engaging in the production of special nuclear material in any [friendly] foreign country" and which did not "involve the communication of Restricted Data or other classified defense information" or the "violation of other provisions of law" would not be considered a violation of Section 57a(3)(B) of the 1954 act.[136] The agency also announced its intention to incorporate and implement the foregoing "determination and authorization" in regulations, which were subsequently promulgated on January 20, 1956.[137]

9. General Content and Form of Rules

Rules and regulations promulgated by the Atomic Energy Commission generally show careful and clear draftsmanship and are cast in a form which makes their content readily ascertainable by the person consulting them. Thus, each part of the rules usually begins with paragraphs which set forth the purpose,[138] basis,[139] and scope [140] of the rules. In some cases, policy "findings" upon which the rules are based, are included.[141] "Definition" sections often are included where required or appropriate.[142]

The Commission apparently has sought to find a practical solution to two problems which often face regulated persons or businesses. The first of these problems arises from the fact that rules of procedure often seem to conflict whenever two or more rules or sets of rules are appli-

[134] See Section C, "Licensing," *infra.*

[135] 20 Fed. Reg. 7399 (Oct. 5, 1955).

[136] 42 U.S.C.A. §2077(a)(3)(B): "It shall be unlawful for any person to . . . directly or indirectly engage in the production of any special nuclear materials outside of the United States except . . . upon authorization by the Commission after a determination that such activity will not be inimical to the interest of the United States."

[137] 21 Fed. Reg. 418 (Jan. 20, 1956).

[138] *E.g.,* 10 Code Fed. Regs. §7.1 ("Advisory Boards").

[139] *E.g.,* 10 Code Fed. Regs. §40.1 ("Control of Source Material").

[140] *E.g.,* 10 Code Fed. Regs. §2.1 ("Rules of Practice").

[141] *E.g.,* 10 Code Fed. Regs. §6.10 ("Security Policies and Practices Relating to Labor Management Relations").

[142] *E.g.,* 10 Code Fed. Regs. §80.2 ("General Rules of Procedure on Applications for the Determination of Reasonable Royalty Fee, etc.").

cable to a given situation. Under the Commission's Rules of Practice, where there is any conflict between a general procedural rule applicable to every type of agency proceeding "and a special rule in another subpart applicable to a particular type of proceeding, the special rule will govern." [143]

More important, however, has been the Commission's attempt to deal with the problem of reliance by private parties upon official interpretations of its rules. To provide some protection for the private party who seeks an interpretation of the meaning and applicability of a rule and desires to rely upon such interpretation, each of eleven parts of the Atomic Energy Commission's regulations provide, with respect to the subject matter of that part, that

> Except as specifically authorized by the Commission in writing, no interpretation of the meaning of the regulations in this part by any officer or employee of the Commission other than a written interpretation by the general counsel will be recognized to be binding upon the Commission.[144]

It is to be hoped that the above type of provision will be extended to all parts of the Commission's rules.

Only in a few cases throughout the entire federal government does the private party have such a right to rely in good faith upon an interpretation of an administrative rule or its application to the facts of a particular case.[145] In most cases, the party acts at his peril in so relying, particularly where the application of a rule is controversial and subject to the vicissitudes of changes in agency policy.

[143] 10 Code Fed. Regs. §2.3.

[144] 10 Code Fed. Regs. §20.6 ("Standards for Protection Against Radiation"); §25.4 ("Access to Restricted Data"); §30.5 ("Licensing of Byproduct Material"); §40.50 ("Control of Source Material"); §50.3 ("Licensing of Production and Utilization Facilities"); §55.5 (Operators' Licenses"); §70.6 ("Special Nuclear Material"); §81.4 ("Standard Specifications for Granting of Patent Licenses"); §95.7 ("Safeguarding of Restricted Data"); §110.5 ("Unclassified Activities in Foreign Atomic Energy Programs"); and §140.4, ("Financial Protection Requirements and Indemnity Agreements"). For an example of a similar rule adopted under the 1946 act, see §50.60 ("Control of Facilities for the Production of Fissionable Material"), now obsolete.

[145] By statute, an advisory agency opinion may be relied upon from the Office of Alien Property, 50 U.S.C. App. §5(b), and the Department of Labor under the "Portal-to-Portal" Act, 29 U.S.C.A. §259. These two statutes, as well as the Defense Production Act of 1950, 64 Stat. 818, 50 U.S.C.App. §2157, and the six regulatory statutes administered by the Securities and Exchange Commission, 15 U.S.C.A. §§77s(a), 77sss(c), 78w(a), 79t(d), 80a-37(c), and 80b-11(d), permit reliance in good faith upon a rule or regulation of the agency concerned. See Hoover Commission Legal Task Force Report, *supra* note 43 at 189: "By practice and precedent, letters of advice and staff opinions are given limited validity by the Bureau of Foreign Commerce,

D. Conclusions

By the end of 1957 the Atomic Energy Commission had developed the major framework of rules implementing the Atomic Energy Act of 1954.[146] Criticism of the agency's delay in developing and promulgating these rules, particularly under the impetus of a pending administrative proceeding,[147] has been countered by the claim that the Commission "went about its job slowly and deliberately so that there would be an opportunity for industry to comment on what the AEC proposed and for the AEC to think carefully about its regulations before they were issued."[148] Consultation with advisory groups, rather than resort to public rule-making proceedings, seems to have been the primary reliance of the Commission in developing its regulations.[149] This policy, while not apparently abused to date, is vulnerable to imputations of *ex parte* influence in the eyes of the public and could be so abused in the future.

In general, the Atomic Energy Commission would appear to have exercised its rule-making authority under the 1954 statute in accordance with both the letter and the spirit of the Administrative Procedure Act of 1946.[150] A desire to improve public policy and relations with the

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Department of Commerce, by the Federal Deposit Insurance Corporation, by the Interstate Commerce Commission, by the Post Office Department, and by the Office of Munitions Control, Department of State. This excellent practice . . . has been most effectively used by the Securities and Exchange Commission, which issues several thousand such opinion letters annually."

[146] See 1957 Section 202 Hearings, *supra* note 7 at 18, 147; Trowbridge, "Licensing and Regulation of Private Atomic Energy Activities," 34 Tex. L. Rev. 842 (1956).

[147] In the Matter of Power Reactor Development Company, AEC Dkt. F-16. This proceeding was inaugurated on Aug. 31, 1956, by the filing of a petition of intervention to oppose the conditional granting of a construction permit to the applicant, awarded to the applicant by the Commission on Aug. 4, 1956.

[148] Trowbridge, *supra* note 146.

[149] 1957 Section 202 Hearings, *supra* note 7 at 149; AEC Response to Questionnaire, *supra* note 77 at 1081.

[150] See McKinney Panel Report, *supra* note 10 at 130: "The Commission has selected a complex and time-consuming technique for developing its regulations. It has conducted conferences with representatives of diverse organizations on each aspect of regulations. . . . While some points of view may not be fully reflected by this technique, opportunity for comment is also afforded after publication of proposed regulations in the Federal Register. The logic of this course of Commission action appears sound and is not being vigorously opposed by any interests or groups so far as can be observed." The only substantial attack to date upon the Commission in the field of rule making has come from intervenors United Automobile Workers and AFL-CIO in AEC Dkt. No. F-16, in the matter of Power Reactor Development Company. The intervenors did not specifically attack the licensing rules involved in that proceeding but argued that the Commission, "in granting the conditional construction permit," violated 10 Code Fed. Regs. §§50.35, 50.40, and 50.45; see "Petition for Intervention

industries and individuals subject to regulation might have dictated uniform resort to public rule-making procedures and to notice of promulgation of rules, even where non-substantive matters traditionally have been exempt therefrom under the Administrative Procedure Act.

Particularly commendable, so far as the practice goes, has been the adoption of the regulation for interpretation of rules by the Commission's General Counsel, upon which good-faith reliance can be placed. This procedure should be extended to all parts of the agency's rules, which step could be effected by an appropriate amendment to Part 8 of the Commission's rules.

Largely untested is the 1954 statute's provision for review of certain rules by the Joint Congressional Committee on Atomic Energy, which rules relate to changes in the definitions of "special nuclear material" and "source material." The Committee's authority thus conferred tends to give the Committee "a very substantial role in the atomic energy program." [151] This review procedure affords a relatively speedy means for amending Sections 11x and 11y of the 1954 act by a quasi-legislative process. However, the power exercised by the Joint Committee in this connection conceivably could be used in the future to affect the administration of the atomic energy law by the Executive Department.[152]

III. LICENSING

A. Licensing in Administrative Law

In its report published in 1941, the Attorney General's Committee on Administrative Procedure referred to licensing by federal agencies as a distinguishing characteristic of the "trend toward preventive legislation" in the United States. Indeed, the report stated:

> Licensing of any activity may be one of the most burdensome forms of regulation, since all who engage in the activity must

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and Request for Formal Hearing" 4-13 (Aug. 31, 1956); Notice of Hearing Order, 21 Fed. Reg. 7809 (Oct. 12 1956).

In May 1958 the AEC informed the Joint Committee that "informal" public rule-making procedures would be utilized in connection with consideration of that agency's regulations on "Financial Protection Requirements and Indemnity Agreements," 10 Code Fed. Regs. Pt. 140, issued initially Sept. 11, 1957, with only 15 days' public notice (22 Fed. Reg. 7223, BNA, Atomic Industry Reporter 227:625). Industry advisory conferences on the subject occurred in Dec. 1957, and Jan. 1958, but the Commission felt the need for further industry advice concerning, and public support for, the regulations in this field; see BNA, Atomic Industry Reporter 4:100 and 4:157.

[151] 1 CCH Atomic Energy Law Reporter ¶568.

[152] See, *e.g.*, Letter of AEC Chairman Strauss to Rep. Cole, Aug. 3, 1957, concerning the Commission authorization bill for fiscal year 1958, 103 Cong. Rec. A6319-A6320 (Aug. 5, 1957).

> be licensed in order that the persons who would probably act improperly may be controlled. But it is also one of the most effective [means of control], and it is particularly likely to be resorted to where the effort to effectuate policies is made with conviction.[153]

More than a decade later another governmental body, after a survey of federal administrative functions, observed that the "power to license is in effect the power to control the business and commercial life of the community." [154]

In no field of regulation affecting American private industry has the Congress used licensing more extensively to assure governmental control than in that of atomic energy. The major areas of private industrial and research activity permitted under the Atomic Energy Act of 1946 were severely circumscribed by restrictions upon the licensing process. One of these areas—the manufacture or production of any device utilizing fissionable material or atomic energy, or the utilization of such forms of energy—was never exploited. Under the Atomic Energy Act of 1954, expanded private use of atomic energy is governed by licensing requirements which give the President, the Atomic Energy Commission, and even the Joint Committee on Atomic Energy, greater control over industry than is the case in any other area of federally regulated activity.

In enacting the Atomic Energy Act of 1946 [155] and the statute which superseded it in 1954,[156] Congress had the foresight to require that the licensing authority of the Atomic Energy Commission be subject to safeguards of the Federal Administrative Procedure Act. Provisions of that legislation affecting the licensing process clearly were enacted by Congress in 1946 "because of the very severe consequences of the conferring of licensing authority upon administrative agencies" and "to remove the threat of disastrous, arbitrary, and irremediable administrative action." [157]

Under the Administrative Procedure Act, licensing covers "any form

[153] Sen. Doc. No. 8, *supra* note 45 at 14.

[154] Commission on Organization of Executive Branch of the Government, Report on Legal Services and Procedure 58 (March 1955) (hereafter cited as Hoover Commission Legal Services Report); see Hoover Commission Legal Task Force Report, *supra* note 43 at 172-174.

[155] Section 14, 42 U.S.C.A. §1814 (1946).

[156] Section 181, 42 U.S.C.A. §2231.

[157] Sen. Doc. No. 248, *supra* note 43 at 368.

of required official permission." [158] Agencies are required to proceed with reasonable dispatch to conclude and decide proceedings on applications for licenses.[159] No license may be withdrawn without the agency's first giving the licensee notice thereof in writing and an opportunity to demonstrate or achieve compliance with all lawful requirements. In business of a continuing nature, no license can expire until timely application for a new license or for a renewal thereof is determined by the agency, except in "cases of willfulness or those in which the public health, interest, or safety requires." In the latter cases, an agency can summarily suspend or revoke a license.[160]

B. Licensing Under Atomic Energy Act of 1946

Licensing under the Atomic Energy Act of 1946 was rigorously curtailed by Congressional policy, even though the Commission was required to carry out a program "directed toward improving the public welfare, increasing the standard of living, [and] strengthening free competition in private enterprise." [161] Particularly restrictive was the direction of the statute for a "program for Government control of the production, ownership, and use of fissionable material to assure the common defense and security and to insure the broadest possible exploitation of the fields." [162] This policy was further effectuated in Section 4(e) of the Atomic Energy Act of 1946,[163] which provided that

[158] *Id.* at 306; see 197, 254. Under Section 2(d), 5 U.S.C.A. §1001(d), licensing constitutes a form of agency "adjudication" and is always the subject of an "order." Under Section 2(e), a license is defined as including "the whole or part of any agency permit, certificate, approval, registration, charter, membership, statutory exemption or other form of permission"; and "licensing" as including "agency process respecting the grant, renewal, denial, revocation, suspension, annulment, withdrawal, limitation amendment, modification, or conditioning of a license." Under Section 2(f), an agency "sanction" "includes the whole or any part of any agency . . . requirement, revocation, or suspension of a license"; and agency "relief" includes "any agency . . . grant of . . . license." Under Section 2(g), an "agency proceeding" includes licensing, and "agency action" includes an agency license.

[159] See Section 6(a), 5 U.S.C.A. §1005(a): ". . . Every agency shall proceed with reasonable dispatch to conclude any matter presented to it except that due regard shall be had for the convenience and necessity of the parties or their representatives. . . ." Although this provision was intended by Congress to assure a speedy decision with respect to matters before any agency, consistent with the public interest in a full and complete record, "The Administrative Procedure Act provides no remedy for failure of agencies to proceed with reasonable dispatch" (Hoover Commission Legal Task Force Report, *supra* note 43 at 183-186).

[160] Section 9(b), 5 U.S.C.A. §1008(b).

[161] Section 1(a), 42 U.S.C. §1801(a)(1946).

[162] Section 1(b)(4), 42 U.S.C. §1801(b)(4)(1946).

[163] 42 U.S.C. §1804(e)(1946).

licenses for the manufacture of production facilities for fissionable material [164] were to be issued "in accordance with such standards and upon such conditions as will restrict the production and distribution of such facilities to effectuate the policies and purposes of this Act."

1. Types of Licenses

Licensing activities of the Atomic Energy Commission under the 1946 act were limited to four major categories. These included licenses (1) for facilities (including important component parts thereof) for the production of fissionable material,[165] (2) for the transfer of source materials,[166] and (3) for the distribution and use of by-product materials (radioisotopes).[167] A fourth licensing activity, never implemented, covered the manufacture or production of any equipment or device utilizing fissionable material or atomic energy.[168]

In controlling facilities for the production of fissionable material, the Commission under the 1946 act issued both specific licenses for domestic and foreign activities and also general licenses for domestic activities.[169] The general licensing device was especially convenient because of the fact that the definition of facilities for the production of fissionable material was broad enough to encompass an extensive list of articles in common use.[170] These included Geiger counters and mass spectrometers and spectrographs. The production and utilization of these articles, together with those of some twenty other devices, were controlled by general licenses [171] subject only to reporting requirements.[172]

The same division of licenses into general and special categories [173] was made with respect to the licensing of source material transfers. This was effected by the use of a detailed list of exempted products [174]

[164] Defined in Section 5(a)(1) generally as "plutonium, [and] uranium enriched in the isotope 235," 42 U.S.C. §1805(a)(1)(1946).

[165] Section 4(e), 42 U.S.C. §1804(e)(1946).

[166] Section 5(b)(2), 42 U.S.C. §1805(b)(2)(1946).

[167] Section 5(c)(2), 42 U.S.C. §1805(c)(2)(1946).

[168] Section 7(a), 42 U.S.C. §1807(a)(1946).

[169] 10 Code Fed. Regs. §§50.10-.13 and 50.30 (repealed).

[170] Section 5(a)(1), 42 U.S.C. §1805(a)(1)(1946).

[171] Under Schedule B, 10 Code Fed. Regs. §50.71 (repealed).

[172] 10 Code Fed. Regs. §§50.12(b) and 50.40-.41 (repealed).

[173] 10 Code Fed. Regs. §40.23.

[174] 10 Code Fed. Regs. §40.60, listing "Schedule I" which covered incandescent mantles, ceramic products, refractories, glass products, photographic supplies, certain rare earth metals, and vacuum tubes, and certain types of thoriated tungsten. Section 40.61, containing "Schedule II" and §40.28 prohibit the use of source material, containing by weight uranium in excess of 0.05%, in the manufacture of ceramic, glass, and photographic products.

and transactions protected by general license.[175] A similar program for general and special licensing was in effect promulgated to regulate the distribution of byproduct material by exempting from the AEC's rules therefor certain categories of items and quantities thereof.[176]

2. Standards and Conditions

It is perhaps fortunate that licensing under the Atomic Energy Act of 1946 did not assume the importance that this function has under current legislation. The statutory standards under which the Atomic Energy Commission exercised its authority under the 1946 legislation were sketchy, if not entirely non-existent from a practical point of view, with the "licensing power . . . left to the virtually uncontrolled discretion of the Commission." [177] Except in the case of authorizations for radioisotope procurement, licensing regulations issued by the agency failed to provide specific standards for licenses and the conduct of licensees.

The tone of the regulations under the 1946 act was, of course, set by the statute itself. Under that act, licenses for the manufacture, production, transfer, or acquisition of any facilities for the production of fissionable material were to "be issued in accordance with such standards and upon such conditions as will restrict the production and distribution of such facilities to effectuate the policies and purposes of this [1946] Act." [178] The standards and conditions with respect to transfers of source materials were only slightly more specific and required that licenses should not impair an adequate supply of source materials or permit "the use of such materials in a manner inconsistent with the national welfare." [179] More exact and readily ascertainable standards and conditions were stated with respect to authorizations for the use of radioisotopes.[180] Licensing of fissionable and source materials was prohibited under the 1946 act "if, in the opinion of the Commission, the issuance

[175] 10 Code Fed. Regs. §40.62, containing "Schedule III."

[176] 10 Code Fed. Regs. §30.71 (repealed) containing "Schedule A" for exempt items, and §30.72 (repealed), containing "Schedule B" for exempt quantities.

[177] Report of the American Bar Association Special Committee on Atomic Energy to Joint Committee on Atomic Energy 12 (Mimeo Nov. 20, 1953) (hereafter cited as ABA Committee Report).

[178] Section 4(e), 42 U.S.C. §1804(e)(1946).

[179] Section 5(b)(3), 42 U.S.C. §1805(b)(3)(1946).

[180] Section 5(c)(2), 42 U.S.C. §1805(c)(2)(1946), set forth the authorized uses for byproduct materials. Further, authorization was to be denied to "any applicant, who is not equipped to observe or who fails to observe such safety standards to protect health as may be established by the Commission." See 10 Code Fed. Regs. Pt. 30 (repealed).

of a license to such person . . . would be inimical to the common defense and security." [181] A similar vaguely-worded condition was applied to licenses for the manufacture, production, or export of any equipment utilizing fissionable material or atomic energy.[182]

The regulations issued with respect to licenses for facilities for the production of fissionable material [183] and for transfers of source material [184] followed the statute and permitted the Commission to impose "such conditions as it deems appropriate and in accordance with law." Regulatory standards incorporated in the rules were as indefinite as those of the statute itself. They included such terms, capable of varied interpretation, as "assurance of the common defense and security," [185] "assurance of adequate" supplies of the materials or facilities concerned,[186] "prevention of the use of source materials in a manner inconsistent with the national welfare," [187] "preservation of health and safety," [188] "inimical to the common defense and security," [189] and "effectuating the policies and purposes of the Atomic Energy Act of 1946." [190] Since compliance with all regulations of the Commission was a condition of every license and since the Commission reserved the right to change its regulations,[191] there existed no clearly ascertainable standards and conditions with respect to licenses for facilities to produce fissionable materials and to transfer source material.

Only in the case of regulations with respect to authorization for utilization of radioisotopes did the Commission set forth standards and conditions which could be readily ascertained with reasonable cer-

[181] Section 5(d), 42 U.S.C. §1805(d)(1946). The phrase "common defense and security," nowhere explained in the Act, also appeared in Section 1(a), 42 U.S.C. §1801(a) (1946) ("Findings and Declaration") and Section 1(b)(4), 42 U.S.C. §1801(b)(4)(1946)("Purpose of Act").

[182] Section 7(c), 42 U.S.C. §1807(c)(1946).

[183] 10 Code Fed. Regs. §50.21 (repealed).

[184] 10 Code Fed. Regs. §40.21.

[185] 10 Code Fed. Regs. §§40.22(a) and 50.22(a)(repealed).

[186] 10 Code Fed. Regs. §§40.22(b) and 50.22(b)(repealed).

[187] 10 Code Fed. Regs. §§40.22(c) and 50.22(c)(repealed).

[188] 10 Code Fed. Regs. §40.22(d).

[189] 10 Code Fed. Regs. §40.22.

[190] 10 Code Fed. Regs. §50.22(d)(repealed).

[191] 10 Code Fed. Regs. §40.25: "Nothing in this section [on revocation, suspension, and modification of licenses] shall limit the authority of the Commission to issue or amend its regulations in accordance with law." See, to the same effect, §50.32 (repealed). The open-end nature of the licenses issuable under the 1946 Act also arises under the 1954 act; see Section 187 of the latter statute, 42 U.S.C.A. §2237 and 10 Code Fed. Regs. §70.32(b), more fully discussed hereafter.

tainty.[192] Thus, requirements for approval of an authorization for the use of radioisotopes required specified uses for the byproduct material, suitable equipment for health and safety, and suitably trained personnel.

3. Licensing Procedures

Although subject to the requirements of the Federal Administrative Procedure Act, procedures for licensing under the Atomic Energy Act of 1946 [193] were not otherwise defined or marked out by Congress.[194] However, except in the case of appeals from denials or revocations of licenses, licensing procedures complied generally with those required by the Administrative Procedure Act.[195]

Appeals procedure was clearly deficient in the case of licenses for the manufacture of facilities for the production of fissionable material and transfer of byproduct materials. In each case, the only procedure provided was for an applicant to file a "petition" in letter form with the Commission "stating the reasons why the petition should be granted." [196] Although the General Counsel of the Commission at one time held the view that these regulations in effect authorized an intra-agency appeal when desired by an applicant,[197] such a construction depended more upon the practice of the agency itself than upon the actual language of the regulations involved.

[192] 10 Code Fed. Regs. §30.21(a)(1)-(2) (repealed). Special requirements were listed for human uses by institutions (§30.24(a)) and by individual physicians (§30.24(b)), for human use of sealed sources (§30.24(c)), for use in research and development (§30.24(d)), and for processing (§30.24(e)).

[193] Section 14, 42 U.S.C. §1814 (1946).

[194] Thus, Section 4(e), 42 U.S.C. §1804(e)(1946), stated that licenses for the manufacture of facilities for the production of fissionable material "shall be issued in accordance with such procedures as the Commission may by regulation establish." Section 5(b)(3), 42 U.S.C. §1805(b)(3)(1946), was to same effect with respect to licenses for the transfer of source materials. Section 5(c)(2), 42 U.S.C. §1805(c)(2)(1946), covering authorizations for distribution of radioisotopes, contained no provision whatsover for licensing procedures.

[195] See 10 Code Fed. Regs. §§30.30 (repealed), 40.20, and 50.20 (repealed) dealing with license applications; §§30.34 (repealed), 40.25, and 50.32 (repealed) dealing with license revocation, suspension, or modification; and §40.26 dealing with license renewals.

[196] 10 Code Fed. Regs. §§40.51 and 50.61 (repealed).

[197] Answers of Atomic Energy Commission to Questionnaire Submitted by Task Force on Legal Services and Procedure, Commission on Organization of Executive Branch of the Government (1954): "As indicated in §40.51 and 50.61 of the regulations, an appeal may be made by filing a letter with the Commission, stating the reasons for the appeal. If reason therefor appears, the action may be modified by the Licensing Controls Branch. Otherwise the appeal and the related file data are referred to the General Manager for consideration and response to the applicant."

C. Licensing Under Atomic Energy Act of 1954

Licensing under the Atomic Energy Act of 1954 is the means whereby the government not only regulates the atomic energy industry but also effects the development of that industry in accordance with the aims of that legislation. "[A] comparative newcomer among the Commission's many other functions," licensing constitutes a fairly "narrow but highly significant area of the Commission's overall responsibilities for atomic energy development" which is "closely linked with the AEC's nonregulatory responsibilities." [198]

The overriding national defense policy of the Congress in enacting the 1946 Act set the tone of licensing thereunder. In enacting the Atomic Energy Act of 1954, however, Congress manifested a compelling intention to take advantage of the potentialities of private industry in the development of atomic energy for peaceful uses. Accordingly, "the development, use, and control of atomic energy . . . to [among other things] strengthen free competition in private enterprise," [199] as provided in the 1954 act, should and must guide the Commission in enacting regulations to implement the legislation. Further, Congress intended that Commission programs for assistance to research and development and the "dissemination of unclassified scientific and technical information" should "encourage scientific and industrial progress." [200] Indeed, one of the specific purposes of the present statute, clearly designed to set the administrative tone of the licensing function thereunder, is the stated policy "to encourage widespread participation in the development and utilization of atomic energy for peaceful purposes to the maximum extent consistent with the common defense and security and with the health and safety of the public." [201]

Licensing under the Atomic Energy Act of 1954 is subject to two controlling factors that did not exist under the earlier legislation. First, the Commission acts "in the dual capacity of encouraging as well as regulating private activity," with the result that "considerations of Government promotion and assistance were more closely interrelated with those of regulation than is the case in most other regulatory agencies." [202] Second, the Joint Congressional Committee on Atomic Energy acts, under a 1957 amendment to Section 261 of the 1954 stat-

[198] Joint Committee Staff Study, *supra* note 3 at 2-3.
[199] Section 1b, 42 U.S.C.A. §2011(b).
[200] Section 3a and b, 42 U.S.C.A. §2013(a) and (b).
[201] Section 3d, 42 U.S.C.A. §2013(d).
[202] Joint Committee Staff Study, *supra* note 3 at 4.

ute,[203] in a reviewing capacity with respect to all major licenses where federal government assistance in any form is involved. These two factors vitally affect the development of private atomic enterprise under the 1954 act, as amended.

The Atomic Energy Act of 1954 establishes a complex system of integrated licensing controls. Thus, where a public utility or research institution desires to build and operate on atomic reactor, it must obtain (1) a construction permit to build the reactor; (2) a facility license to operate the reactor; (3) depending on the reactor design, a license to acquire, possess, and use source material; (4) a license to possess and use special nuclear material; and (5) a license for each person operating the reactor.

Several statutory features promote the integration of licensing functions. For example, the licensing provisions of the 1954 act are, for the most part, contained in a single chapter of the statute.[204] An applicant for a so-called "commercial" [205] or "non-commercial" [206] license for a facility utilizing or producing special nuclear material is encouraged to develop the information which will be required by the Commission by prior consultation with the agency and to submit its application for each type of license required in connection with the operating permit, insofar as possible, at the same time.[207] Further, Section 161h of the present statute authorizes the Commission to

> . . . consider in a single application one or more of the activities for which a license is required by this Act, [and] combine in a single license one or more of such activities. . . .[208]

The licensing system now administered by the Atomic Energy Commission requires the following types of authorizations before a private person or business can act:

> 1. *Special Nuclear Material*—License to receive, possess, use, and transfer special nuclear material, as provided in Sections 53 and 57a(1)-(2): for the conduct of research and development activities under Section 31; for use in conduct of research and development activity or in medical therapy, under

[203] Pub. L. 85-79, 85th Cong., 1st Sess. (1957).

[204] Chapter 10, "Atomic Energy Licenses," Sections 101-110, 42 U.S.C.A. §§2131-2140.

[205] Under section 103, 42 U.S.C.A. §2133.

[206] Under section 104, 42 U.S.C.A. §2134.

[207] Joint Committee Staff Study, *supra* note 3 at 11-15 and 101-105; Upton, "Licensing and Services to Licensees and Others Under the Atomic Energy Act of 1954," 24 Geo. Wash. L. Rev. 488, 489 (1956).

[208] 42 U.S.C.A. §2201(h).

non-commercial licenses pursuant to Section 104; and for use under commercial licenses pursuant to Section 103.

2. *Source Material*—License to transfer, deliver, receive, possess, import, or export source materials after removal from the place of deposit in nature, as provided in Sections 62 and 63: for use in the conduct of research and development activities under Section 31; for use in research and development activities or in medical therapy under non-commercial licenses pursuant to Section 104; for use under commercial licenses pursuant to Section 103; or for "any other use approved by the Commission as an aid to science or industry."

3. *Byproduct Material*—License to transfer, manufacture, produce, acquire, own, possess, import, or export byproduct material, as provided in Sections 81 and 82, for use in research and development, medical therapy, industrial uses, agricultural uses, and "such other useful applications as may be developed."

4. *Activity Abroad*—Authorization for activity involving the production of special nuclear material outside the United States, as provided in Section 57a(3)(B), where United States has no agreement for cooperation with a foreign country pursuant to Sections 54 and 123.

5. *Commercial Utilization or Production Facility*—License for commercial utilization or production facility using special nuclear material as provided in Section 103.

6. *Non-Commercial Utilization or Production Facility*—License for non-commercial utilization or production facility using special nuclear material as provided in Section 104 for medical therapy, research and development activities for industrial or commercial purposes, and research and development activities for non-commercial purposes.

7. *Construction Permit*—Construction permit for construction prior to licensing, or alteration after licensing, of utilization or production facility licensed under Sections 103 and 104, as provided in Section 185.

8. *Operator's License*—License to operate, as provided in Section 107, various classes of utilization or production activities otherwise licensed under Sections 103 and 104.

9. *Access Permit*—License authorizing access, subject to personnel security clearances, to confidential or secret Restricted Data, as developed by Commission regulation under Sections 3b, 141, 145, and 161i.

With respect to the domestic distribution of special nuclear material,[209] the transfer of source material in interstate or foreign com-

[209] Section 53b, 42 U.S.C.A. §2073(b); see 10 Code Fed. Regs. §§70.11-.14.

merce,[210] the domestic distribution of byproduct material,[211] and the domestic production or use of component parts of utilization and production facilities,[212] the Commission is authorized to issue either a special or general license. The authority of the Commission in this respect is considerably expanded under the Atomic Energy Act of 1954, as compared with the situation under the 1946 statute.

1. Standards and Conditions

The statutory standards established by the Atomic Energy Act of 1954 for Commission licensing, and also the conditions and terms imposed on licensees under Commission regulations, constitute only a minor improvement over those of the 1946 legislation and rules issued thereunder. For example, the completely vague and meaningless standard of "national welfare," so commonly used in the Atomic Energy Act of 1946, appears infrequently in the 1954 legislation [213] and survives in the present regulations only as a licensing condition for source materials.[214] However, the Atomic Energy Act of 1954, particularly with respect to licensing, provides "only the vaguest 'standards' to guide the hand of the Commission." [215]

The indefinite standard of "common defense and security" [216] appears

[210] Sections 62 and 63b, 42 U.S.C.A. §§2092 and 2093(b); see 10 Code Fed. Regs. §§40.11, 40.23, 40.60, and 40.62.

[211] Section 81, 42 U.S.C.A. §2111; see 10 Code Fed. Regs. §§30.71-.72.

[212] Section 109(a), 42 U.S.C.A. §2139(a).

[213] Under Section 1a, 42 U.S.A. §2011(a) ("Declaration"), it is "the policy of the United States that . . . the development, use, and control of atomic energy shall be directed so as to make the maximum contribution to the general welfare. . . ." Under Section 3c, 42 U.S.C.A. §2013(c), the Commission is directed to carry out, among others, "a program for Government control of the possession, use, and production of atomic energy and special nuclear material so directed as to make the maximum contribution to . . . the national welfare." See also Section 2g, 42 U.S.C.A. §2012(g), concerning the use of funds "to promote general welfare," and Section 2i, 42 U.S.C.A. §2012i, concerning government indemnity in the interest of the general welfare.

[214] 10 Code Fed. Regs. §§40.1 and 40.22(c).

[215] Stason, Workshops on Legal Problems of Atomic Energy 4 (1956) (hereafter cited as Atomic Energy Workshops); see "Report of Workshop III" at 58-59. See also statement of Rep. Holifield concerning Section 53 of the 1954 act with respect to licenses for special nuclear material, 1957 Congressional Review Hearing, *supra* note 7 at 16: "Under Section 53 . . . of the act, you [the AEC] have wide latitude to make administrative judgments in the granting of a license. You can, in effect, include in this granting of the license every kind of a term and condition that you want. . . ."

[216] This is nowhere defined in the new act except in Section 11g, 42 U.S.C.A. §2014(g), which merely states, "The term 'common defense and security' means the common defense and security of the United States."

frequently throughout the present statute [217] and the regulations issued thereunder.[218] Further, under the Atomic Energy Act of 1954, any license may contain "such terms and conditions as the commission may, by rule or regulation, prescribe to effectuate the provisions of this Act." [219] This language confers on the Commission almost unlimited discretionary authority over licenses in the atomic field. This broad authority also is written into the regulations by the provision that a license shall be issued "in such form and upon such conditions as it [the Commission] deems appropriate and in accordance with law." [220]

Of even more doubtful regulatory justification is the statutory [221] and regulatory [222] provision under the 1954 act that licenses may be, *ipso facto,* modified or amended by subsequent changes in legislation or regulations.[223] This is particularly true in view of the fact that a hearing on

[217] Section 1a, 42 U.S.C.A. §2011(a) ("Declaration"); Section 2a, b, d, e, g, and i, 42 U.S.C.A. §2012(a), (b), (d), (e), (g), and (i) ("Findings"); Section 3c, d, and e, 42 U.S.C.A. §2013(c), (d), and (e) ("Purpose"); Sections 53b and 57b(2), 42 U.S.C.A. §§2073(b) and 2077(b)(2) ("Domestic Distribution of Special Nuclear Material" and "Prohibition"); Sections 63b and 69, 42 U.S.C.A. §§2093(b) and 2099 ("Domestic Distribution of Source Material" and "Prohibition"); Section 81, 42 U.S.C.A. §2111 ("Domestic Distribution of Byproduct Material"); Sections 103b and d and 104a, c, and d, 42 U.S.C.A. §§2133(b) and (d) and 2134(a), (c), (d) ("Atomic Energy Licenses"); and Section 182a, 42 U.S.C.A. §2232(a) (general licensing standards).

[218] 10 Code Fed. Regs. §§30.31b(1) and 30.33(c) ("Licensing of Byproduct Material"); §40.22(a) ("Control of Source Material"); §70. 32(b)(1) ("Special Nuclear Material"); §§50.12 and 50.40(c) ("Licensing of Production and Utilization Facilities").

[219] Section 183, 42 U.S.C.A. §2233; see, to the same effect, Section 103a, 42 U.S.C.A. §2133(a), with respect to commercial licenses.

[220] 10 Code Fed. Regs. §40.21; see, to the same effect, §§30.31(b), 50.50, 55.30, and 70.31(a).

[221] Sections 183d and 187, 42 U.S.C.A. §§2233(d) and 2237. "Section 183d would seem to imply that while licenses are subject to the hazard of a change in the act, they are not subject to the hazard of a change in regulations without a change in the act"; but "section 187 indicates that license terms are subject to modification by subsequent regulations" and to revocation for failure to observe such subsequent regulations, Upton, *supra* note 207 at 496, 497.

[222] 10 Code Fed. Regs. §§30.32(a), 40.25, 50.54(h), 55.40(a), and 70.61(a).

[223] Section 170a of the 1954 act, 42 U.S.C.A. §2210(a), added by Congress in 1957, requires that, as a condition of their licenses, certain classes of licensees "have and maintain financial protection" in the form of liability insurance or otherwise, as determined by the Commission under Section 170b, 42 U.S.C.A. §2210(b). It is a further condition of such licenses that the licensee enter into an indemnity agreement with the AEC, Section 170c, 42 U.S.C.A. §2210(c). With respect to these conditions imposed upon persons licensed by the Commission prior to enactment of the 1957 legislation, the Joint Committee has stated, H.R. Rep. No. 435, 85th Cong., 1st Sess. 21 (1957): "In view of the provisions in section 187 of the Atomic Energy Act of 1954, making

changes in the licensing regulations usually is held only upon the request of any licensee affected thereby.[224]

2. Types of Licenses

a. Use and Production of Special Nuclear Material

Under the Atomic Energy Act of 1954, the United States retains title to all special nuclear material.[225] The Atomic Energy Commission is authorized to distribute such material at a reasonable charge to persons licensed to possess it. The statute also requires that the Commission purchase from licensees at a fair price special nuclear material produced by licensees in the course of their operations.

Section 31 of the Atomic Energy Act of 1954 [226] authorizes assistance by the Commission to private or public institutions or persons for research and development activities relating to nuclear processes, the theory and production of atomic energy, utilization of special nuclear material, and the protection of health and the promotion of safety. Under Section 104,[227] licenses are authorized for medical therapy and for research and development for industrial or commercial purposes. Where special nuclear material is licensed by the Commission for activities authorized under Sections 31 and 104, the Commission may, but is not required to, make a reasonable charge for the use of such material, the charge to be based upon established criteria, "considering, among other things, whether the licensee is a nonprofit or eleemosynary institution and the purposes for which the special nuclear material will be used." [228]

On the other hand, the Commission is required to make a reasonable charge for special nuclear material for use by commercial licensees [229] under Section 103 of the Atomic Energy Act of 1954.[230] Further, with respect to charges for such material to be used by both Section 104 non-

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all licenses subject to later amendment of the act, there is no need to incorporate language here amending the licenses where this financial protection may be required. . . ." For a discussion of the insurance and indemnity provisions of the 1954 act, see *infra*, text at note 495.

[224] Section 189b, 42 U.S.C.A. §2239(b).

[225] Sections 2b and 52, 42 U.S.C.A. §§2012(b) and 2072.

[226] 42 U.S.C.A. §2051.

[227] 42 U.S.C.A. §2134.

[228] Section 53b(1)-(2) and c, U.S.C.A. §2073(b)(1)-(2) and (c).

[229] Section 53b(3) and c, 42 U.S.C.A. §2073(b)(3) and (c).

[230] 42 U.S.C.A. §2133.

commercial licensees and Section 103 commercial licensees, the Commission must take into consideration

> (1) the use to be made of the special nuclear material;
> (2) the extent to which the use of the special nuclear material will advance the development of the peaceful uses of atomic energy; [and]
> (3) the energy value of the special nuclear material in the particular use for which the license is issued. . . .[231]

Where a Section 103 commercial license is involved, the Commission must, "insofar as practicable, make uniform, nondiscriminatory charges" for special nuclear material used in connection with such a license.[232] In addition,

> . . . with respect to special nuclear material consumed in a facility licensed pursuant to section 103, the Commission shall make a further charge based on the cost to the Commission, as estimated by the Commission, or the average fair price paid for the production of such special nuclear material as determined by Section 56, whichever is lower.[233]

Section 56 of the Atomic Energy Act of 1954 deals with the "fair price" to be paid by the Commission for special nuclear material produced in licensed private facilities.[234] Such a price must be applicable to all producers of the same type of material and must reflect the value of the material for its intended use by the United States, and the Commission "may give such weight to the actual cost of producing that material as the Commission finds to be equitable." Further, Section 56 provides that

> . . . the Commission may establish guaranteed fair prices for all special nuclear material delivered to the Commission for such period of time as it may deem necessary but not to exceed seven years.

By the middle of 1957 the Commission had made available to private industry for domestic use 50,000 kilograms of contained uranium 235.[235]

[231] Section 53d(1)-(3), 42 U.S.C.A. §2073(d)(1)-(3).
[232] Section 53d(4), 42 U.S.C.A. §2073(d)(4).
[233] Section 53d(5), 42 U.S.C.A. §2073(d)(5).
[234] 42 U.S.C.A. §2076.
[235] Twenty thousand kilograms were made available Feb. 22, 1956, and an additional 30,000 kilograms July 3, 1957. At the same time, equal amounts were released for use by cooperating foreign nations. See AEC, Twenty-third Semi-Annual Report, 19, 23 (1958); AEC Twentieth Semi-Annual Report vii-ix (1956); Atomic Energy Facts 3 (GPO 1957).

Subsequently, the Commission by regulation established guaranteed fair prices for special nuclear material lawfully produced under license through June 30, 1963.[236] The agency also has sought to waive the use charge for special nuclear material in connection with certain projects under the civilian reactor program.[237] In addition, the Commission, at a fixed unit charge to the licensee, recovers in Commission-owned facilities source and special nuclear materials from spent reactor fuel or blanket materials of licensees under Sections 103 and 104 of the Atomic Energy Act of 1954.[238]

Opponents of the 1954 legislation have attacked these sale and purchase provisions, as administered by the Commission, as a "built-in subsidy feature" to industry.[239] As a result of this criticism, a new Section 58 was added to the statute by Congress in July 1957, providing:

> Before the Commission establishes any fair price or guaranteed fair price period in accordance with the provisions of Section 56, or establishes any criteria for the waiver of any charge for the use of special nuclear material licensed or distributed under section 53, the proposed fair price, guaranteed fair price period or criteria for the waiver of such charge shall be submitted to the Joint Committee. . . .[240]

The Commission-proposed price must lie before the Joint Committee for a period of forty-five days prior to its effective date. This provision was aimed directly at curbing the future exercise of Commission discre-

[236] 21 Fed. Reg. 1421 (Mar. 3, 1956), AEC Press Rel. No. 930 (Nov. 18, 1956), 22 Fed. Reg. 3985 (June 6, 1957), and 22 Fed. Reg. 10965 (Dec. 28, 1957).

[237] Under the first, second, and third round invitations; see statement of AEC General Manager Fields, 1957 Authorizing Legislation Hearings, *supra* note 7 at 153-154. In its request for authorization of funds for fiscal year 1958, the AEC asked authorization for a total of $23,115,000 for waiver of fuel-use charges under the three rounds, but Congress authorized only $20,000,000 to be used under the third round invitation (Sen. Rep. No. 791, *supra* note 23 at 39). Waiver of use charges aggregating $1,325,000 under the first round invitation and $1,790,000 under that of the second round, as requested by the Commission, were disallowed by Congress.

[238] Section 161m(1), 42 U.S.C.A. §2201(m)(1); 22 Fed. Reg. 1591 (Mar. 12, 1957).

[239] H.R. Rep. No. 2181, *supra* note 5 at 130-131; Adams, "Atomic Energy: the Congressional Abandonment of Competition," 55 Col. L. Rev. 158, 168-169 (1955); Rep. Holifield, 1957 Authorizing Legislation Hearings, *supra* note 7 at 183; Rep. Cannon, 103 Cong. Rec. 5192 (1957). In his report on a review of AEC contract No. AT(30-3)-22 with Yankee Atomic Electric Co. executed in Nov. 1956, the Comptroller General charged that the Commission's announced policy of waiving fuel-use charges up to an agreed-upon amount of money was not fully complied with in the Yankee contract "since it provides that AEC will waive its use charge, without limitation, for all special nuclear material used during the contract period" (1957 Section 202 Hearings, *supra* note 7 at 758).

[240] Pub. L. 85-79, 85th Cong., 1st Sess. (1957), 42 U.S.C.A. §2078.

tion with respect to prices for special nuclear material used in the civilian reactor program.[241]

As a matter of law, ownership of special nuclear material by the United States is not necessary to adequate regulation of the atomic energy industry.[242] As long as the Commission remains the major producer of special nuclear material and as long as the number of private users of such material for energy producing purposes is limited, the need for private ownership is not particularly pressing. However, as the number of private reactors increases, the availability of an assured source of enriched reactor fuel at reasonably foreseeable prices will become a requisite to financial and operational stability of the industry. The more the industry is subject to normal competitive market conditions, the healthier it will be, and the greater will be the benefit to the public welfare from a thriving private atomic energy production base.

The Commission appears conscious of these factors. As it has emphasized to the Joint Committee:

> The AEC policy on pricing materials and services which it makes available, and on establishing fair prices which it will pay for special nuclear materials produced in licensed facilities is recognized as being of major importance to the growth and development of the industry, both here and abroad.
>
> The influence of these prices on the industry depends not only upon their actual level, but almost equally upon their stability, for without some assurance that these prices will remain reasonably stable, industry will be unable to make the long-range plans essential to the procurement of the financing necessary to proceed with its projects.[243]

At the present time, industry has no guarantee that it can obtain a reasonably assured quantity of special nuclear material at prices which will

[241] H.R. Rep. No. 571, 85th Cong., 1st Sess. 6 (1957): "It is intended that the provisions of section 58 shall apply to changes by the Commission to any presently established fair price, guaranteed fair price period, or criteria for the waiver of charge period, as well as to the establishment of such matters in the future."

[242] Estep, "Federal Control of Health and Safety Standards in Peacetime Private Atomic Energy Activities," 52 Mich. L. Rev. 333 (1954); see "Report of Workshop III," Atomic Energy Workshops, *supra* note 215 at 56-57: ". . . [A]uthority for adequate regulation of such industry exists under the several clauses of the Constitution, including, for example, the commerce power and the war power and established regulatory powers thereunder."

[243] 1957 Section 202 Hearings, *supra* note 7 at 107. See 1958 Section 202 Hearings, *supra* note 32 at 62, 67, and 127 (". . . the Government's price for fissionable material and associated processing operations is potentially one of the most significant factors that determine the course and speed of power reactor development.").

be set by supply and demand rather than by administrative or congressional fiat, possibly based on political, not economic, considerations.[244]

The McKinney Panel has urged that Congress re-examine the policy of federal ownership of special nuclear material. In the meantime, problems created by such ownership confront the industry.

> Federal ownership does create some problems which may tend to grow with the growth of a private atomic industry. The most critical of these is the role of the Federal Government in the pricing of special nuclear materials, hence its role in the economics of private licensed operations. . . .
>
> In most prospective near-term commercial atomic power reactors, the "buy back" price could make or break the economies of the plant. By law, the Commission can only guarantee "buy back" prices for 7 years, while plants able to produce such material must run for 25 to 40 years to amortize their costs. Thus, private investors have no way of forecasting when they may suddenly be thrown into a losing operation as a result of changes in future Commission-guaranteed prices. It is true that all licensees receive the same prices, but all licensees will not have the same types of plants and may have differing economic break-even points.
>
> During the period when there are relatively few atomic power-plants in operation, there are advantages to the principle of Federal ownership [*i. e.*, assured buyer of byproduct materials and stability of prices]. . . .
>
> As the number of atomic power-plants increases, a market for the byproduct plutonium or uranium 233 for use as reactor

[244] 10 Code Fed. Regs. §50.60(a); see Upton, *supra* note 207 at 493-94: "How binding is this [Commission] allocation? The difficulty is that Section 161m of the act, which permits the Commission to make long-term agreements to sell source material, expressly denies similar authority for the distribution of special nuclear material. Thus, one could argue that the Commission's assurances would be meaningless and that the licensee would not have any legal remedy if the Commission failed to honor its assurances." See also statement of AEC to Joint Committee, 1957 Section 202 Hearings, *supra* note 7 at 107: "The Commission's prices [for enriched uranium] . . . are not guaranteed, but . . . it is the intention of the Commission to maintain the price schedule on as stable a basis as is possible. . . ." On the other hand, Section 56, 42 U.S.C.A. §2076, authorizes Commission-guaranteed fair prices for special nuclear material produced in private facilities for up to 7 years, which presumably have the binding force of a contract between the government and private parties acting in reliance upon the guarantee, provided Joint Committee approval of such guarantee has been given under Section 58, 42 U.S.C.A. §2078. Under Section 161m(2), 42 U.S.C.A. §2201(m)(2), the Commission may sell or lease source or byproduct material to Section 103 or 104 licensees, subject to cancellation by the licensee; this section specifically excludes special nuclear material from the provisions thereof. Special nuclear material may be recaptured by the AEC during a war or national emergency declared by Congress (Section 108, 42 U.S.C. §2138).

> fuel will undoubtedly develop, thus a degree of inherent market stabilization will come into existence. . . . When that time does arrive, the policy of Federal ownership should be re-examined.[245]

b. Use of Source and Byproduct Materials

The transfer, receipt, delivery, or possession of source materials [246] and byproduct materials [247] are subject to Commission licensing.[248] Such materials may be sold, leased, or otherwise made available by the Commission to its licensees [249] at reasonable charges and upon written criteria established by the Commission,[250] without, however, the necessity of obtaining Joint Committee approval as in the case of special nuclear material.[251]

Licenses for the transfer, delivery, or possession of source and byproduct material are issued pursuant to regulations which establish general conditions with respect to the common defense and security, the preservation of health and safety, the furnishing of reports, and the keeping of records.[252] Prior to May 1957, the Atomic Energy Commission did not require immediate reporting of incidents involving possible radiation hazards from the use of byproduct materials. This

[245] McKinney Panel Report, *supra* note 10 at Vol. 1, p. 131; see also 13 and 134.

[246] Defined as uranium, thorium, and their refined counterparts after removal from the place of deposit in nature (Section 11x, 42 U.S.C.A. §2014(x), formerly Section 11s, 42 U.S.C.A. §2014(s)).

[247] Defined as "any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear material" (Section 11e, 42 U.S.C.A. §2014(e)).

[248] Section 62 (source material) and Section 81 (byproduct material), 42 U.S.C.A. §§2092, 2111.

[249] Section 161m(2), 42 U.S.C.A. §2201(m)(2).

[250] Section 63c (source material) and Section 81 (byproduct material), 42 U.S.C.A. §§2093(c), 2111.

[251] Section 58, 42 U.S.C.A. §2078.

[252] 10 Code Fed. Regs. §§40.21-.22 and 40.30 (source material) and 30.23-.24, 30.31(b)-.32, and 30.41-.43 (byproduct material). As of the end of 1957, the AEC had issued 1,200 licenses to use radioisotopes for industrial purposes to about 1,667 industrial organizations, AEC, Twenty-third Semi-Annual Report 25 (1958). In addition, 7 commercial firms have received licenses to dispose of low-level radioactive byproduct and source material wastes (*id.* at 151). On March 8, 1958, the AEC for the first time gave notice of its intention to issue a byproduct and source material license to provide radioactive waste disposal service, 23 Fed. Reg. 1663, BNA, Atomic Industry Reporter 4:88. As of March 1958, the AEC had denied 4 applications for licenses for source materials and 46 applications for licenses for byproduct materials, while 21 applications of the latter type were withdrawn, 1958 Section 202 Hearings, *supra* note 32 at 91.

serious omission in the agency's regulations was corrected by amendment to the rules [253] governing licensees of such materials as the result of an accident reported to the Commission more than a month after its occurrence.[254] For both source and byproduct material, the Commission has exempted certain types of uses from the requirements of a specific license and provided instead a general license in such situations.[255]

c. Operators

Although its statutory authority with respect to operators' licenses is practically unfettered,[256] the Commission has exercised restraint in restricting to the minimum the classes of persons required to obtain licenses.[257] Licenses for individual operators of utilization and production facilities have been generally controlled by reasonable conditions of health and proficiency.[258]

[253] 10 Code Fed. Regs. §20.403, 22 Fed. Reg. 3389 (May 14, 1957). This regulation requires that (1) each byproduct material licensee "immediately" notify the nearest AEC Operations Office by telephone and telegraph "of any incident involving licensed material possessed by him and which may have caused or threatens to cause" serious exposure to individuals and the suspension of work in the facility involved for one week or more; (2) each such licensee notify the AEC within 24 hours of any incident involving minor exposure to individuals and the suspension of work in the facility involved for less than one week; and (3) each such licensee submit to the AEC a written report of any of the above types of incidents within 30 days thereafter. At the time these additions to the regulations affecting byproduct material licenses were issued, the Commission also added a regulation requiring such licensees to report "immediately" any theft or loss of licensed material, 10 Code Fed. Regs. §20.402.

[254] This involved Byproduct Material License Nos. 31-246-1 and 31-246-2 issued to M. W. Kellogg Company, *infra* note 454. The incident involving byproduct material occurred on March 13, 1957, but was not reported to the Commission until April 19, 1957, acording to the AEC General Manager (BNA, Atomic Industry Reporter 265:206).

[255] 10 Code Fed. Regs. §§40.23, 40.60, and 40.62 (source material) and 30.20-.21 and 30.71-.72 (byproduct material). On June 27, 1958, the AEC announced that depleted uranium (containing less than .007 percent by weight of uranium 235) would be sold by the Commission on an unclassified basis to domestic buyers for such goods as ceramics, glass products, coloring agents, and photographic supplies; such sales and transfers of the material involved would continue to be subject to the Commission's licensing procedures; AEC Press Rel. No. A-158.

[256] Section 107, 42 U.S.C.A. §2137.

[257] For example, licensing is not required of persons who may manipulate controls but who do so in the presence and under the direction of a licensed operator. As of the end of 1957, only 148 operators' licenses had been issued, AEC, Twenty-third Semi-Annual Report 195-199 (1958); see BNA, Atomic Industry Reporter 227:851-857. As of March 1958, only one application for an operator's license had been denied by the AEC; 1958 Section 202 Hearings, *supra* note 32 at 91.

[258] 10 Code Fed. Regs., Pt. 55, particularly §55.11.

d. Foreign Activity, Imports, and Exports

The Atomic Energy Act of 1954 established several categories of regulated activity concerning the export, import, or use abroad of atomic materials or of atomic information. These activities are controlled by the requirement of a license.

Section 62 of the present legislation [259] requires a license for the import into, or export from, the United States of any source material. Section 82c contains a similar requirement with respect to byproduct material.[260] The export or import of special nuclear material by private individual is, of course, impossible under the 1954 act, since title to such material is vested in the United States government.[261]

Persons under the jurisdiction of the United States are prohibited from directly or indirectly engaging "in the production of any special nuclear material outside of the United States" except in two circumstances.[262] In the first circumstance, such activity is authorized where carried on pursuant to an agreement for cooperation between the United States and a foreign country,[263] which requires the approval of the Atomic Energy Commission, the Department of Defense, the President, and the Joint Committee.[264] In the second circumstance, the activity may be authorized by the Commission if it determines that "such activity will not be inimical to the interest of the United States." As an implementation of this authority, licenses are required by the Commission for private concerns and persons to engage in certain unclassified activities in foreign atomic energy programs, outside of the scope of agreements for cooperation.[265]

[259] 42 U.S.C.A. §2092.

[260] 42 U.S.C.A. §2112(c); see 10 Code Fed. Regs. §30.33.

[261] Section 52, 42 U.S.C.A. §2072.

[262] Section 57a(3), 42 U.S.C.A. §2077(a)(3).

[263] Section 123, 42 U.S.C.A. §2153; see also Section 144, 42 U.S.C.A. §2164.

[264] Thirty-nine such agreements with 37 countries were in effect at the end of 1957. AEC, Twenty-third Semi-Annual Report 195-199 (1958); see BNA, Atomic Industry Reporter 287:203. Once such an agreement is reached, the Commission issues an authorization letter to the private concern or individual to act under the agreement; see AEC authorization letter to Westinghouse Electric Corporation dated April 2, 1956, under an agreement with Belgium; BNA, Atomic Industry Reporter 287:401.

[265] 10 Code Fed. Regs., Pt. 110. Section 110.7(a) of the regulations states the determination by the Commission that "any activity which . . . (1) Constitutes directly or indirectly engaging in the production of special nuclear material in any foreign country [other than countries or areas within the Soviet or Communist Chinese bloc] . . . ; and (2) Does not involve the communication of Restricted Data or other classified defense information; and (3) Is not in violation of other provisions of law . . . will not be inimical to the interests of the United States and is authorized by the

The principal difficulty which arises in the international field derives from the fact that the Atomic Energy Commission is not the only federal regulatory body concerned with exports and imports. The Commission is a member of the Advisory Committee on Export Policy created by the Secretary of Commerce in 1950[266] to administer the Export Control Act of 1949.[267] This Committee advises the Secretary of Commerce with respect to "export measures required from the standpoint of national security, foreign policy, and short supply," which measures are administered under Department of Commerce regulations. Under this system, import certificates are required from the Department for source materials or for facilities for the production or utilization of special nuclear material.[268] Export licenses issued by the Department of Commerce also are required for components of facilities for the production or utilization of special nuclear material,[269] isotopes for which procurement authorization previously has been obtained from the Atomic Energy Commission,[270] unclassified technical data,[271] and certain types of unpublished technical data.[272] Validated licenses are required for the export of certain metals such as beryllium and boron[273] to all foreign countries except Canada.[274] Special licensing restrictions apply to the exportation of certain materials to the Soviet and Chinese Communist bloc.[275]

Although diffuse exercise of federal regulatory power by different agencies of the government is ordinarily objectionable, over-all control of exports and imports by the Department of Commerce appears justified in view of the aspects of foreign policy involved. The burden imposed on the private or business interest by having to deal with two

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Atomic Energy Commission." Prior to the promulgation of Part 110 in 21 Fed. Reg. 418 (Jan. 20, 1956), the Commission issued a notice of Commission policy identical with Section 110.7(a) of the regulations, 20 Fed. Reg. 7399 (Oct. 5, 1955).

[266] Dep't of Commerce Order No. 125 (Oct. 5, 1950), as amended, 20 Fed. Reg. 5269 (July 21, 1955).

[267] 50 U.S.C.A. App. §§2021 *et seq.*

[268] 15 Code Fed. Regs. §§368.1(a)(3), (b)(1), and (e).

[269] 15 Code Fed. Regs. §370.4(d).

[270] 15 Code Fed. Regs. §373.55(b).

[271] Granted by general license, 15 Code Fed. Regs. §385.1-.2.

[272] Granted by special license, 15 Code Fed. Regs. §385.3.

[273] So-called "RO" commodities appearing on the Department of Commerce's "Positive List of Commodities," 15 Code Fed. Regs. § 399.1, app. A.

[274] 15 Code Fed. Regs. §§371.3(a)(1) and 399.1(f).

[275] So-called "R" commodities, such as naphthenates of metals, for which no license is required for export to countries outside this bloc, 15 Code Fed. Regs. §§371.3(a)(2) and 399.1(f).

different agencies—that department and the Atomic Energy Commission—is, to a certain extent, outweighed by the need for centralized control of strategic exports and imports.

e. Access Permits

To make "available to private enterprise classified scientific and technical information relating to the civilian uses of atomic energy" under the Atomic Energy Act of 1954,[276] the Atomic Energy Commission in 1955 instituted its information access permit program. No such program existed under the Atomic Energy Act of 1946, although that statute stated the policy, never implemented, that

> . . . the dissemination of scientific and technical information relating to atomic energy should be permitted and encouraged so as to provide that free interchange of ideas and criticism which is essential to scientific progress.[277]

The Atomic Energy Act of 1954 sought to raise, consistent with national security, the paper curtain imposed by the earlier statute. Congress therefore laid down the policy for the Commission that

> The dissemination of scientific and technical information relating to atomic energy should be permitted and encouraged so as to provide that free interchange of ideas and criticism which is essential to scientific and industrial progress and public understanding and to enlarge the fund of technical information.[278]

The dissemination of information under atomic energy legislation is complicated by the existence of a special category of information created under the 1946 statute, Restricted Data.[279] Such information is defined in the Atomic Energy Act of 1954 as

> . . . all data concerning (1) design, manufacture, or utilization of atomic weapons; (2) the production of special nuclear

[276] AEC Statement to Joint Committee, 1957 Section 202 Hearings, *supra* note 7 at 92; see AEC, Twenty-third Semi-Annual Report 165-66 (1958).

[277] Section 10a(2), 42 U.S.C.A. §1210(a)(2)(1946); see, to the same effect, Section 1(b)(2), 42 U.S.C.A. §1801(b)(2)(1946).

[278] Section 141 b, 42 U.S.C.A. §2161(b); see, to the same effect, Section 3b, 42 U.S.C.A. §2013(b), authorizing the Commission to engage in "a program for the dissemination of unclassified scientific and technical information and for the control, dissemination, and declassification of Restricted Data, subject to appropriate safeguards, so as to encourage scientific and industrial progress." Section 142, 42 U.S.C.A. §2162, provides for classification and declassification procedures. Under Section 146b, 42 U.S.C.A. §2166(b), "[t]he Commission shall have no power to control or restrict the dissemination of information other than as granted by this or any other law."

[279] Section 10(b)(1), 42 U.S.C.A. §1810(b)(1)(1946). This definition does not substantially differ from that under the 1954 legislation.

material; or (3) the use of special nuclear material in the production of energy. . . .[280]

Persons employed by private concerns in connection with Commission contracts or commercial or non-commercial licenses under Sections 103 and 104 of the 1954 act must receive permission from the Commission, after investigation, to have access to Restricted Data.[281] Since administration of an atomic energy license or operation of an atomic energy reactor pursuant to license will in all cases require the use of such data, the access permit is an absolute necessity for the private concern involved.[282]

Access permits are issued by the Commission for periods of two years for three separate categories of Restricted Data. These are (1) an "L" clearance for Confidential Restricted Data, (2) a "Q" clearance for Secret or Top Secret Restricted Data in areas outside the controlled thermonuclear field, and (3) a special "Q" clearance for access to information involving the controlled fusion process. For an "L" clearance, the applicant must demonstrate to the Commission that he has "potential use" for the information desired.[283] For a "Q" clearance involving access to Secret or Top Secret Restricted Data not related to the controlled thermonuclear field, the applicant must demonstrate to the agency a specific need for the information desired.[284] A "Q" clearance for access

[280] Section 11w, 42 U.S.C.A. §2014(w) (formerly Section 11r).

[281] Under Section 161i(1) of the 1954 Act, 42 U.S.C.A. §2201(i)(1), the Commission is authorized to issue regulations necessary "to protect Restricted Data received by any person in connection with any activity authorized pursuant to this Act." Section 145a, 42 U.S.C.A. §2165(a), further provides that "[n]o arrangement shall be made under section 31, no contract shall be made or continued in effect under section 41, and no license shall be issued under section 103 or 104, unless the person with whom such arrangement is made, the contractor or prospective contractor, or the prospective licensee agrees in writing not to permit any individual to have access to Restricted Data until the Civil Service Commission shall have made an investigation and report to the Commission on the character, associations, and loyalty of such individual, and the Commission shall have determined that permitting such person to have access to Restricted Data will not endanger the common defense and security." Similar clearance is required for Commission employees, Section 145b, 42 U.S.C.A. §2165(b). Investigation procedures are covered by Sections 142c-e, 143, and 145c, 42 U.S.C.A. §§2162(c)-(e), 2163, and 2165(c), and criminal penalties concerning misuse of Restricted Data are prescribed in Sections 221 and 224-227, 42 U.S.C.A. §§2271 and 2274-2277. Effective July 1, 1958, issuance of access permits became the authority of the AEC's field offices; AEC Press Rel. No. A-152 (June 23, 1958).

[282] See Green, "The Atomic Energy Information Access Permit Program," 25 Geo. Wash. L. Rev. 548, 553 (1957).

[283] 10 Code Fed. Regs. §§25.11(b)(7), 25.15(a), and 95.3(d).

[284] 10 Code Fed. Regs. §§25.11(b)(7), 25.15(b)(1), and 95.3(g).

to Secret or Top Secret Restricted Data related to controlled thermonuclear processes will not be granted unless the applicant is, among other things, "directly engaged in a substantial effort to develop, design, build or operate a fission power reactor that is planned for construction and is making or proposes to make a comparative evaluation of fission and controlled thermonuclear processes for production of power." [285]

Although an access permit is probably a license within the meaning of the Federal Administrative Procedure Act,[286] the Atomic Energy Commission has refused to recognize that such a permit is protected by the licensing provisions of the Atomic Energy Act of 1954. However, the Commission has followed a liberal, rather than a restrictive, policy in issuing such permits,[287] and the denial of permits has not been up to the present time, in any event, a serious factor adversely affecting the atomic energy program.[288]

The only major criticism of the access permit program has been made in connection with the application by Power Reactor Development Company for a construction permit.[289] In that proceeding counsel for certain intervenors moved the Commission to grant access, "without imposition of any security requirements," to information relevant to the proceeding. The motion alleged that the information required by counsel had been "published" within the meaning of Section 142a of the 1954 Act by its being "made available or offered by the Commission to many hundreds of persons under the Commission's access permit program, and to many thousands of the employees of such persons." The motion concluded that (1), "[t]o the extent that the Atomic Energy Act of 1954 requires Intervenor's attorneys to submit to the security regulations of the Commission as a condition of access to any information essential and pertinent to the preparation and trial of this proceeding, the Act abridges freedom of speech and violates due process of law contrary to the First and Fifth Amendments of the Constitution. . . ."; and (2) due process of law and the Fifth Amendment would be

[285] 10 Code Fed. Regs. §25.15(b)(2), as amended, 22 Fed. Reg. 6568 (Aug. 15, 1957).

[286] Section 2(e), 5 U.S.C.A. §1001(e), made applicable to AEC functions by Section 181 of the Atomic Energy Act of 1954, 42 U.S.C.A. §2231.

[287] At the end of 1957, 1,404 access permits were in force, involving 22,352 persons cleared for access to classified documents in 26 major categories of American industry; 57 percent of the permits allowed access to secret and confidential Restricted Data, and the remainder to confidential Restricted Data alone. AEC, Twenty-third Semi-Annual Report 138, 166 (1958).

[288] Green, *supra* note 282 at 555-556.

[289] AEC Dkt. No. F-16.

violated as to the intervenors "for the Commission to condition Intervenors' ability effectively to pursue their rights and privileges under law upon their attorneys' submission to the Commission's security requirements." The motion of intervenors was opposed by Commission counsel, and the Commission denied the motion March 5, 1957.[290] The intervenors claimed that Commission refusal to grant the motion constituted "denial of a fair hearing." [291]

f. Commercial and Non-Commercial Facilities

The most important category of atomic energy licenses are those prescribed in Chapter 10 of the Atomic Energy Act of 1954. This category covers licenses for the construction and operation of facilities utilizing or producing special nuclear material either for medical therapy and research and development (a Section 104 [292] "non-commercial" license) or for private industrial uses (a Section 103 [293] "commercial" license). Even though Section 103 or Section 104 licenses are used for different purposes, both types of licenses were intended to be subject

> . . . to the same general conditions . . ., namely, ownership and control in United States citizens, and operation to be consonant with the common defense and security and with the health and safety of the public.[294]

(1) Construction Permits

An integral part of the licensing system is the so-called construction permit provided for under Section 185 [295] of the 1954 statute. A construction permit is a form of intermediate licensing issued prior to the

[290] BNA, Atomic Industry Reporter 3:12, 3:85, and 246:739-743. Considerations of public policy probably favor the Commission's making access to Restricted Data as easy as possible for intervenors' counsel within the requirements established by Congress. However, the extreme position on the motion would, if sustained, have weakened the entire information security program; see *id.* at 2:379.

[291] Post-Hearing Brief of Intervenors with Proposed Findings and Conclusions 28-35. The intervenors conceded that 40 out of the 73 documents requested in the motion were declassified by the Commission without any deletions. The applicant in the proceeding argued to the Commission that the question raised by the intervenors was "utterly without merit" and claimed that "[n]o classified evidence has been offered by any party to this proceeding, and there has been no indication that any information still classified is directly relevant to any issue in the proceeding" (Reply Memorandum for Applicant 2-3 (Nov. 19, 1957)).

[292] 42 U.S.C.A. §2134.

[293] 42 U.S.C.A. §2133.

[294] H.R. Rep. No. 2181, *supra* note 5 at 20.

[295] 42 U.S.C.A. §2235.

granting of a Section 103 or 104 license.[296] This two-step procedure for licensing an atomic energy facility was based on that contained in the Federal Communications Act of 1952.[297] The standards and conditions attached to a construction permit are generally the same as those for the license eventually desired by the permit applicant.[298]

As of June 30, 1958, the Commission had issued construction permits for five facilities [299] to conduct research and development activities for industrial or commercial purposes under Section 104b of the 1954 act.[300] By that time the agency also had issued construction permits for thirty-two facilities [301] to conduct research and development activities for nu-

[296] 10 Code Fed. Regs. §50.23.

[297] 47 U.S.C.A. §§153(dd) and 308; see Hollis, "Atomic Energy and Lawyers," 24 D.C. Bar Assn. J. 76, 79 (1957). An excellent description of the negotiations and procedures whereby application is made to the Commission for a construction permit and its conversion to a license is to be found in the Joint Committee Staff Study, *supra* note 3 at 11-15 and App. 4 at 100-108; see also remarks of F. K. Pittman, Deputy Chief, AEC Division of Civilian Application, Dec. 12, 1955, BNA Atomic Industry Reporter 51:105. In its Brief filed in the PRDC proceeding, AEC Dkt. No. F-16, the so-called "separated staff" of the Commission claimed that the "legislative history [of the Atomic Energy Act of 1954] indicates that the concept of a construction permit was patterned in some measure on that contained in the Federal Communications Act" (p. 16).

[298] 10 Code Fed. Regs. §§50.45 and 50.55(c).

[299] Consolidated Edison Co., CPPR-1 (May 4, 1956); Commonwealth Edison Co., CPPR-2 (May 4, 1956); General Electric Co., CPPR-3 (May 14, 1956); Power Reactor Development Co. (PRDC), CPPR-4 (Aug. 4, 1956); and Yankee Atomic Electric Company, CPPR-5 (Nov. 4, 1957). The PRDC permit has been the subject of a formal AEC hearing.

[300] Providing for facilities "involved in the conduct of research and development activities leading to the demonstration of the practical value of such facilities for industrial or commercial purposes."

[301] *Research reactor construction permits:* University of Michigan, CPRR-1 (Feb. 17, 1955); Armour Research Foundation, CPRR-2 (Mar. 28, 1955); U.S. Naval Research Laboratory, CPRR-3 (April 29, 1955); Battelle Memorial Institute, CPRR-4 (Aug. 5, 1955); Massachusetts Institute of Technology, CPRR-5 (May 7, 1956); Aerojet-General Nucleonics, CPRR-6 (Aug. 16, 1956); AMF Atomics, Inc., CPRR-7 (Jan. 22, 1957); Westinghouse Electric Corp., CPRR-8 (July 3, 1957); Aerojet-General Nucleonics, CPRR-9 (Feb. 22, 1957); North Carolina State College, CPRR-10 (Mar. 7, 1957); Curtiss Wright Corp., CPRR-11 (June 20, 1957); Aerojet-General Nucleonics, CPRR-12 (July 8, 1957); Aerojet-General Corp. and Aerojet-General Nucleonics, CPRR-13 (July 8, 1957); North American Aviation Inc., CPRR-14 (Aug. 2, 1957); University of Virginia, CPRR-15 (Sept. 13, 1957); Ordnance Materials Research Office, CPRR-16 (Oct. 2, 1957); Daystrom, Inc., CPRR-17 (Oct. 11, 1957); Union Carbide Corp., CPRR-18 (Oct. 31, 1957); General Electric Co., CPRR 19 (Oct. 26, 1957); and American Radiator and Standard Sanitary Corp., CPRR-20 (Oct. 31, 1957).

Critical experiment construction permits: Babcock and Wilcox, CPCX-1 (Dec. 9, 1955) and CPCX-9 (Oct. 2, 1957); Battelle Memorial Institute, CPCX-2 (Dec. 28,

clear processes and for the theory and production of atomic energy under Sections 31 [302] and 104c [303] of the Atomic Energy Act of 1954.[304]

Two problems are presented in connection with construction permits. The first, which has not yet arisen but which nevertheless deserves consideration, concerns the conversion of a permit into a license upon construction of a facility, in the absence of "good cause." [305] The phrase "good cause" as used in this context is not defined by the act or regulations [306] and creates considerable uncertainty as to the right of a permittee to receive a license.[307]

The second problem presented with respect to a construction permit arises under the regulation which authorizes the Commission to issue a provisional permit in cases where

> . . . an applicant is not in a position to supply initially all of the technical information otherwise required to complete the application. . . . If the Commission is satisfied that it has information sufficient to provide reasonable assurance that a facility of the general type proposed can be constructed and operated at the proposed location without undue risk to the

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1955); Nuclear Development Corp. of America, CPCX-3 (June 11, 1956); General Electric Co., CPCX-4 (July 5, 1956); Lockheed Aircraft Corp., CPCX-5 (Mar. 15, 1957); Martin Co., CPCX-6 (May 13, 1957); General Dynamics Corp., CPCX-7 (June 18, 1957); General Electric Co., CPCX-8 (Sept. 20, 1957); Westinghouse Electric Corp., CPCX-10 (Oct. 17, 1957) and CPCX-12 (June 16, 1958); and National Advisory Committee for Aeronautics, CPCX-11 (Jan. 22, 1958).

[302] 42 U.S.C.A. §2051, providing for AEC research assistance.

[303] Providing for facilities "useful in the conduct of research and development activities of the types specified in Section 31 and which are not facilities of the type specified in subsection 104b."

[304] One application for a license for a research reactor was denied by the Commission prior to 1958. On Dec. 31, 1957, the Commission by notice advised that the application of The Prosperity Company, Syracuse, N.Y. had been denied "with the consent of the applicant and without prejudice to submittal of a new application." 22 Fed. Reg. 11088 (Dec. 31, 1957); see BNA, Atomic Industry Reporter 4: 16.

[305] Section 185, 42 U.S.C.A. §2235; see 10 Code Fed. Regs. §50.56.

[306] "Good cause" for the purpose of extending the completion date of a permit is defined in the regulations as including "developmental problems attributable to the experimental nature of the facility or fire, flood, explosion, strike, sabotage, domestic violence, enemy action, an act of the elements, and other acts beyond the control of the permit holder." (10 Code Fed. Regs. §50.55(b)).

[307] See Upton, *supra* note 207 at 492: ". . . [A] permit does not mean very much under present circumstances. The unsolved technological problems are such that any permit must be stated in terms so general to be of questionable value as assuring the issuance of a subsequent facility license." It is the opinion of the Chairman of the AEC's Advisory Committee on Reactor Safeguards that "it is impossible to give a construction permit which can be guaranteed to be converted into an operating license in my view" (1958 Section 202 Hearings, *supra* note 32 at 120).

> health and safety of the public and that the omitted information will be supplied, it may process the application and issue a construction permit on a provisional basis without the omitted information subject to its later production and an evaluation by the Commission that the final design [of the facility] provides reasonable assurance that the health and safety of the public will not be endangered.[308]

The regulations also provide for certain "common standards" for both construction permits and licenses [309] and for the granting of a construction permit to an applicant for a license "if the application [for a construction permit] is in conformity with and acceptable under the criteria . . . and standards" applicable to a license.[310]

The issuance of a provisional construction permit to Power Reactor Development Co. (PRDC)[311] to build a fast-neutron breeder reactor at Monroe, Michigan, for the production of electrical energy developed the opposing points in view concerning the Commission's authority to issue such a permit under the Atomic Energy Act of 1954.[312] The view

[308] 10 Code Fed. Regs. §50.35.

[309] 10 Code Fed. Regs. §50.40.

[310] 10 Code Fed. Regs. §50.45.

[311] CPPR-4 (Aug. 4, 1956), 21 Fed. Reg. 5974 (Aug. 9, 1956). The conversion of the construction permit into a license is subject to two general conditions, namely: (1) "Unless, within twelve months from the date of this construction permit, PRDC submits sufficient information relating to its financial resources to enable the Commission to make a finding that the Company has adequate financial resources to meet the requirements of the law and the regulations, this permit shall expire; provided that the Commission may for good cause shown extend the time for the submission of such data"; and (2) "The conversion of this permit to a license is subject to submittal by PRDC to the Commission (by amendment of the application) of the complete, final Hazards Summary Report (portions of which may be submitted and evaluated from time to time). The final Hazards Summary Report must show that the final design provides reasonable assurance to the satisfaction of the Commission that the health and safety of the public will not be endangered by operation of the reactor in accordance with the specified procedures." (Ed. Note: On December 10, 1958, the Commission issued its Opinion and Initial Decision in the PRDC case and continued the provisional construction permit in effect, subject to further conditions to establish complete safety and financial qualifications.)

[312] See Petition for Intervention and Request for Formal Hearing, AEC Dkt. No. F-16, filed Aug. 31, 1956, by three unions and their officials; BNA, Atomic Industry Reporter 2:283 and 2:294. The principal contentions were that (1) the Commission failed to make the requisite findings of "Reasonable Assurance" of safety required by Section 185 of the act and §50.35 of the regulations, particularly in view of a generally adverse report dated June 6, 1956, by the Commission's Advisory Committee on Reactor Safeguards (*Petition*, pp. 4-11); and (2) the Commission could not issue a permit conditional upon the satisfaction of "financial qualifications" at a later date (*id.* at 11-13). See also statement of Rep. Cannon, 103 Cong. Rec. 5196-5198 (1957); statements of W. P. Reuther, President, United Automobile Workers, AFL-CIO,

taken by the intervenors in that proceeding against the validity of the provisional construction permit issued to PRDC was that no section of the Atomic Energy Act of 1954, including Section 185,

> . . . provides for the issuance of conditional or provisional construction permits. There is nothing in this section [185], nor in any other section of the Act, which indicates that there may be inconsistent criteria for the issuance of construction permits.
>
> It is true that Section 185 does enumerate, as one of the conditions for the issuance of an *operating* license, that the applicant file "any additional information needed to bring the original application up to date.". . . It was not contemplated that the kind of *construction* permit to be issued would depend on the amount of information filed with the application. In other words, Congress did not contemplate that the filing of additional information was one of the requirements that make the application acceptable to the Commission. . . . [A]cceptability must be determined *at the beginning,* when the construction permit is granted. . . .
>
> It seems quite clear that Sections 50.45 and 50.40 [10 Code Fed. Regs.] were based on this interpretation of the Act. . . . This means that there must be a *present* determination that the information supplied to the Commission gives reasonable assurance that the health and safety of the public will not be endangered by the construction and operation of the reactor.[813]

The view supporting the validity of a provisional construction permit stresses the necessity for such a device under a broad interpretation

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B. C. Sigal, counsel, UAW, and Leo Goodman, staff member, UAW, 1957 Authorizing Legislation Hearings, *supra* note 7 at 597-633; statement of A. J. Biemiller, Legislative Director, AFL-CIO, 1957 Section 202 Hearings, *supra* note 7 at 440; statements of Sen. Anderson and Rep. Holifield, Joint Committee Staff Study, *supra* note 3, App. 7.B and C, at 125-127. The standing of intervenors to intervene in the proceedings was questioned by PRDC, which stated, however, that it was willing to have the issues involved in the granting of the construction permit heard in a proper hearing (BNA, Atomic Industry Reporter 2:307 (Sept. 26, 1956)). "Notice of Hearing, Order and Memorandum" were issued by the Commission Oct. 8, 1956, 21 Fed. Reg. 7809 (Oct. 12, 1956) and Joint Committee Staff Study, *supra* note 3, App. 7.D. at 128-132. After prehearing conferences held Oct. 29 and Nov. 29, 1956, the hearing commenced Jan. 8, 1957, with the introduction of testimony in narrative form by the applicant, PRDC. Witnesses were examined May 13, June 10, Aug. 1, and Aug. 7, 1957. Briefs were submitted by Nov. 29, 1957, and the record was certified to the Commission without decision by the hearing examiner appointed in the case. Procedural and other issues presented in these proceedings are discussed where appropriate elsewhere in this chapter.

[813] Reply Brief of Intervenors 9 (Nov. 19, 1957). See, to the same effect and arguing that the legislative history of Section 185 supported this position, Post-Hearing Brief of Intervenors, *supra* note 291 at 16-17.

of the Atomic Energy Act of 1954 and the Commission's regulations. In the light of Section 185,

> . . . the Commission was thus faced with the very practical problem of determining what showing is to be required at the construction permit stage, especially by applicants for licenses for developmental projects. The construction of a large power reactor and associated generating facilities necessarily takes approximately four or five years. Yet the entire history to date of the peaceful application of nuclear energy comprises a span of only a little over a decade, and at least for the next few years relatively brief periods undoubtedly will continue to witness vast accretions of knowledge in this field. The Commission was therefore aware that if the basic policies of the Atomic Energy Act of 1954 were to be effectuated, and if the United States is not to fall far behind in this rapidly moving field, the construction of developmental projects . . . must not only be permitted but must be encouraged to be started without waiting for all of the technological problems associated with them to be definitively solved.
>
> Thus it was clear that if the Commission required applicants for licenses to submit at the outset all of the technical information required to be included in the final Hazards Summary Report, it would effectively defeat the purposes of the Act by seriously delaying if not utterly eliminating most developmental projects, and particularly those which will lead to substantial technological advances.[814]

Regardless of the issues involved in the PRDC proceeding, the provisional construction permit represents one of the means whereby private industry can carry out its role in the atomic energy field in the present fluid state of the technology involved. An alternative to legislation and regulations which permit industry to construct reactors on the basis of

[814] Brief for Applicant 34-35 (Oct. 29, 1957). In its Brief filed with the Hearing Examiner in the PRDC proceeding, the so-called "separated staff" of the AEC, represented by the Acting General Counsel of the Commission and two other AEC attorneys, argued (p. 21): "Thus, the legislative history of Section 185 reflects both the desire of industry for maximum assurance that conversion of a construction permit to a license will be semi-automatic, and the concern by at least some members of Congress that once a construction permit is granted and substantial funds are expended, the pressures for conversion of the permit into a license may become overwhelming. Both considerations serve to emphasize the importance of the determinations made at the construction permit stage." PRDC took the position that "there is no legal, moral or other commitment of any sort to convert this [construction] permit into an operating license unless and until the full showing required by the law and the regulations to be made at that time has been completed to the satisfaction of the Commission. . . . The only risk involved in going forward with this project . . . is a financial one, and a financial one to PRDC alone. . . ." (Brief for Applicant 87).

continually expanding knowledge of science and engineering is, of course, a government monopoly of all such developmental work.

(2) Non-Commercial Licenses

Non-commercial licenses issuable under Section 104 of the 1954 act are used for medical therapy,[315] research and development for industrial or commercial purposes,[316] and research and development of a theoretical and purely scientific nature.[317] Through the end of June 1958, forty-two licenses had been issued, and one proposed, for reactors in the last-named category.[318]

Standards and conditions applicable to non-commercial licenses relate primarily to considerations of health and safety and the value of the research involved.[319] The principal administrative problem with respect to non-commercial licenses arises not so much under these regulations

[315] Section 104a and d, 42 U.S.C.A. §2134(a) and (d); see 10 Code Fed. Regs. §§50.21(a) and 50.41(a) and (b).

[316] Section 104b, 42 U.S.C.A. §2134(b); see 10 Code Fed. Regs. §§50.21(b) and 50.41(c).

[317] Section 104c, 42 U.S.C.A. §2134(c); see 10 Code Fed. Regs. §50.21(c).

[318] North Carolina State College of Agriculture, R-1 (Oct. 1, 1955); Pennsylvania State University, R-2 (July 8, 1955); Armour Research Foundation, R-3 (June 12, 1956); Battelle Memorial Institute, R-4 (Aug. 10, 1956); Naval Research Laboratory, R-5 (Sept. 14, 1956); Aerojet-General Nucleonics, R-6 (Oct. 19, 1956), R-7 (Feb. 23, 1957), R-9 (Mar. 14, 1957), R-10 (Mar. 29, 1957), R-13 (July 11, 1957), R-14 (July 11, 1957), R-17 (Aug. 1, 1957), R-20 (Aug. 23, 1957), R-21 (Aug. 23, 1957), R-29 (Sept. 20, 1957), R-32 (Oct. 28, 1957), R-34 (Jan. 22, 1958), R-35 (Feb. 12, 1958), R-39 (May 16, 1958), and R-42 (June 3, 1958); Aerojet-General Corp., R-8 (Mar. 12, 1957), R-12 (June 19, 1957), R-15 (July 16, 1957), R-16 (July 16, 1957), R-18 (Aug. 6, 1957); U.S. Naval Post-graduate School, R-11 (April 29, 1957); North American Aviation, Inc., R-19 (Aug. 2, 1957), R-40 (May 17, 1958); Oklahoma State University of Agriculture, R-22 (Aug. 26, 1957); Texas Agricultural and Mechanical College System, R-23 (Aug. 26, 1957); University of Akron, R-24 (Sept. 5, 1957); University of Utah, R-25 (Sept. 12, 1957); Colorado State University, R-26 (Sept. 12, 1957); U.S. Naval Hospital, Bethesda, Md., R-27 (Sept. 13, 1957); University of Michigan, R-28 (Sept. 13, 1957); University of California, R-30 (Nov. 19, 1957); Catholic University, R-31 (Nov. 15, 1957); General Electric Co., R-33 (Oct. 21, 1957); Curtiss Wright Corp., R-36 (April 29, 1958); Massachusetts Institute of Technology, R-37 (June 9, 1958); General Dynamics Corp., R-38 (May 3, 1958); American Radiator and Standard Sanitary Corp., R-41 (May 21, 1958); and University of Delaware, proposed. As of June 30, 1958, the AEC also had issued 11 critical experiment licenses, as follows: Babcock & Wilcox Co., CX-1 (Mar 20, 1957) and CX-10 (Jan. 22, 1958); General Electric Co., CX-2 (July 29, 1957), CX-4 (Aug. 30, 1957), and CX-5 (Oct. 16, 1957); General Dynamics Corp., CX-3 (June 26, 1958); Westinghouse Electric Co., CX-6 (Nov. 25, 1957) and CX-11 (June 17, 1958); Martin Co., CX-7 (June 12, 1958); Nuclear Development Corp., CX-8 (Jan. 22, 1958), and Battelle Memorial Institute, CX-9 (Jan. 16, 1958)

[319] *E.g.* 10 Code Fed Regs §§50.34 and 50.41.

as under another statutory requirement which must be met before a reactor, developed under Section 104b and shown to have the necessary safety and operational features,[320] can be licensed for commercial use under Section 103.

Under Section 102 [321] of the act, whenever the Commission has made "a finding in writing that any type of utilization or production facility has been sufficiently developed to be of practical value" under Section 104, a Section 103 license therefor may be issued upon appropriate application.[322] "Practical value" appears to embrace both technical and economic considerations, and up to the end of 1958 the Commission never had issued such a finding. This probably is due in part to the economic uncertainties in private atomic enterprise at this beginning stage of development and also to the failure of the statute and regulations to permit a private citizen to request, and provide the evidentiary basis for, a determination of "practical value" and to set forth the standards for such a finding.[323] Indeed, until these deficiencies in Section 102 are corrected, the section can be used as "a barrier of Commission discretionary authority" to the issuance of Section 103 licenses.[324]

Further, a problem arises in connection with the transition from a "developmental" to a practically useful stage of reactor development. The private operator has no statutory assurance that his Section 104b license will be permitted to remain in effect for its prescribed term after the Section 103 license is issued, thus protecting the investment and research of the licensee.[325] It is true that the Commission has adopted a

[320] A Section 104b license is essentially a "demonstration" license; Upton, *supra* note 207 at 490.

[321] 42 U.S.C.A. §2132.

[322] H.R. Rep. No. 2181, *supra* note 5 at 19: "This finding [under Section 102] separates the issuance of research and development licenses for any facility under Section 104b, and the issuance of commercial licenses under Section 103. . . ."

[323] The McKinney Panel has recommended that the statute be amended to permit private citizens to initiate a proceeding for a finding of "practical value" and to limit the definition thereof to "technical considerations" (Report, *supra* note 10 at 13). The Panel further stated (*id.* at 132-133): "The Commission's interpretation of section 102 . . . particularly strains our concepts of private enterprise. As yet undefined tests of economic feasibility are to be applied by the Commission in arriving at such findings. While the Federal Government does frequently require applicants for other licensed activities to prove economic feasibility of proposed activities, this is the first time, so far as can be determined, that the Federal Government has set itself up to decide on its own initiative when private licensees can profitably embark on regulated activities, denying private investors the right to proceed before that time. . . ."

[324] *Id.* at 132.

[325] See Upton, *supra* note 207 at 490.

rule that seemingly covers the situation,[326] but a rule can always be changed.

(3) Commercial Licenses

Although the Commission has sought to develop [327] some semblance of regulatory order out of the hodgepodge of provisions contained in Section 103 and related sections, particularly Section 105,[328] the result does not inspire confidence that the regulatory authority can maintain a proper balance between the public and private interests involved.[329]

Under Section 7 of the Atomic Energy Act of 1946,[330] the licensing of atomic power for commercial use was made practically impossible by statutory strictures. Under the procedure therein provided, the Commission was required to report to the President and through him to Congress that industrial, commercial, or non-military use of atomic energy had been developed to a point where such use was practicable. No license for such use could be issued by the Commission until the report had been submitted to Congress while in session and ninety days had elapsed after such submission.[331]

Due to the strictures of Section 7 and the prevailing governmental sentiment prior to 1954 towards the development of atomic energy for peaceful uses, Section 7 was never utilized. Moreover, much of the restrictive philosophy of the section has crept into Section 103 of the present act. Indeed, it is the conflict between these restrictions and the

[326] Effective November 30, 1956, 21 Fed. Reg. 9354, a new §50.24 was added to the licensing regulations, which provided that "[t]he making of a finding of practical value pursuant to section 102 of the act will not be regarded by the Commission as grounds for requiring: (a) The conversion to a Class 103 license of any Class 104 license prior to the date of expiration contained in the license; or (b) The conversion to a Class 103 license of any construction permit, issued under section 104 of the act, prior to the date designated in the permit for expiration of the license." Implementing a policy adopted more than a year previously by the Commission, the regulation "may serve to set at rest, at least for the time being, one possible uncertainty facing those companies engaged in proving out power reactor concepts through construction of full-scale prototypes" (BNA, Atomic Industry Reporter 2: 389).

[327] 10 Code Fed. Regs. Pt. 50.

[328] 42 U.S.C.A. §2135 ("Antitrust Provisions").

[329] McKinney Panel Report, *supra* note 10 at 13: "Despite recognition of the fact that there is no evidence of anyone now being injured by the licensing provisions of sections 103 and 104, the principles involved in these sections . . . conflict with the principles of private enterprise which the 1954 act has been represented as advancing." See also 132-134.

[330] 42 U.S.C. §1807 (1946).

[331] For a favorable view of Section 7, see H.R. Rep. No. 2181, *supra* note 5 at 107-108. For a criticism thereof, see ABA Committee Report, *supra* note 177, at 15-21.

underlying philosophy of the Atomic Energy Act of 1954 to encourage investment of private capital in atomic energy facilities which creates the problem for industry. In this connection it is significant that Section 104 of the present act specifically states that licenses issued thereunder should be "subject to the minimum amount of regulation" consistent with the regulatory duties of the Commission.[332] No such policy statement is contained in Section 103, although the inference to be drawn from its absence is far from clear.[333]

(a) Section 182 Restrictions

Restrictions imposed upon Section 103 licensees concern notice requirements, priorities, the right of the Commission to require information, and antitrust provisions. Under Section 182c of the present statute,[334] notice prior to the issuance of such a license is required to be given to "such regulatory agency as may have jurisdiction over the rates and services of the proposed activity, to municipalities, private utilities, public bodies, and cooperatives within transmission distance and which are authorized to engage in the distribution of electric energy." [335] The effective date of the license is further delayed by a requirement of notice for four consecutive weeks in the Federal Register, followed by another period of four weeks before the license becomes effective.

[332] Section 104a, b, and c, 42 U.S.C.A. §2134(a), (b), and (c).

[333] The applicant PRDC in AEC Dkt. F-16 argued that "Section 104.b enjoins the Commission not to impose in the way of developmental projects any administrative road blocks that are not absolutely essential from the standpoint of security and safety, and it requires that priority be given to those activities most likely to lead to 'major advances' in the industrial application of nuclear energy" (Brief for Applicant, *supra* note 314 at 34). The policy of the section was urged in support of the PRDC position that, in order to qualify for a provisional construction permit, the applicant need only establish "a reasonable probability under all the circumstances that . . . the proposed [PRDC] reactor . . . can in due course be proved safe for operation at the proposed site" (*id.* at 36) and "is reasonably assured under all the circumstances of obtaining the financial resources that it will probably need," taking into consideration "the determination of its [PRDC's] member companies to see the project through" (*id.* at 16 and 12). The contrary view, advanced by the intervenors in that proceeding, was that, notwithstanding Section 104b, "nothing takes priority over the twin elements of (1) common defense and security and (2) health and safety of the public. The encouragement of private participation in the atomic energy industry is a means to these ends, not a qualification of them" (Reply Brief of Intervenors, *supra* note 313 at 3).

[334] 42 U.S.C.A. §2232(c).

[335] See 10 Code Fed. Regs. §50.43(a). The Joint Committee Staff Study, *supra* note 3 at 69-70, outlines briefly the legislative history of Section 182.

Licensing of activities involving interstate as well as intrastate commerce by joint action of a federal and state regulatory body is not an uncommon practice under administrative law.[336] The provisions of Section 182c go further, however, and can only be regarded as a means of prolonging for a period of eight weeks the licensing of an otherwise qualified private commercial facility. During that period application can be made to a court to enjoin the license, or Congress, if in session, can take action by legislation to reverse the performance of Executive Department functions.[337] However, other than the delay involved, this particular restriction raises no insuperable problems for private industry.

Section 182d of the present act also establishes a system of priorities to be given to license applicants. That section provides:

> The Commission, in issuing any license for a utilization or production facility for the generation of commercial power under section 103, shall give preferred consideration to applications for such facilities which will be located in high cost power areas in the United States if there are conflicting applications for a limited opportunity for such license. Where such conflicting applications resulting from limited opportunity for such license include those submitted by public or cooperative bodies such applications shall be given preferred consideration.[338]

As summarized by the Commission in its regulations, such priorities among "conflicting applications for a limited opportunity for such license" are as follows:

> 1. Applications submitted by public or cooperative bodies for facilities to be located in high cost power areas in the United States.
> 2. Applications submitted by others for facilities to be located within such high cost power areas in the United States.
> 3. Applications submitted by public or cooperative bodies for facilities to be located in other high cost power areas.
> 4. All other applications.[339]

[336] See, *e.g.*, Interstate Commerce Commission use of "joint boards" composed of representatives of the agency and state regulatory bodies, 49 U.S.C.A. §305.

[337] Representatives Holifield and Price have charged that these notice requirements lack "specific recognition of those interests whose rights may be affected by Commission action or whose participation may be in the public interest," H.R. Rep. No. 2181, *supra* note 5 at 122.

[338] 42 U.S.C.A. §2232(c).

[339] 10 Code Fed. Regs. § 50.43(b).

Section 182d raises several questions which are not satisfactorily answered by its legislative history.[340] The term "limited opportunity" is susceptible of varying interpretations, although a reasonable meaning would seem to be "limited availability of special nuclear material." [341] Moreover, what constitutes a "high cost power area" is an exceedingly difficult question to answer because of very slight differences in the cost of generating electricity from conventional sources among several areas within the United States.[342]

Both the Commission indirectly, and the Joint Committee directly, have implemented the preference provisions of the 1954 statute with respect to cooperatively and public-owned utilities. The Commission's second round invitation in September 1955, under the civilian power reactor program encouraged application by seven utilities of the preferred publicly or cooperatively owned type to develop, design, construct, and operate nuclear power plants with generating capacities of between 5,000 and 40,000 kilowatts.[343]

However, the limitations on funds available to such groups of utilities have tended to prevent their full-scale participation in the civilian atomic energy program.[344] Although recognizing that this preferred

[340] See H.R. Rep. No. 2181, *supra* note 5 at 28: ". . . [W]here all other conditions are equal and there are conflicting applications for a limited opportunity for a license, the Commission is required to give preferred consideration to facilities which will be located in high-cost power areas." See Joint Committee Staff Study, *supra* note 3 at 69-70.

[341] Upton, *supra* note 207 at 491.

[342] See Atomic Energy Facts 78 (GPO 1957); Rep. Cole has characterized Section 185c as "this fear and apprehension [in private industry] which I call a roadblock" (1957 Section 202 Hearings, *supra* note 7 at 69). After agreeing with Sen. Pastore (Dem., R.I.) that New England "certainly is a high cost area," Mr. E. L. Lindseth, Vice Chairman, Committee on Atomic Power, Edison Electric Institute, told the Joint Committee in the 1957 Section 202 Hearings, *id.* at 268-269: "Our industry takes no exception to that portion of the act which relates to preference in favor of high cost fuel areas. . . ."

[343] See AEC Twenty-fourth Semi-Annual Report 335 (1958); four of those have been accepted as bases for negotiation of contracts, statement of AEC, 1957 Section 202 Hearings, *supra* note 7 at 117-118. These four proposals "are all entitled to preference under the Atomic Energy Act" (Statement of AEC Division of Reactor Development Director, 1957 Authorizing Legislation Hearings, *supra* note 7 at 186). One public body, Consumers Public Power District, of Columbus, Nebraska, has applied for a contract under the first round invitation, Sen. Rep. No. 791, *supra* note 23 at 10-11.

[344] Cole, *supra* note 6 at 480: ". . . [A]ll three invitations for proposals under the demonstration program have emphasized the specific types of available government assistance and have stressed that the Commission's obligations would be limited or 'closed end.' There is one dilemma which is posed by the Commission's desire to

class of utilities showed no "particular competence or experience" with respect to atomic reactors, the Joint Committee in 1957 recommended, and Congress enacted, legislation which specifically directed the Commission to give such utilities a highly preferred position under the civilian power reactor program,[345] with advantages not available to privately owned utilities.[346]

(b) Section 105 Restrictions

Another type of restriction imposed on Section 103 licenses is created by Section 105 of the Atomic Energy Act of 1954 concerning antitrust problems.[347] Previously, under Section 7(c) of the 1946 act:

> Where activities under any license might serve to maintain or to foster the growth of monopoly, restraint of trade, unlawful competition, or other trade position inimical to the entry of new, freely competitive enterprises in the field, the Commission is authorized and directed to refuse to issue such license or to establish such conditions to prevent these results as the Commission, in consultation with the Attorney General, may determine. The Commission shall report promptly to the Attorney General any information it may have with respect to any utilization of fissionable material or atomic energy which appears to have these results. . . .[348]

Under the present legislation, the restrictions imposed under the 1946 legislation have been broadened by new statutory provisions which were "in large part, the product of compromise." [349]

The antitrust provisions of the 1954 act have three principal effects upon the regulated atomic energy industry. Each of these is presumably based on the intended policy of strengthening "free competition in private enterprise." [350]

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limit commitments and this is a result of a preference clause contained in the Atomic Energy Act of 1954. The very limited funds generally available to such 'preference' groups . . . for assumption of technological risk make it difficult, in a practical sense, for these groups to assume responsibility for excessive costs. Thus difficulty is encountered in making contractual arrangements containing strong incentives for cost-reduction except as these groups may be able to make favorable arrangements with reactor manufacturers."

[345] Sen. Rep. No. 791, *supra* note 23 at 16.

[346] These preferred contractual arrangements were contained in Section 111(a)(1) of Pub. L. 85-162, 85th Cong., 1st Sess. (1957), and are discussed in detail, *infra*.

[347] 42 U.S.C.A. §2135.

[348] 42 U.S.C. §1807(c)(1946).

[349] Attorney General Brownell, 1957 Section 202 Hearings, *supra* note 7 at 631-635.

[350] Section 1b, 42 U.S.C.A. §2011(b); see Jacobs and Melchoir, "Antitrust Aspects of the Atomic Energy Industry," 25 Geo. Wash. L. Rev. 508 (1957). The authors were listed as members of the Antitrust Division, Department of Justice.

The first, and most important, is the mandate that no provision of the act "shall relieve any person from the operation" of the antitrust laws.[351] These laws may well be applied not only to actual violations thereof, but also, and of more practical significance to the industry, to "incipient practices which could ultimately lead to Sherman Act violations." [352] Moreover, in the event a license is found by a court of competent jurisdiction to have violated any provision of the federal antitrust laws, then the Commission "may suspend, revoke or take such other action as it may deem necessary with respect to any license issued by the Commission under the provisions of this Act." [353]

As under the 1946 act, Section 105b of the 1954 act requires the Commission to report to the Attorney General any information coming to its attention with respect to license activity "which appears to violate or to tend toward the violation of any of the [antitrust] . . . Acts, or to restrict free competition in private enterprise." [354] Further, under

[351] Further designated in the Atomic Energy Act as the Sherman Act of 1890, 15 U.S.C.A. §§1-7; the Wilson Tariff Act of 1894, 15 U.S.C.A. §§8-11; the Clayton Act of 1914, 15 U.S.C.A. §§12-27; and the Federal Trade Commission Act of 1914, 15 U.S.C.A. §§41-46 and §§47-58.

[352] Jacobs and Melchoir, *supra* note 350 at 509; see Brownell, 1957 Section 202 Hearings, *supra* note 7 at 631: ". . . In this evolving [atomic energy] industry, we [the Federal Government] attempt preventive measures to foster competition, rather than remedial litigation to undo the effect of anticompetitive action already taken." Critics of the current AEC program have emphasized the alleged danger from incipient violations of the antitrust laws. Rep. Cannon, 103 Cong. Rec. 5197-5198 (1957) has referred to "serious antitrust implications" in the PRDC project because it was being undertaken by "two separate combinations of companies." Some witnesses in the Joint Committee 1957 Section 202 Hearings charged that the 1954 act was being administered in such a fashion as to effect "monopolization of the atomic energy field" by major power companies, which were accused of engaging in "a form of legalized collusion" to violate the antitrust laws, *supra* note 7 at 452-456; see, to the same effect, *id.* at 285-289 and 460-462.

[353] Jacobs and Melchior, *supra* note 350 at 511-12: "Should the Federal Trade Commission find a violation of section 5 of its act and the respondent not seek court review, the [Atomic Energy] Commission could not under this section [105a of the Atomic Energy Act] cite the finding as a basis for suspension, as this would not constitute a finding by a court of competent jurisdiction. . . . Thus, considerable importance attaches to what might be an accident of procedure, *i.e.*, whether an action for violation of one of the antitrust laws is brought in the first instance by the Department of Justice or by the Federal Trade Commission." The opposite position would be that Congress intended an atomic energy licensee to have its alleged violation of the antitrust laws adjudicated in a federal court, either at the District Court level in an original proceeding or at the Court of Appeals level on review of a Federal Trade Commission order, rather than have the atomic energy license jeopardized by merely an administrative determination.

[354] Jacobs and Melchior, *supra* note 350 at 512: "The obligation will require the application of a degree of antitrust expertise at an early stage, to make possible the detection of anti-competitive practices in their incipience."

Section 105c, when the Commission proposes to issue a Section 103 license, the Attorney General must be notified, and he must give an opinion within 90 days, to be published in the Federal Register, "whether insofar as he can determine, the proposed license would tend to create or maintain a situation inconsistent with the antitrust laws." This section empowers the Attorney General to request, and the Commission to furnish or "cause to be furnished, such information as the Attorney General determines to be appropriate or necessary to enable him to give the advice called for by this section." It should be noted that Section 105c has application only to proposed Section 103 commercial licenses. It does not apply to construction permits for either Section 103 or 104 licenses, nor does it reach to Section 104 licenses, a fact which has occasioned some controversy.[355]

Indeed, Section 105 was one of the most controversial portions of the Atomic Energy Act of 1954. The theory underlying the section is derived from certain other administrative powers and duties delegated by Congress with respect to government ownership, regulation, or disposal of war industries and materials.[356] As originally proposed in Congress, this section would have permitted a licensee to purge itself of any violation of the antitrust laws in connection with any atomic energy activity, before the Atomic Energy Commission could take any action with respect to the license.[357] The legislation reported out by the Joint Committee on Atomic Energy would have provided "for hearings [before

[355] 1957 Section 202 Hearings, *supra* note 7, at 285, 288-289, 292; Jacobs and Melchior, *supra* note 350 at 513-514; Rep. Cannon, 103 Cong. Rec. 5198 (1957).

[356] Section 20 of the Surplus Property Act of 1944, reenacted as Section 207 of the Federal Property and Administrative Service Act of 1949, 40 U.S.C.A. §488 (whenever an executive agency begins negotiations for the disposition of plant or property which cost the United States at least $1 million or of patents, processes, and inventions, the Attorney General must advise within 60 days whether "the proposed disposition tend to create or maintain a situation inconsistent with the antitrust laws"); Section 708 of Defense Production Act of 1950, 50 U.S.C.A. App. §2158 (requiring submission of "voluntary agreements and programs" within an industry to the Attorney General and Federal Trade Commission, publication thereof in the Federal Register, and formal approval thereof by the Attorney General before the President can put any such agreement or program into effect); Rubber Producing Facilities Disposal Act of 1953, 50 U.S.C.A. App. §1941a (before submission of proposed disposal of rubber plant to Congress, Rubber Producing Facilities Disposal Commission must obtain, but need not follow, advice of Attorney General with respect to antitrust problems in connection with such disposal). See Austern, "Memorandum of Collateral Antitrust Enforcement," Atomic Energy Workshops, *supra* note 215 at 165-166; Jacobs and Melchoir, *supra* note 350 at 515-516.

[357] Austern, "Legislative History of Sections 105 and 158 of the Atomic Energy Act of 1954," Atomic Energy Workshops, *supra* note 215 at 155.

the Federal Trade Commission] and judicial review in case there is any claim by the Attorney General or the Federal Trade Commission that a proposed license of any production or utilization facility would violate the antitrust laws." [358] A Senate amendment to the bill passed by the House, which was rejected by the conference committee, would have

> . . . required that the Commission follow the advice of the Attorney General unless the President made a finding that the issuance of such a license was essential to the common defense and security and the finding was published in the Federal Register. This amendment in effect made the advice of the Attorney General a decision binding upon the Commission and the applicant without hearing. . . .[359]

As finally enacted, Section 105 does not require the denial of a license because of a possible antitrust violation as was the case under the 1946 statute. The Commission merely takes "due account" of the Attorney General's opinion.[360] It would, however, take a foolhardy Commission to disregard the Attorney General's opinion.[361]

Thus, the atomic energy industry faces the possibility of adverse decisions based upon administrative interpretation and the application of the antitrust laws without an opportunity for administrative hearing or judicial review.[362] However, it is to be hoped that the Commission,

[358] H.R. Rep. No. 2181, *supra* note 5 at 20.

[359] H.R. Rep. No. 2639, 83d Cong., 2d Sess. 47 (1954). The amendment rejected was proposed by Sen. Humphrey (Dem., Minn.), see Adams, *supra* note 222, 55 Col. L. Rev. 169-170.

[360] 10 Code Fed. Regs. §50.42(b); see also §50.54(g); Austern, *supra* note 339 at 165. Concerning this provision, Attorney General Brownell has stated, 1957 Section 202 Hearings, *supra* note 7 at 633: "This provision, patterned after earlier surplus of property disposal laws, makes available to the [Atomic Energy] Commission analysis of any special anticompetitive considerations presented. Antitrust advice, however, need not be controlling. For the Commission must also weigh the necessities of defense and security and public health and safety. Nonetheless such a procedure provides an effective means to insure that knowledge of possible antitrust difficulties required to foster competition."

[361] See Adams, *supra* note 239 at 170. It is possible that, where the Attorney General either gives adverse or favorable advice concerning a Section 103 license application to the Commission, he would not be precluded from proceeding by appropriate antitrust proceedings against the licensee for future violations of these laws or for violations unknown and undisclosed to the government at the time the application was processed. See Attorney General Brownell, 1957 Section 202 Hearings, *supra* note 7, at 633; Jacobs and Melchior, *supra* note 350 at 517-518. Probably the Attorney General's position would not be binding upon a private party seeking treble damages or other relief under the antitrust laws.

[362] Under the Humphrey amendment, *supra* note 359, the Attorney General was both "a judge and jury," "not an appropriate role for the prosecuting attorney to play" (Sen. Hickenlooper (Rep., Iowa), 100 Cong. Rec. 14344 (Aug. 13, 1954)).

if so requested by an applicant for a license which initially is denied as a result of Section 105, would make the antitrust question an issue at the formal hearing provided by statute and regulation.[363]

Section 105, as enacted by Congress and implemented by Commission regulation, represents a probable deterrent to private participation in the atomic energy field. Section 105a providing that no official action under the Atomic Energy Act shall prevent appropriate action by the Department of Justice and Federal Trade Commission under the antitrust laws merely states existing law for "normal application of antitrust to the civilian atomic industry." [364] These provisions are unobjectionable, even if unnecessary. The only basic objection to Section 105a lies in the unlimited discretion granted the Atomic Energy Commission in the event a licensee is found by a court to have violated an antitrust act, clearly a matter which should be left exclusively in the jurisdiction of the court,[365] without permitting extrapunitive action by an administrative body.[366]

The language of Section 105b and c, especially with respect to the grounds on which the Attorney General may render an adverse advisory opinion or the Commission may refuse a license, go far beyond ordinary concepts of antitrust law developed heretofore by statutes, the courts, and administrative agencies.[367] A final source of possible administrative overreaching under Section 105 lies in the requirement, under Section 161p of the act, that licensees furnish information and reports, and permit inspections, "as may be necessary to effectuate the purposes

[363] Section 189a, 42 U.S.C.A. §2239(a); 10 Code Fed. Regs. §2.102(a).

[364] Attorney General Brownell, 1957 Section 202 Hearings, *supra* note 7 at 632.

[365] See Atomic Energy Workshops, *supra* note 215 at 61.

[366] "Those who engage in activity in this [atomic energy] field in violation of the antitrust laws should get no better and no worse treatment, be subjected to the same sanctions, imposed by the same administrative and judicial tribunals, and prosecuted by the same enforcement agencies, as are those who engage in any other business subject to the antitrust laws" ("Report of Workshop III," Atomic Energy Workshops, *supra* note 215 at 58).

[367] See "Report of Workshop III," Atomic Energy Workshops, *supra* note 215 at 58; Austern, *supra* note 357, at 155; Austern, *supra* note 356 at 167-168: "In Section 105c of the Atomic Energy Act, the Attorney General is to decide whether a proposed license would tend to create or maintain 'a situation inconsistent with the antitrust laws.' This language does not confine the Attorney General's interest in the matter to any particular area of the company's business. On occasion the Attorney General is bound to be influenced by the existence of litigation which he is conducting against a proposed licensee, even if the litigation does not directly involve atomic energy at all. . . ." For a similar criticism of the standards in Section 7(c) of the 1946 Act, see ABA Committee Report, *supra* note 177 at 20.

of the Act, including Section 105 of the Act." [368] This statutory provision, as implemented by regulation,[369] in effect constitutes an unlimited hunting license for the federal government to police the atomic energy industry without any of the traditional safeguards afforded other branches of industry subject to the antitrust laws.

The provisions of Section 105 as enacted have been characterized as " 'passing the buck' on monopoly prevention" and as locking "the barn after the horse is stolen." [370] The power given the Atomic Energy Commission under the 1946 act to decide antitrust questions has been supported and justified on the basis of the argument that eight Federal agencies,[371] other than the Federal Trade Commission, have the same authority in the fields regulated by them.[372] What has been termed the "collateral enforcement" of the antitrust laws is, however, subject to serious objection because of diffusion of responsibility [373] and possible inefficient administration.[374]

However, in enacting the Atomic Energy Act of 1954, Congress has avoided adding to the conflicting interpretation and sometimes overlapping jurisdiction in the antitrust field by excluding the Atomic

[368] 42 U.S.C.A. §2201(p).

[369] 10 Code Fed. Regs. §§50.70 (inspections) and 50.71 (records and reports). These requirements present real problems for the licensee who conceivably could withhold no operating information from the Commission, and the Commission apparently is under no affirmative obligation to refrain from publishing what might ordinarily be a business secret. Limited protection for business secrets is afforded by 10 Code Fed. Regs. §2.790, which permits the Commission to "withhold any document or part thereof from public inspection if disclosure of its contents is not required in the public interest and would adversely affect the interest of a person concerned," subject, of course, to the exercise of Commission discretion. As of March 6, 1957, the Commission had received four requests for the withholding of certain information contained in license applications, two of which were granted. "Requests by License Applicants to Withhold Matters from Public Inspection," Joint Committee Staff Study, *supra* note 3, App. 13, at 183-186.

[370] H.R. Rep. No. 2181, *supra* note 5 at 125-126. See Adams, *supra* note 239 at 178-179: "If monopoly comes to atomic energy, it shall not have been inevitable. . . . It shall have come about because of unwise, man-made, discriminatory, privilege-creating legislation which throttles competition and restricts opportunity. . . ."

[371] Interstate Commerce Commission, Federal Communications Commission, Civil Aeronautics Board, Federal Reserve Board, U.S. Tariff Commission, Federal Power Commission, Department of Interior, and Department of Agriculture.

[372] H.R. Rep. No. 2181, *supra* note 5 at 125-126. For a criticism of this situation, see Hoover Commission Legal Services Report, *supra* note 154 at 86 and Hoover Commission Legal Task Force Report, *supra* note 43, at 250-255.

[373] Austern, *supra* note 356 at 165; see Report of Attorney General's National Committee to Study the Antitrust Laws 367-369 (1955).

[374] See Transamerica Corp. v. Board of Governors of Federal Reserve System, 206 F. 2d 163 (3d Cir. 1953).

Energy Commission from issuing orders based upon antitrust considerations. There has been substituted the procedure for reports to and from the Attorney General, with the possible withholding of the license by the Commission based upon these reports. Because of the extra-judicial character of the Attorney General's participation in the atomic energy licensing process, this procedure can hardly be regarded as an improvement from the standpoint of the licensee.

More recently, still another extra-judicial forum to consider possible antitrust problems affecting individual licensees has been established. This results from the 1957 amendments by Congress to Section 261a of the Atomic Energy Act.[375] In its review of the bases requested for appropriations by the Commission for financial assistance to private parties under the civilian power reactor programs, the Joint Committee will have the opportunity "to review the antitrust and patent implications of each individual arrangement before it is consummated." [376]

3. Hearing Procedures

The general licensing provisions of the 1954 statute,[377] as implemented by the Commission's regulations,[378] establish procedures for the granting, denial, or revocation of licenses which substantially comply, both in spirit and in letter, with the requirements of the Federal Administrative Procedure Act. Inasmuch as these hearing procedures in their formal aspects are only now being gradually utilized by the Commission, considerable question remains concerning their application and implementation. The hearing procedures of the Commission have, in fact, undergone considerable statutory and policy change since enactment of the 1954 legislation.

Initially, Section 189a of the statute [379] provided only that "in any proceedings . . . for the granting, suspending, revoking, or amending of any license . . . and in any proceeding for the issuance or modifica-

[375] 42 U.S.C.A. §2017(a).

[376] Remarks of Rep. Holifield outlining scope of review of Joint Committee under Section 261a, 1957 Congressional Review Hearings, *supra* note 7 at 38: "Antitrust policy and patent policy: Under the Joint Committee bills . . . the basis for each individual arrangement must be submitted to the Joint Committee . . . before becoming effective it it provides any financial assistance. Such basis shall include a description of 'the general features of the proposed arrangement or amendment' . . . and it is contemplated that the Joint Committee may therefore be able to review the antitrust and patent implications of each individual arrangement before it is consummated."

[377] Sections 181-189, 42 U.S.C.A. §§2231-2239.

[378] 10 Code Fed. Regs Pt. 2.

[379] 42 U.S.C.A. §2239(a).

tion of rules and regulations dealing with the activities of licensees . . . the Commission shall grant a hearing upon the request of any person whose interest may be affected by the proceeding. . . ." Section 181 provides that the "provisions of the Administrative Procedure Act shall apply to all agency action taken under this act." [380] Licensing under the Atomic Energy Act clearly constitutes adjudication under the Administrative Procedure Act.[381] The Commission has taken the praiseworthy and correct [382] position that a "formal hearing" should be held on applications for the issuance, amendment, or transfer of a license or construction permit [383] or the modification, suspension, or revocation thereof.[384] However, "informal" proceedings are obviously preferred by the Commission for the collection of necessary information and for rule making.[385]

Prior to 1957, a "formal" proceeding could be initiated under two circumstances. Before the Commission acted on an application, such a hearing could be ordered upon the request of the applicant, an intervenor, or the Commission itself. Request by the applicant or an intervenor for such a hearing also could be made, within thirty days after notice of Commission action with respect to the license had been published.[386]

Further, "in such cases as it deems appropriate," the Commission could serve notice of proposed action on an application upon the appli-

[380] 42 U.S.C.A. §2231.

[381] Section 2(d), 5 U.S.C.A. §1001(a).

[382] Under Section 5 of the Administrative Procedure Act, 5 U.S.C.A. §1004, formal adjudication occurs where the applicable statute requires a determination "on the record after opportunity for an agency hearing." Although Section 189a of the Atomic Energy Act of 1954 prior to the 1957 amendment did not use the words "on the record," the context in which the hearing requirement was used and the liberal interpretation to be accorded the Administrative Procedure Act warranted the Commission's position that a hearing "on the record" was required where requested under Section 189a. See Wong Yang Sung v. McGrath, 339 U.S. 33, 50, 70 S. Ct. 445 (1950) as modified, 339 U.S. 908, 70 S. Ct. 564 (1950); Hoover Commission Legal Task Force Report, *supra* note 43 at 167-170. For a contrary point of view, see Davison, "Requirements of Hearings in Administrative Adjudication," Joint Committee Staff Study, *supra* note 3, App. 15 at 195. In the case of the first such request in a licensing proceeding, the Commission correctly ordered a formal hearing. In the Matter of Power Reactor Development Company, AEC Dkt. F-16, "Notice of Hearing Order," 21 Fed. Reg. 7809 (Oct. 12, 1956). Prior to 1957, it was recommended that the Commission, as a matter of policy, order a formal hearing in each Section 103 licensing proceeding, "Report of Workshop III," Atomic Energy Workshops, *supra* note 215 at 59.

[383] 10 Code Fed. Regs. §2.102(a).

[384] 10 Code Fed. Regs. §2.202.

[385] 10 Code Fed. Regs. §2,708.

[386] 10 Code Fed. Regs. §2.102(a).

cant and interested parties and publish such notice, and a formal hearing could be held upon request of such applicant or other parties if request therefor was made within fifteen days after service of the notice.[387] Under this procedure, the Commission "uniformly" [388] took its action first, subject to a request for hearing within thirty days.

However, after December 1956, the agency changed its practice and issued notices of intention to grant a license affording fifteen days' time in which to file requests for hearing.[389] In April 1957, the Commission by rule formalized the latter procedure.[390] The Commission's action was taken partly as the result of a Joint Committee Staff Study which set forth in compelling terms the reasons for requiring a formal hearing in every case prior to issuance of a construction permit or license under Sections 103 or 104 of the statute.[391] The proposal had, in fact, been opposed by the Commission.[392] Subsequently, Congress followed the Staff recommendation, and in September 1957, it amended Section 189a to require that the "Commission . . . hold a hearing after thirty days notice and publication once in the Federal Register on each application under Sections 103 or 104b for a license for a facility, and on any application under Section 104c for a license for a testing facility." [393]

[387] 10 Code Fed. Regs. §2.102(b).

[388] Joint Committee Staff Study, *supra* note 3 at 19.

[389] See "Notice of Proposed Issuance of Construction Permit to AMF Atomics, Inc.," Dec. 19, 1956, Dkt. No. F-17, as explained in AEC Press Rel. Dec. 28, 1956, Joint Committee Staff Study, *supra* note 3, App. 14A and B at 186-189.

[390] This was done by amending 10 Code Fed. Regs. §2.102(b) and (c); see "Notice of Proposed Rule Making," 22 Fed. Reg. 2433 (April 11, 1957).

[391] Joint Committee Staff Study, *supra* note 3 at 23: "The advantages of this notice of intent and hearing procedure are that it would provide the maximum amount of information concerning the proposed reactor to the public, and would also provide easy opportunity for participation by interested parties and the public. This type of procedure would seem to provide maximum assurance of fair and open dealings on the part of the agency." Sen. Anderson indicated support for such a recommendation during floor debate on Section 189 of the 1954 act, *id.*, at 17, n.2 see recommendation that the AEC, as a matter of policy, order a formal hearing in each Section 103 licensing proceeding, "Report of Workshop III," Atomic Energy Workshops, *supra* note 215 at 59.

[392] Chiefly on the grounds that such procedure would destroy "administrative simplicity" and cause unnecessary delay in proceedings, particularly where uncontested, Joint Committee Staff Study, *supra* note 3 at 22-24 and App. 5 at 109-110.

[393] Pub. L. 85-256, 85th Cong., 1st Sess. (1957); see H.R. Rep. No. 435, 85th Cong., 1st Sess. 12, 25 (1957). As the result of the amendment to Section 189a, the Commission was required to vacate the notice of proposed issuance of a construction permit for a Section 104b research reactor to Yankee Atomic Electric Co., Dkt. No. 50-29, and to set the matter for hearing, 22 Fed. Reg. 7188 (Sept. 7, 1957). After a hearing on Oct. 8 and 24, 1957, the AEC on Nov. 19, 1957, published a notice of its findings and

This congressional action represents an important step in bringing administrative due process to atomic energy procedures, a development which had been parallelled to a certain extent by Commission procedure developed by regulation and precedent in the Power Reactor Development Company licensing proceeding, the first of its kind held by the agency.[394] The requirement of an opportunity for a hearing before an application for a construction permit or license is issued also resolves the question concerning the suspension of such a permit or license which is once issued but later becomes the subject of a hearing.[395]

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order and of the issuance of a construction permit to Yankee, 22 Fed. Reg. 9237. The "Memorandum of Opinion of the Commissioners" granting the permit was not published in the Federal Register, an omission which should be corrected in the interests of complete public information in the field of atomic energy (see BNA, Atomic Industry Reporter 227:644a). The Yankee proceeding was the first completed under the new Section 189a procedure.

[394] The PRDC proceeding "has already begun the development of quasi-judicial attitudes and techniques on the part of the Commission" (Plaine, *supra* note 1 at 75).

[395] In its order for hearing dated Oct. 8, 1956, in the PRDC proceeding, the Commission denied the request of intervenors "for an immediate suspension of said construction permit pending the final determination of the matters raised by said petitions . . . without prejudice to ultimate determination by the Commission as to whether the permit should be continued, modified, or vacated" (Para. (4)). The intervenors in that proceeding argued that the "continuance of the construction permit to PRDC . . . would be contrary to the Act and the regulations of the Commission" and that the permit "should be suspended" during the hearing (Reply Brief of Intervenors, *supra* note 313 at 43). The dilemma in which the AEC had placed itself by issuing a provisional construction permit and then by passing upon the merits of the controversy after a formal hearing thereon is stated by the intervenors in their Post-Hearing Brief, *supra* note 291 at 36: "If this were . . . a case of initial licensing in which the Commission had not taken a position on the merits at the time of the hearing, there can be no question that it would have been entirely appropriate for AEC not to take a position with respect to the issues. . . . But this is not in fact a case of initial licensing. The Commission had already issued the license when the instant proceeding was instituted, and it has continued that license, in effect, over the strenuous objections of Intervenors. It is utterly unrealistic for the Commission to act as if it had not already rendered a decision on the issues, and to ignore the fact that it was being called on, in effect, to defend or reverse its position." Refusal of the Commission to take a position during the proceeding was claimed to be a denial of a fair hearing. In this connection, the following exchange occurred between AEC Chairman Strauss and Sen. Gore during the 1957 Section 202 Hearings, *supra* note 7 at 43-44: "Senator Gore. Is not that [the PRDC construction permit] in fact in a state of suspension? . . . Mr. Strauss. There is a hearing in progress, Senator. . . . [C]onstruction is going ahead with no suspension or delay as far as the Commission is aware. Senator Gore. You have given a construction permit? Mr. Strauss. That is right. It is not in suspension in any way." Under the Federal Communications Act of 1952, 47 U.S.C.A. §309(c), a construction permit automatically is suspended for the duration of a hearing initiated by a protest. See Joint Committee Staff Study, *supra* note 3 at 21.

Subject, of course, to actual observance by the Commission of the Atomic Energy Act of 1954 and the Administrative Procedure Act in spirit as well as letter, the agency appears to have provided very adequately by its rules for administrative due process on such matters as service of papers,[396] representation,[397] intervention,[398] consolidation of related proceedings,[399] and notice of hearing.[400] The burden of proof in any proceeding has been placed properly upon the applicant for a construction permit or license, which must affirmatively "demonstrate at the hearing that it is able to satisfy those requirements of law and the Commission's regulations which are in controversy." [401]

[396] 10 Code Fed. Regs. §2.703.

[397] 10 Code Fed. Regs. §2.704. In formal hearings, involving as they do the practice of law, only attorneys at law will be permitted to represent others, 10 Code Fed. Regs. §2.704(b); see Plaine, *supra* note 77 at 808-809.

[398] 10 Code Fed. Regs. §§2.705-.706; see Plaine, *supra* note 77 at 809. The PRDC proceeding, AEC Dkt. No. F-16, raises an interesting question with regard to the right of intervention. The three unions petitioning to intervene therein largely based their right to do so on their representation of union members whose health and safety allegedly would be adversely affected if the application were granted; see Post-Hearing Brief of Intervenors, *supra* note 291 at 1-2. The standing to intervene was questioned but not actually controverted by the applicant, and the Commission held that "[p]rima facie these allegations provide a basis for the granting of leave to intervene in the procedings before the Commission" ("Memorandum of the Commission" 1 (Mimeo Oct. 8, 1956); see BNA, Atomic Industry Reporter 52:41). The applicant, in a subsequent filing with the Commission, asked to have one of the issues, *i.e.*, the issue of financial qualification, eliminated on the grounds, *inter alia*, that the intervening unions had no interest in the matter of financial qualification. On Mar. 4, 1957, the State of Michigan filed a petition, and was permitted, to intervene in the PRDC proceedings, to participate therein "as its interests may arise" (BNA, Atomic Industry Reporter 3:77).

[399] 10 Code Fed. Regs. §2.707.

[400] 10 Code Fed. Regs. §2.735. This regulation provides for the specification of issues by the AEC in its order for hearing, to which specification in the PRDC proceeding intervenors strongly objected. Charging that the Commission had been "capricious" in its limitation of issues in the order dated Oct. 8, 1956, counsel for the intervenors charged before the Joint Committee that "we [the intervenors] had to consider it [participation in the hearing] on their [the AEC's] terms and only on their terms," without regard to "the question of whether the AEC itself had violated the law" (1957 Section 202 Hearings, *supra* note 7 at 467, 476-477). It was the position of the intervenors that, by its limitation of the issues of the proceeding "so as to preclude proof of illegal conduct on the part of the Commission in the issuance of a conditional construction permit to PRDC," the AEC had denied them a fair hearing (Post-Hearing Brief of Intervenors, *supra* note 291 at 19); see Reply Memorandum for Applicant, *supra* note 291 at 4.

[401] Power Reactor Development Company, AEC Dkt. No. F-16. "Memorandum of the Commission," *supra* note 398 at ¶6.

a. Hearing Officers

In formal licensing proceedings, Atomic Energy Commission rules [402] require that the hearing officer be either a member of the Commission, an officer or board to whom has been delegated final authority of the agency to act, or a hearing examiner appointed under Section 11 of the Administrative Procedure Act.[403] The appointment of Section 11 hearing examiners in the first formal proceedings under the Atomic Energy Act of 1954 [404] indicates the Commission will use such examiners to the greatest extent possible. The powers of a presiding officer [405] are essentially those provided for under the Administrative Procedure Act.[406] The use of prehearing conferences [407] and deposition procedure [408] also is emphasized. Time-consuming interlocutory appeals to the Commission from rulings of presiding officers are prohibited "except in extraordinary circumstances." [409]

Ordinarily, a presiding officer issues an intermediate decision which becomes final unless it is excepted to by the parties to the proceeding or

[402] 10 Code Fed. Regs. §2.732. This conforms to Section 7(a) of the Administrative Procedure Act, 5 U.S.C.A. §1006(a).

[403] 5 U.S.C.A. §1010.

[404] Power Reactor Development Company, AEC Dkt. No. F-16, "Notice of Hearing Order," BNA, Atomic Industry Reporter 52:40; Yankee Atomic Electric Co., AEC Dkt. No. 50-29; National Advisory Committee for Aeronautics, AEC Dkt. No. 50-30, "Hearings: Additions and Modifications," 22 Fed. Reg. 7214 (Sept. 10, 1957), BNA, Atomic Industry Reporter 53:67; General Electric Company, AEC Dkt. No. 50-70, BNA, Atomic Industry Reporter 4:95; see Plaine, *supra* note 77 at 812-813. On Aug. 5, 1958, the AEC announced that an Office of Hearing Examiner has been established, and Samuel W. Jensch appointed thereto, "to fill the Commission's requirement for hearings and to keep pace with the growth of the regulatory functions of the Commission" (AEC Press Rel. No. A-201).

[405] 10 Code Fed. Regs. §§2.733, 2.744, 2.745, 2.746, and 2.747.

[406] Section 7(b), 5 U.S.C.A. §1006(b).

[407] 10 Code Fed. Regs. §2.740; such a conference was held in the PRDC proceeding.

[408] 10 Code Fed. Regs. §2.745.

[409] 10 Code Fed. Regs. §2.748. This regulation provides that the hearing officer shall not permit interlocutory appeals to the Commission during a proceeding "except in extraordinary circumstances where in the judgment of the presiding officer prompt decision by the Commission is necessary to prevent detriment to the public interest or unusual delay or expense." In the PRDC proceeding, AEC Dkt. No. F-16, the hearing examiner refused to permit an interlocutory appeal from his order overruling objections to the use of written narrative testimony by PRDC witnesses. This decision was affirmed by the Commission Feb. 27, 1957, on the grounds that ". . . to allow the requested appeal would simply mean allowing one of the parties to circumvent a sound rule aimed at expediting the course of hearings, and would encourage continuing interruptions of this hearing by recurring appeals to the Commission" (BNA, Atomic Industry Reporter 3:78).

unless it is ordered by the Commission to be certified to it.[410] Prior to December 1957, in neither its regulations nor its practice had the Commission permitted a hearing officer to issue an initial decision, which would become final unless appealed.[411] Such decisions, if permitted, would have afforded the agency the benefit of the views of the officer who heard the testimony.[412] However, the Commission in orders issued in December 1957, instructed its hearing examiner to render initial decisions in two proceedings, a development which, it is hoped, may establish a new policy for the Commission in the future.[413]

Hearing examiner orders, in cases where permitted by the Commission, and final orders of the agency itself are required to contain findings of fact and conclusions of law.[414] Provision also is made in the AEC regulations for briefs and oral argument before the Commission [415] and for petitions for reconsideration of a final order of the agency.[416]

[410] 10 Code Fed. Regs. §§2.751-.752.

[411] The Commission, in every proceeding prior to 1958, has directed that the record be certified to it by the presiding officer without decision, Power Reactor Development Company, AEC Dkt. No. F-16, "Notice of Hearing Order," 21 Fed. Reg. 7809 (Oct. 12, 1956), BNA, Atomic Industry Reporter 52:40; Yankee Atomic Electric Co., AEC Dkt. No. 50-29, and National Advisory Committee of Aeronautics, AEC Dkt. No. 50-30, "Hearing: Additions and Modifications," 22 Fed. Reg. 7214 (Sept. 10, 1957), BNA, Atomic Industry Reporter 53:67.

[412] If hearing examiners are to perform the quasi-judicial role intended for them by Congress, then agencies should permit them to tender initial decisions in every case, unless the parties stipulate otherwise; Hoover Commission Legal Task Force Report, *supra* note 43 at 203-206. See Joint Committee Staff Study, *supra* note 3 at 39, n. 7: "The Commission's reluctance to permit the hearing examiner to make an initial decision [in the PRDC proceeding] is understandable, since he had no previous background in atomic energy matters, but it points up the need for qualified hearing examiners who are conversant with the Atomic Energy Act, AEC regulations and atomic energy technology." In questioning witnesses before the Joint Committee, Rep. Holifield claimed that the hearing examiner in the PRDC proceeding was a "special examiner appointed by the AEC" (1957 Section 202 Hearings, *supra* note 7 at 441 and 467-468). For a criticism of the AEC's refusal to permit a decision at the examiner level, see *id.* at 478.

[413] National Advisory Committee for Aeronautics, AEC Dkt. No. 50-30, 22 Fed. Reg. 9895 (Dec. 11, 1957), BNA, Atomic Industry Reporter 3:422; General Electric Co., AEC Dkt. No. 50-70, 22 Fed. Reg. 10126 (Dec. 18, 1957). On February 26, 1958, the hearing examiner gave his decision that the order for a construction permit be granted as of March 25, 1958, unless exceptions were filed to his decision or the Commission took the matter under advisement. On March 3, 1958 the applicant moved that the construction permit be granted immediately, to which motion the Commission staff consented, and the Commission ordered the construction permit issued on March 7, 1958. See BNA, Atomic Industry Reporter 4:95-96.

[414] 10 Code Fed. Regs. §§2.749, 2.750, and 2.754.

[415] 10 Code Fed. Regs. §2.753. This rule does not contemplate oral argument before an intermediate decision provided under 10 Code Fed. Regs. §2.751. However, in the PRDC proceeding, the Commission announced that it would have oral argument before

b. Evidence

By both rule and practice, the Commission has shown a realistic but fair attitude towards the submission of evidence in formal proceedings before that agency. In accordance with the Administrative Procedure Act,[417] the AEC regulations provide for the submission of "such oral or documentary evidence . . . as may be required for a full and true disclosure of the facts," [418] with an admonition to the hearing officer to "exclude all irrelevant, immaterial or unduly repetitious evidence." [419]

The regulations also encourage the submission of evidence in written form.[420] This practice has been used extensively, and it is believed wisely, in the Power Reactor Development Company proceedings.[421]

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the agency itself issued an intermediate decision; BNA, Atomic Industry Reporter 4:22. Oral argument was held before Commissioners Floberg, Graham, and Vance on May 29, 1958, at which Commissioner Floberg stated that consideration had been given to remanding the case to the hearing examiner for an intermediate decision but that the Commission had decided itself to issue such a decision, to which the parties would have an opportunity to file exceptions and comments before a final decision was rendered; see BNA, Atomic Industry Reporter 4:179.

[416] 10 Code Fed. Regs. §2.756.

[417] Section 7(c), 5 U.S.C.A. §1006(c), which provides, in part: "Any oral or documentary evidence may be received, but every agency shall as a matter of policy provide for the exclusion of irrelevant, immaterial or unduly repetitious evidence. . . . Every party shall have the right to present his case or defense by oral or documentary evidence . . . as may be required for a full and true disclosure of the facts. . . ."

[418] 10 Code Fed. Regs. §2.747(a); see Plaine, *supra* note 77 at 816.

[419] 10 Code Fed. Regs. §2.747(b). In the PRDC proceeding the applicant charged that, as the result of cross-examination by the intervenors, "the proportion of the testimony included in the transcript which is totally irrelevant to any issue presented is extraordinarily high" (Brief for Applicant, *supra* note 314 at 5, n. 7).

[420] 10 Code Fed. Regs. §2.747(a): "The parties shall be encouraged to present evidence in written form."

[421] At a pre-hearing conference in the proceeding, AEC Dkt. No. F-16, on Nov. 29, 1956, the hearing examiner permitted the applicant to prepare the "substantial part" of its case in the form of sworn statements by witnesses, subject to objection by the intervenors and cross-examination of the witnesses concerned; BNA, Atomic Industry Reporter 2:387. On Jan. 8, 1957, the applicant presented and rested its case with the introduction of so-called "canned testimony" by six witnesses, whereupon the hearing was adjourned to Jan. 28, 1957, for objection to the testimony by the other parties concerned; *id.* at 3:11. After oral argument, the examiner on Jan. 29, 1957, overruled all but 5 of 62 objections to the PRDC evidence. The principal attack by intervenors on the evidence was that (1) under 10 Code Fed. Regs. §2.740(b), providing for pre-trial orders, the consent of intervenors was required to the entry of the examiner's pre-trial order with respect to written evidence and (2) counsel was denied the right to observe the demeanor of the witnesses. The intervenors filed an interlocutory appeal from the examiner's ruling (*id.* at 3:45) which was denied by the Commission Feb. 27, 1957 (*id.* at 3:78). The issue was extensively argued by the parties in their briefs, the intervenors taking the position that a fair hearing had been

It is a matter of common practice in the older established agencies like the Federal Communications Commission [422] and Federal Power Commission.[423]

c. Public Records

An important problem that arises in connection with licensing by any agency is the manner in which the agency implements Section 3(c) of the Administrative Procedure Act which provides:

> Save as otherwise required by statute, matters of official record shall in accordance with published rule be made available to persons properly and directly concerned except information held confidential for good cause found.[424]

Aside from problems which arise under the Atomic Energy Commission's access permit program,[425] that organization is one of the few executive agencies and departments which has spelled out by regulation the meaning of the term "public records." [426]

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denied them; Post-Hearing Brief of Intervenors, *supra* note 291 at 6-7 and 37-41; Reply Memorandum for Applicant, *supra* note 291 at 2-4. In connection with the National Advisory Committee for Aeronautics proceeding, AEC Dkt. No. 50-30, the presiding examiner requested parties thereto to distribute written copies of testimony to each other prior to the hearing; BNA, Atomic Industry Reporter 4: 13. The use of sworn memoranda in proceedings, particularly where uncontested, was approved by the Joint Committee Staff Study, *supra* note 3 at 21-22, 24. The AEC has indicated that proposed written testimony by Commission witnesses will be submitted in advance of hearing to an applicant for a license where the application is not contested and the Advisory Committee on Reactor Safety report is generally favorable, whereby "the applicant and other parties will be in a position to cross-examine promptly, if they desire to do so." (Statement of Robert Lowenstein, Office of General Counsel, AEC, to Atomic Industrial Forum (mimeo, 1958)).

[422] *E.g.*, In the Matter of Carolina Gas Corp., et al., FPC Dkt. No. G-1335 (1950).

[423] *E.g.*, In the Matter of Charges for and in Connection with Marine Telegraph Services, FCC Dkt. Nos. 9915 'and 9822 (1951). In particular, see testimony introduced by South Porto Rico Sugar Company, operator of a small coastal radio station which was saved considerable expense by the use of "canned testimony." Indeed, without such a device, such small companies would find participation in rate and other proceedings almost prohibitively high in cost. Further, the device speeds the proceeding, a result which the intervenors in the PRDC case recognized but probably did not favor.

[424] 5 U.S.C.A. §1002(c). See Hoover Commission Legal Task Force Report, *supra* note 43 at 155: "A weakness of the Administrative Procedure Act is that it contains no definition of matters of official record. The majority of agencies have not defined this term. Even where a definition has been provided, it has usually been too restrictive. . . ."

[425] See text, *supra* at note 289.

[426] 10 Code Fed. Regs. Pt. 9, adopted Dec. 8, 1956. For the more important provisions of these regulations, see Joint Committee Staff Study, *supra* note 3, App. 3C, at 90-91; BNA, Atomic Industry Reporter 2: 355.

Adopted to meet the needs of the AEC's first adjudicatory proceeding, the rules are not without their shortcomings, a fact which Congress has sought to remedy by amendment of the Atomic Energy Act of 1954. The practice of the Commission prior to the PRDC licensing proceeding was to withhold from the public the report of the agency's Advisory Committee on Reactor Safeguards (ACRS).[427] A qualified report by the ACRS with respect to the PRDC reactor [428] was leaked through Congressional sources, whereupon the Commission in October 1956, published the Committee report together with the AEC's order setting the PRDC case for hearing.[429] The Commission made clear that this action was not to be considered a precedent, but modified its previous procedure in licensing cases to the extent that a summary of the ACRS report was contained in the memorandum accompanying the Commission issuance of a construction permit or license.[430]

This action did not, however, completely answer doubts raised as to the wisdom of the Commission's policy of withholding ACRS reports, particularly in view of the indemnity program then being considered by the 85th Congress.[431] The result was that, in enacting legislation to provide for a federal indemnity for atomic accidents and a limitation on the liability of persons participating in the atomic energy program,[432] Congress gave the ACRS legislative status.[433] This legislation also required that all applications for construction permits and licenses under Sections 103 and 104 be reviewed by ACRS, and that the report be "made part of the record of the application and available to the public, except to the extent that security classification prevents disclosure." [434]

[427] Joint Committee Staff Study, *supra* note 3 at 29; see AEC, Twenty-third Semi-Annual Report 320 (1958).

[428] Joint Committee Staff Study, *supra* note 3, App. 8 at 133.

[429] See Para. (6), "Notice of Hearing," 21 Fed. Reg. 7809 (Oct. 12, 1956), BNA, Atomic Industry Reporter 52:39; and Para. 9, "Memorandum of the Commission" Oct. 9, 1956, *ibid.*, which stated in part: "This action is being taken because a copy of the Advisory Committee's report was sent to the Power Reactor Development Co. on June 18, 1956. . . . The Commission has concluded that the public interest would be served in this instance by making the document available to the interveners and the public."

[430] Letter of AEC General Manager Fields to Joint Committee Executive Director, Oct. 17, 1956, Joint Committee Staff Study, *supra* note 3, App. 9 at 136.

[431] H.R. 7383 and S. 2051, 85th Cong., 1st Sess., favorably reported by the Joint Committee May 9, 1957, Sen. Rep. No. 296, *supra* note 32, and H.R. Rep. No. 435, *supra* note 223.

[432] Pub. L. 85-256, 85th Cong., 1st Sess. (1957).

[433] Section 29, 42 U.S.C.A. §2039.

[434] Section 182b, 42 U.S.C.A. §2232(b). The requirement for publicity of ACRS reports was closely tied in with that of Section 189a, as amended, requiring a formal

d. "Parallel Procedures"

The Atomic Energy Act of 1954 authorizes the Commission to provide by regulation

> . . . in the case of agency proceedings or actions which involve Restricted Data or defense information . . . for such parallel procedures as will effectively safeguard and prevent disclosure of Restricted Data or defense information to unauthorized persons with minimum impairment of the procedural rights which would be available if Restricted Data or defense information were not involved.[435]

This provision constitutes a landmark in administrative law and a praiseworthy attempt to accommodate the national need for information security with administrative due process and fairness to persons participating in the atomic energy program.[436]

The Commission delayed in implementing the statutory provision for

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hearing in all Section 103, 104b, and 104c procedings. See H.R. Rep. No. 435, *supra* note 223 at 12: "Having established the Committee [ACRS] under the bill, it was thought that its functions would be best served if its reports should be made public, and if the facilities of the type on which its report were required should be licensed only after a public hearing. . . . [F]ull, free, and frank discussion in public of the hazards involved in any particular reactor would seem to be the most certain way of assuring that the reactors will indeed be safe and that the public will be fully apprised of this fact." The policy of ACRS, according to its chairman, is to avoid "concerning itself with problems of national policy other than the question of safety. The Committee believes that it is possible to conduct the operation of nuclear reactors without unnecessarily exposing the public or workers to harmful amounts of radiation" (1958 Section 202 Hearings, *supra* note 32 at 118). The emphasis by members of the Joint Committee on the role of ACRS is on its freedom of action "to exercise your judgment fully without restriction in this field" (*id.* at 117). With respect to the ACRS, an official of the AEC has recently emphasized that the group is an advisory group only and "not an 'independent agency,'" with the ultimate responsibility for the issuance or non-issuance of a license resting with the Commission; meetings of the ACRS probably will not be open, although representatives of the applicant may be asked to answer questions of ACRS after preliminary study of the application by the latter; in cases where the ACRS report is favorable, "the hearing is not likely to be protracted" before a hearing examiner (Lowenstein, *supra* note 421).

[435] Section 181, 42 U.S.C.A. §2231.

[436] As originally proposed, Section 181 required the AEC to "provide by regulation for identical procedures except that they shall not be made public." The language of the section as enacted was proposed by Sen. Hickenlooper (Rep., Iowa), with the following comment (Joint Committee Staff Study, *supra* note 3 at 68-69): ". . . [T]he change in section 181 relating to the Administration Procedure Act is to provide the Commission with a little more flexibility in dealing with procedures than was provided in this section in the bill. . . . [T]he procedures are such as to protect against the wrongful dissemination of restricted data and defense information while at the same time preserving as many of the normal procedures as possible. . . ."

such "parallel procedures." Apparently as the result of some prodding by the Joint Committee on Atomic Energy and "a need in pending proceedings" for such rules, the Commission finally in late 1956 provided for "parallel procedures" for Restricted Data.[437]

As the Commission stated in its notice of rule making:

> Discharge of this responsibility [under Section 181 of the Act] requires the framing of novel procedures; and a delicate balancing of the need to provide adequate protection for Restricted Data in relation to the importance of providing access for parties and the public to the records of administrative proceedings before the Commission and information relating thereto.[438]

An important step in the implementation of the statutory provision was taken in placing these rules in effect.

The principal features of the new "parallel procedures" are (1) the obligation of parties to a proceeding to avoid introduction of Restricted Data,[439] (2) the requirement of a notice of intent to introduce Restricted Data,[440] and (3) the authority of the presiding officer to rearrange or suspend the proceeding pending the satisfaction of security requirements by interested parties and counsel.[441] Effective implementation of these rules will depend, in large part, upon the whole-hearted cooperation of parties, their counsel, the hearing officer, and the Commission, a pattern which has been established in other types of administrative proceedings before federal agencies where the schedule of hearings, admission of evidence, and the examination of witnesses often is adjusted to suit the convenience and needs of the parties by mutual consent.[442] The present rules are not without possible defect, and im-

[437] 21 Fed. Reg. 8594 (Nov. 8, 1956) and 21 Fed. Reg. 9741 (Dec. 8, 1956), 10 Code Fed. Regs. §§2.800-.814. It is significant that on the same December date that the AEC published notice of intention to promulgate the parallel procedure regulations, the agency announced promulgation of new rules with respect to public records; 21 Fed. Reg. 9743, 10 Code Fed. Regs. §§9.1-9.7.

[438] 21 Fed. Reg. 8594 (Nov. 8, 1956).

[439] 10 Code Fed. Regs. §2.806.

[440] 10 Code Fed. Regs. §§2.807-.808.

[441] 10 Code Fed. Regs. §2.809.

[442] See Section 5(a) of the Administrative Procedure Act, 5 U.S.C.A. §1004(a) which provides, *inter alia:* "In fixing the times and places for hearings, due regard shall be had for the convenience and necessity of the parties or their representatives." In the PRDC proceedings, AEC Dkt. No. F-16, the agency has had a "classification officer" available at the hearing to advise the hearing examiner on questions of security information; BNA, Atomic Industry Reporter 3:87 and 3:102.

provements in the procedure certainly should result from experience gained by the Commission and private parties thereunder.[443]

4. Revocation, Suspension, and Modification of Licenses and Construction Permits

Revocation of a license is specifically subject [444] to the safeguards of Section 9(b) of the Administrative Procedure Act.[445] This requirement is implemented by Atomic Energy Commission regulation providing for opportunity for a formal hearing.[446] However, unlike applications for a construction permit or license under Sections 103 and 104 of the statute, the suspension, revocation, or modification of a license requires only that the agency provide opportunity for hearing.

As under the Administrative Procedure Act, a license or construction permit may be suspended or revoked,[447] or an order to show cause immediately issued,[448] where "in the opinion of AEC the public health, interest, or safety requires, or the failure to be in compliance [with the Act, regulations issued thereunder, or license conditions] is wilful." Aside from failure to comply with the act, regulations issued thereunder, or license conditions, other grounds for immediate or future suspension or revocation of a license include a "material false statement" in an

[443] See Report of the Special Committee on Atomic Energy Law, 82 ABA Rep. 324-25 (1957): (1) "The . . . rules seem to contemplate the interruption of public hearings whenever restricted data may be requested from a witness. . . . This might be completely disruptive, and, indeed, it might even be used for that purpose. An alternative procedure would postpone the introduction of restricted data until some convenient occasion later in the hearing. . . . " (2) Provision of §2.805(d) for interlocutory appeals from rulings of a hearing examiner concerning safeguarding of restricted data "would seem to open the door to innumerable interlocutory appeals which could delay and disrupt the proceeding. . . . [T]he presiding officer should be left in control of the proceedings with authority to certify questions relating to access to restricted data if in his judgment it should seem desirable to do so. . . ." (3) "No provision is made in the . . . rules relative to court review of Commission decisions involving classified information. . . . It would seem desirable to take notice of the possibility of review in cases involving classified information. Provision could be made, for example, for certifying the non-classified record which could be amplified to contain non-classified statements concerning the general nature and content of the classified information. . . . The classified record could thereafter be made available upon court order to the court itself for the purpose of determining its relevance and importance to an adequate court review. . . ."

[444] Section 186a, 42 U.S.C.A. §2236(a).

[445] 5 U.S.C.A. §1008(b).

[446] 10 Code Fed. Regs. Pt. 2, Subpt. B.

[447] 10 Code Fed. Regs. §§2.201(b), 70.61(d), 40.25, 30.51(c), 50.100, and 55.40(a) and (b).

[448] 10 Code Fed. Regs. §2.202(a)(2).

application or report,[449] conviction of the licensee for violation of the antitrust laws "in the conduct of the licensed activity," [450] and, in the case of an operator's license, for personal behavior on the job deemed by the Commission to create a hazard in the operation of a facility.[451] In connection with the requirements of compliance with license conditions, failure to maintain the records, submit the reports, and permit the tests and inspections imposed by the statute and regulations,[452] as required by the license, would constitute grounds for immediate or proposed suspension or revocation of a license. When a license for a commercial or non-commercial production or utilization facility is revoked or suspended, the facility can be seized and operated by the government upon payment of "just compensation." [453]

Prior to 1958, the Commission suspended only one license, and this without hearing because of the danger to public health and safety. By order dated May 2, 1957, a byproduct material license was temporarily suspended because of "certain incidents . . . resulting in the contamination of major portions of the facility from by-product material," the contamination of clothing or employees, and "a potential hazard to the health and safety of employees of the Company and members of their families." [454]

This AEC action represents a wise exercise of the extensive discretionary power which is conferred upon the agency with respect to licenses once they have been issued.[455] However, in general, there is some reason

[449] Section 186a, 42 U.S.C.A. §2236(a); 10 Code Fed. Regs. §§70.61(b), 40.24, 40.40, 30.51(b), 50.100, and 55.40(a) and (b).

[450] Section 105a, 42 U.S.C.A. §2135(a); 10 Code Fed. Regs. §50.54(g).

[451] 10 Code Fed. Regs. §55.40(c).

[452] Sections 65 and 103b, 42 U.S.C.A. §§2095 and 2133(b); 10 Code Fed. Regs. §§70.32(b)(5), 70.51-.54, 40.24, 40.29-.30, 30.41-.44, 110.10-.11, 50.34-.35, 50.70-.71, and 55.41.

[453] Section 188, 42 U.S.C.A. §2238; 10 Code Fed. Regs. §50.102.

[454] Byproduct Material License No. 31-246-1 and 31-246-2, M. W. Kellogg Co., "Temporary Suspension Order," 22 Fed. Reg. 3263 (May 9, 1957). The order was modified to permit, among other things, decontamination of the premises involved, "Notice of Proposed Modification of Temporary Suspension Order," 22 Fed. Reg. 8965 (Nov. 7, 1957). For the complete text of the documents involved in this proceeding, including the full text of the conditions imposed in the modification order dated Nov. 7, 1957, and a statement by the General Manager with respect to the incident dated Nov. 2, 1957, see BNA, Atomic Industry Reporter 265: 203-208. On March 14, 1958, the Commission permanently cancelled Kellogg's license at the request of the licensee; 23 Fed. Reg. 1938 (March 22, 1958).

[455] By order dated Feb. 12, 1958, the Commission temporarily suspended without hearing Byproduct Material License No. 42-9000-2 of Radiation Products Company and issued an order for the licensee to show cause why the license should not be sus-

for apprehension over the Commission's wide authority to revoke licenses. This is particularly important because the agency's regulations themselves "do not impose self-restraints upon the exercise of that authority." [456]

5. Internal Separation of Functions

Under Section 5(c) of the Administrative Procedure Act, except in cases, among others, of initial licensing, a separation of functions is required in formal adjudication with respect to hearing officers and investigatory and prosecuting officers.[457] A hearing officer may not be subject to the direction or jurisdiction of an investigatory or prosecuting officer, nor may such latter type of officer participate or advise in the decision of a case which he has investigated or prosecuted. The principles involved in this salutory provision of the Administrative Procedure Act have been thus summarized:

> By internal separation of powers is meant an arrangement within an agency designed to prevent the contamination of judging by other inconsistent functions. The basic objective is to maintain the integrity of, and public confidence in, case adjudication affecting private rights. The agency employee who investigates should play no further role in such proceedings than that of witness. The legal staff members who present

pended or revoked; "Temporary Order and Order to Show Cause," 23 Fed. Reg. 1100 (Feb. 19, 1958). The order alleges that "[u]pon the basis of preliminary investigation, it apears that . . . the company has willfully transferred quantities of Cobalt 60, a byproduct material . . . to one or more persons in violation" of the Atomic Energy Act of 1954 and the applicable regulations issued thereunder. A hearing on the order initially was set for Feb. 24, 1958, but the respondent waived the hearing. The AEC was reported to have notified the Texas State Commissioner of Health and the Dallas City Health Officer of the action taken by the federal agency. ". . . [T]he fact that the AEC has taken this action in the Radiation Products case may stem from the reaction to last year's M. W. Kellogg Company radiation incident at Houston" (BNA, Atomic Industry Reporter 4:60-61). On April 18, 1958, the AEC served notice of intent to revoke the Radiation Products Company license effective February 7, 1958, unless contested by the licensee, for violation of the original suspension order. The Commission claimed failure by Radiation Products Company to request a transfer of the original license from it to Radiation Products Company, incorporated by the former principal, in Radiation Products Company, 23 Fed. Reg. 2817 (April 26, 1958). By order dated June 13, 1958, as modified July 24, 1958, the AEC temporarily suspended part of the license of a user of byproduct material for non-destructive testing, and a hearing before the AEC hearing examiner on claimed violations of the license was held in July, 1958, *In The Matter of Advance Industrial X-Ray Laboratories*, By-Product Material License No. 41695-2B59.

[456] Trowbridge, *supra* note 146 at 859.

[457] 5 U.S.C.A. §1004(c); see Plaine, *supra* note 77 at 813-14.

> evidence on behalf of the agency should not participate in the ultimate decision of the case. The officer who presides at the hearing can exercise his independent judgment on the evidence only if he is insulated against agency and staff influence. The agency members should exercise their judgment on the written record without consultation with those who investigated, prosecuted and heard the case below. These are the fundamental objectives of internal separation of functions vital to the protection of private rights.[458]

Problems of internal separation have been presented to the Atomic Energy Commission in its first formal licensing proceeding, that involving PRDC.[459] One of these related to the role of agency counsel in the proceeding, since the PRDC conditional construction permit had been issued with the active support and encouragement of the Commission itself. The PRDC proceeding involved initial licensing, and the separation of functions ordinarily required by the Administrative Procedure Act was not applicable.[460] The Commission complied, to a limited extent, with the spirit of the latter statute by creating a separated legal staff for AEC participation at the hearing level.[461] The Commission did not, however, permit the hearing examiner to issue an intermediate or

[458] Hoover Commission Legal Task Force Report, *supra* note 43 at 176-177.

[459] Power Reactor Development Company, AEC Dkt. F-16. As the result of the criticism of the Commission's role in this proceeding, the Chairman of the Joint Committee directed its staff to study the problem of insuring "sharper separation of the licensing function within the AEC organization" and invited comments thereon from the AEC itself, Joint Committee Staff Study, *supra* note 3 at v and 1. See also BNA, Atomic Industry Reporter 2:413.

[460] Section 5(c), 5 U.S.C.A. §1004(c).

[461] The separated staff was represented by the Acting General Counsel and two other attorneys of the AEC. Briefs filed by these attorneys stated that they were "submitted by the separated staff established for the purpose of representing AEC as a party to this proceeding" and reflected "only the views of the separated staff" and not those of the Commission itself. See AEC Response to Questionnaire, *supra* note 77 at 1095; AEC General Manager Fields' letter to Joint Committee Chairman Anderson, Dec. 12, 1956, Joint Committee Staff Study, *supra* note 3, App. 11B at 178-179, which read, in part: ". . . [T]he Commission has established a separated staff for the preparation and conduct of the proceeding on behalf of the AEC. . . . In the preparation and conduct of the proceeding, the separated staff will not be subject to supervision by persons not on the separated staff. This staff will not participate in advising the Commission with respect to its decision. . . . To assure the impartiality of these AEC staff members in advising the Commission, the Commission has directed that such staff members may not discuss with members of the separated staff questions relating to the position to be taken by the separated staff at the proceeding. . . . The separated staff will attempt in the public interest to insure that all relevant facts not brought out by the other parties are fully developed at the hearing. . . ."

initial decision in the case, thus reserving unto itself all of the judging function.[462]

The PRDC proceeding brought to public attention an equally important problem with respect to the application of separation of functions to the Atomic Energy Commission itself.[463] Prior to December 1957, the Division of Civilian Application of the AEC exercised regulatory functions with respect to licensing and non-regulatory functions with respect to the stimulation of reactor development by private industry.[464] That the promotional efforts of the Commission might conflict

[462] Joint Committee Staff Study, *supra* note 3 at 39: "The separation of the 'judging' function in the PRDC case was of a limited nature, however, and only applied to staff advisers, because the Commission did not delegate to the hearing examiner any power to make an initial decision, but retained all 'judging' authority and responsibility itself." The Commission recognizes the importance of maintaining the independence of hearing examiners assigned to it. (1958 Section 202 Hearings, *supra* note 32 at 87 and 89); see statement by Commissioner Floberg to the Joint Committee, *id.* at 89-90: "One of the things I am particularly sensitive to is the complete independence of the trial examiners. As long as I have anything to do with this Commission, our trial examiners will be the most independent of any agency in Washington"; see note 404, *supra*.

[463] A less spectacular, but no less important, problem raised by the PRDC proceedings concerned the role to be played by AEC employees and consultants as expert witnesses during the course of the hearing. Since many such persons had played an important part in developing the PRDC project, the evidence of these witnesses was pertinent and important to the making of a complete factual record. During the proceedings, charges were made by the intervenors to the Joint Committee that the AEC had sought to draw "a curtain between nuclear experts [of the AEC] and critics of the Commission" (statement of B. C. Sigal, IUE, AFL-CIO, General Counsel, 1957 Section 202 Hearings, *supra* note 7 at 470). This situation was claimed to have arisen because of instructions issued to AEC staff members by the Director, Division of Civilian Application, generally cautioning against participation in such procedings as witnesses unless ordered to appear by subpoena (*id.* at 471-475). In the Post-Hearing Brief of Intervenors, it was argued that the "Commission denied Intervenors a fair hearing in warning consultants of the Commission that they may be subject to criminal prosecution under conflict of interest laws if they have testified for the parties in this case, other than AEC" (*supra* note 291 at 22-25). See AEC Response to Questionnaire, *supra* note 77 at 1096: ". . . [T]here has been direction to AEC personnel concerning their participation on behalf of parties other than the AEC in proceedings before the agency. AEC employees are directed to provide information and services to parties to a proceeding on the same basis as they would follow with regard to other persons, but are prohibited from consulting on their own time or voluntarily serving as witnesses for any party. AEC employees were for the purposes of the PRDC matter permitted to appear on subpoena by any party to a proceeding. In the matter of PRDC the General Manager did testify upon subpoena by the intervenors."

[464] AEC Release No. 1238, Dec. 26, 1957, BNA, Atomic Industry Reporter 209:21; see AEC Announcement No. PSMO-3, "Organization of the Division of Civilian Application," Nov. 2, 1956, Joint Committee Staff Study *supra* note 3, App. 11 at 176-178; statement of AEC Commissioner Graham, 1958 Section 202 Hearings, *supra* note 32 at 84.

with its responsibilities in adjudicating applications for construction permits and commercial licenses always was inherent in that agency's organization so long as promotional and adjudicatory functions were grouped at the staff level in one division.[465]

The most drastic proposal for reorganization of the Commission contemplated the creation of two entirely separate statutory agencies, the one concerned with regulation of private industry and the other with military matters and the promotion and development of atomic energy technology.[466] The Commission, to date, has opposed this step.[467] A middle course proposed by the staff of the Joint Committee on Atomic Energy, which would create separate regulatory and promotional divisions within the Commission,[468] was, in fact, adopted by the Commission in December 1957.[469] Under this reorganization, a Division of Licensing and Regulation, reporting to the General Manager,[470] handles all licensing and regulatory functions theretofore assigned to the Divi-

[465] The intervenors in the PRDC proceeding sought to take advantage of claimed conflicts of interest within the AEC between that agency's promotional responsibilities and those relating to licensing. They moved that the AEC Chairman disqualify himself from considering the case when it reached the Commission because of two public statements made by him concerning the PRDC project. These statements, the intervenors argued, revleaded "bias and prejudice in favor of PRDC" (Post-Hearing Brief of Interveners, *supra* note 291 at 25-28. In its Brief, *supra* note 314 at 8, the applicant argued that the position of intervenors "if sustained, would frustrate the administration of the Atomic Energy Act of 1954. It would mean that if, as here, the Chairman or a member of the Commission fulfills his executive obligations to expound congressional and Commission policy and to make recommendations to Congress regarding its effectuation, he *ipso facto* disqualifies himself from performing the adjudicatory duties that the law places upon him. . . ."

[466] Joint Committee Staff Study, *supra* note 3 at 44: "The separated agency would regulate the private atomic energy industry, while the AEC would continue to be responsible for the main operating program, including procurement of raw materials, production of special nuclear materials, manufacture of weapons, and the research and development program. . . . This separation could be achieved by reducing the present number of AEC Commissioners from 5 to 3, and by creating a second commission of 3 members to regulate the atomic industry. . . ."

[467] AEC Chairman Strauss' letter to Joint Committee Chairman Anderson, Jan. 4, 1957, *id.*, App. 5 at 109; see 46-47.

[468] *Id.* at 44-45.

[469] Plans for the reorganization were announced by the AEC at the time it published Part 1 of its regulations dealing with the offices and divisions of the Commission; 22 Fed. Reg. 9972 (Dec. 12, 1957). However, these regulations still provided for a Division of Civilian Application, 10 Code Fed. Regs. §1.113. On Dec. 26, 1957, the Commission announced that the Division of Civilian Application had been replaced by the Division of Licensing and Regulation and the Office of Industrial Development; BNA, Atomic Industry Reporter 4:3.

[470] Section 24a, 42 U.S.C.A. §2034(a); 10 Code Fed. Regs. §1.107.

sion of Civilian Application.[471] An Office of Industrial Development, reporting to the Assistant General Manager for Research and Industrial Development,[472] was assigned the responsibility for developing over-all Commission policy to encourage and assist private activities in the civilian application of atomic energy.

The greater the internal separation of functions achieved by the agency itself within the spirit and the letter of the Administrative Procedure Act, the less need, and the less pressure, for legislative action creating a separation at the level of the agency or the divisions thereof. In view of the special problems which affect the Atomic Energy Commission and the industry regulated thereby,[473] greater adherence by the AEC to the areas of internal separation marked out by the Congress in the 1946 procedure statute would go far to meet the criticisms leveled at the agency. Should these procedures fail to provide that degree of insulation of the judging from the prosecuting, investigating, and developmental functions which will assure administrative due process and encourage public and Congressional confidence in the atomic energy program, then more drastic action by the legislature may well be favorably considered. Such drastic action, of course, will be invited by the Commission if it fails to meet the standards set by the spirit as well as the letter of the Administrative Procedure Act.[474]

6. Congressional Review of Licensing

Although the Joint Committee on Atomic Energy was given the authority under the Atomic Energy Act of 1946 [475] to sit as a reviewing body in the case of facilities' licenses proposed to be issued by the

[471] 10 Code Fed. Regs. §1.113.

[472] Section 24c, 42 U.S.C.A. §2034(c); 10 Code Fed. Regs. §1.110.

[473] Joint Committee Staff Study, *supra* note 3, at 42-43; see *id.* at 47: "At this stage of the atomic-development program, the arguments against a separate agency are perhaps more persuasive than they will be at a later stage when commercial production of atomic power is achieved and the Government's developmental and promotional assignments are a less prominent part of the Government's overall role [in] atomic-power development. . . . As a longer range view is taken of atomic energy development, however, the strength of the arguments against a separate agency diminish, and tend at some point to be outweighed by the arguments favoring separation. . . ."

[474] Such was the case when Congress in 1947 conferred final authority on the General Counsel of the National Labor Relations Board with respect to investigation of unfair labor practices, issuance of complaints thereon, and prosecution of such complaints before the Board, 29 U.S.C.A. §153(d), while the Board continued to exercise the adjudicatory authority of the agency, 29 U.S.C.A. §160.

[475] Section 7, 42 U.S.C. §1807 (1946).

Atomic Energy Commission, this authority never was exercised. As originally enacted, the Atomic Energy Act of 1954 did not provide for such review, but, by amendment to the appropriations provisions of the statute in 1957, this review has been provided for indirectly.

It is reported that the Chairman of the Joint Committee refused in January 1957 to have a hearing devoted exclusively to the then pending construction permit for Power Reactor Development Co.[476] However, in the hearings which the Committee held thereafter with respect to the development, growth, and state of the atomic energy industry[477] and to authorizing legislation for the AEC budget for fiscal year 1958,[478] the issues involved in the PRDC proceeding were a major source of discussion and controversy. Although the procedure whereby AEC funds were authorized and then appropriated had been the subject of prior adverse comment by some members of Congress,[479] it is clear that the controversy resulting from the proposed construction permit for PRDC brought the matter to a head. The result was a drastic change in the authorizing procedure[480] which may well result in Joint Committee review of all construction permit and licensing proceedings involving in any way financial help from the federal government.

[476] By letter dated Jan. 16, 1957, Rep. Ashley (Dem., Ohio) requested Joint Committee Chairman Durham "to make it [the PRDC project] a proper subject of hearings by the Joint Committee on Atomic Energy." The Chairman responded that the question was "not appropriate" for a separate hearing. BNA, Atomic Industry Reporter 3: 46-47.

[477] See, *e.g.*, exchange between between Rep. Holifield and counsel for some of the intervenors, 1957 Section 202 Hearings, *supra* note 7 at 479: "Representative Holifield. So your contention essentially is this; That . . . you are now asking this committee to exercise its jurisdiction and go into this matter [the PRDC proceeding] thoroughly? Mr. Sigal. Yes. . . ."

[478] See, *e.g.*, Statement of Walter P. Reuther, President, UAW, AFL-CIO, 1957 Authorizing Legislation Hearings, *supra* note 7 at 602: "The Atomic Energy Commission will probably wait until this session of the Congress had adjourned and reaffirm their decision taken last year. The only recourse the people of Detroit and Toledo have lies in this Committee. We urge you not to permit the construction of this hazardous fast-breeder reactor. . . . *We urge you to disapprove and disallow the authorization sought here until the AEC cancels the construction permit . . .*" [Emphasis supplied.] The opposite point of view was expressed by Robert W. Hartwell, Assistant General Manager of PRDC, *id.* at 634: "Messrs. Reuther and Sigal have asked the subcommittee to sit in judgment on the uncompleted record of the construction permit proceeding. . . . Messrs. Reuther and Sigal obviously want the subcommittee and the Congress to sit as a court of appeal and to do so before all the facts are in. . . ."

[479] H.R. Rep. No. 571, *supra* note 241 at 2; Rep. Cannon, 103 Cong. Rec. 5189 (1957); BNA, Atomic Industry Reporter 1: 19.

[480] Section 261, 42 U.S.C.A. §2017; see Green, "The Strange Case of Nuclear Power," 17 Fed. Bar J. 100, 123-125 (1957).

Prior to the 1957 amendment to Section 261 of the Atomic Energy Act, the Commission was required to submit the construction portion of its proposed program for the coming fiscal year for review and authorization by the Joint Committee and Congress before appropriations were requested from Congressional appropriations committees. The remainder of the Commission's program, that is, expenditures not involving so-called "bricks and mortar," was submitted directly to the House Ways and Means Committee without prior authorizing legislation initiated by the Joint Committee on Atomic Energy and passed by Congress.[481]

The original appropriations procedure of the 1954 act was, in the opinion of the Chairman of the House Ways and Means Committee, "inadequate as a framework within which appropriation requests can be adequately considered for atomic electric power." He criticized the practice of the Commission in "arbitrarily" dividing its civilian power reactor program under the first three rounds of invitation into two fiscal categories, one covering physical structures subject to prior Congressional authorization by the Joint Committee and the other covering operating expenses not so subject to such prior authorization. The result, according to the Chairman,

> . . . has been that for fiscal years 1956, 1957, and 1958 the amount appropriated and requested for the civilian power reactor program totals $236.8 million, of which only $40 million was authorized under authorizing legislation reported out by the joint committee and approved by the Congress. . . .[482]

Section 261, as amended in 1957, now requires that appropriations involving any non-military experimental reactor designed to produce more than 10,000 thermal kilowatts of heat or designed to be used in the production of electric power must be authorized by the Joint Committee on Atomic Energy before legislation appropriating the funds

[481] This departure from the treatment accorded most regulatory agencies by legislation affecting their appropriations was made possible by the former language of Section 261, which automatically authorized to be appropriated "such sums as may be necessary and appropriated to carry out the provisions and purposes of this Act except such as may be necessary for the acquisition or condemnation of any real property or any facility or for plant or facility acquisition, construction, or expansion." Under Section 19 of the 1946 statute, 42 U.S.C. §1819 (1946), "there are hereby authorized to be appropriated such sums as may be necessary and appropriate to carry out the provisions of this Act," without any requirement for authorizing legislation.

[482] Rep. Cannon, 103 Cong. Rec. 5189 (1957); see H.R. Rep. No. 571, *supra* note 241 at 2.

therefor can be enacted.[483] Specific authorization also now is required for funds

> . . . necessary to carry out cooperative programs with persons for the development and construction of reactors for the demonstration of their use, in whole or in part, in the production of electric power or process heat, or for propulsion, or solely or principally for the commercial provision of byproduct material, irradiation, or other special services, for civilian use, by arrangements (including contracts, agreements, and loans) or amendments thereto, providing for the payment of funds, the rendering of services, and the undertaking of research and development without full reimbursement, . . . by the Commission of any other financial assistance pursuant to such arrangement. . . .[484]

The effect of this legislation [485] is to bring the regulation and development of contractual arrangements between the Commission and private industry and many non-profit research institutions under the additional umbrella of Joint Committee supervision. Thereby, that committee will be placed in a position to review all applications for construction permits or licenses involving financial benefits.[486] Although reform in the procedure for authorizing the appropriation of funds for the Atomic Energy Commission probably was long overdue, the atmosphere in

[483] Section 261a(1), 42 U.S.C.A. §2017(a)(1).

[484] Section 261a(2), 42 U.S.C.A. §2017(a)(2).

[485] The administration of Section 261a(2), as implemented by Section 111 of each authorization bill, is thus explained by the Joint Committee, H.R. Rep. No. 571, *supra* note 241 at 9: "Under Section 261a(2) and proposed section 111 of the authorization bill, it is contemplated that the Commission will request each year authorization for a certain amount of funds as a lump sum for use in a program not to exceed another lump sum, larger in amount. The first amount would cover appropriations to be authorized, while the second amount would provide a total limitation on the payments and other considerations which could be made available under the program . . . *As each individual agreement is negotiated under that lump sum, the basis of the proposed individual arrangement . . . must be submitted to the Joint Committee, and a period of 45 days must elapse while Congress is in session . . . before the Commission may enter the individual arrangement*" (emphasis supplied). The latter requirement is that provided in a uniform Section 111 for authorization bills agreed upon by the Joint Committee, *id.* at 8, and as enacted in the authorizing legislation for fiscal year 1958, Pub. L. 85-162, 85th Cong., 1st Sess. (1957).

[486] This will affect all outstanding construction permits held by persons under the first and second rounds of the civilian power reactor program. See H.R. Rep. No. 571, *supra* note 241 at 9: "Thus [under Section 261 of the Atomic Energy Act and Section 111 of authorizing legislation] the basis for each arrangement by the AEC with industry under the first, second, third, and all subsequent rounds, will be submitted individually to the Joint Committee before the Commission may proceed to enter into the arrangement. All arrangements heretofore entered into are subject to the authorization and appropriation of funds, unless obligated. . . ."

which this legislative change has been effected was unfortunate. The new Section 261 was designed in general to increase Congressional control over the atomic energy program. In particular, it was intended to give the Joint Committee indirect control over the licensing of the civilian atomic energy industry both in the production of electrical energy and in research and development.

It is clear that Commission financial support for many developmental projects will be required in the future. Under the civilian power reactor program, this aid has taken the form of waiver of established Commission charges for use of source and special nuclear material, mutually agreed-upon research and development work in federal laboratories where such work is not reasonably available elsewhere, and support of research and development required to advance the technology of the industry as a whole. To limit this help, or to subject all contracts and other arrangements concerned therewith to Congressional scrutiny and possible rejection, therefore constitutes a limitation upon the licensing authority of the regulatory body involved.

7. Judicial Review

Under Section 14(a) of the McMahon Act of 1946 [487] the provisions of Section 10 of the Administration Procedure Act [488] were made applicable to decisions of the Atomic Energy Commission. Under the Administrative Procedure Act, judicial review of agency action causing legal wrong to any person is provided, except where "(1) statutes preclude judicial review or (2) agency action is by law committed to agency discretion."

The 1946 provision never was implemented by either statutory review procedure or agency regulation. Only two judicial decisions have been found dealing with Section 14, and they did not construe the scope of review intended by Congress, except to emphasize the bar to judicial reconsideration of agency discretion.[489]

The 1954 statute established a more explicit set of provisions for

[487] 42 U.S.C. §1814(a) (1946).

[488] 5 U.S.C.A. §1009.

[489] Fletcher v. Commission, 192 F. 2d 29, 33 (D.C. Cir. 1951), *cert. den.* 342 U.S. 914 (1952) (Court of Appeals can review Commission denial of award for alleged use of petitioners' inventions but not denial of "just compensation" for such alleged use, the remedy therefor being suit in Court of Claims); United Electrical, Radio & Machine Workers of America v. Lilienthal, 84 F. Supp. 640 (D.C.D.C. 1949) (Court cannot review "executive action committed by law to the discretion of the Atomic Energy Commission")

judicial review. Under Section 189b,[490] judicial review is expressly permitted from final orders entered in proceedings for (1) the granting, suspending, revoking, or amending of any license or construction permit or application to transfer control, (2) the issuance or modification of rules and regulations dealing with the activities of licensees, and (3) the payment of compensation, awards, or royalties.

The area of judicial review may be actually narrower under the Atomic Energy Act of 1954 than under the 1946 atomic energy legislation. It is not impossible that the government would claim that any other final order of the Commission entered in a proceeding not specifically listed in Section 189b is impliedly excluded from judicial review.[491] Such a position, however, would be contrary to the legislative intent in enacting Section 10 of the Administrative Procedure Act.[492]

The procedure for invoking review under the Atomic Energy Act of 1954 is provided under a statute enacted by Congress in 1950.[493] This legislation, after 1954, gave the Federal Courts of Appeals "exclusive jurisdiction to enjoin, set aside, suspend (in whole or in part), or to determine the validity of, all final orders . . . of the Atomic Energy Commission made reviewable" by Section 189 of the 1954 act.[494] The restrictive language of this statute as to the reviewable orders of the Commission also creates a likelihood that judicial review of Commission action will be sought to be closely restricted by the government.

8. Indemnity and Public Liability

By amendment in 1957 to the Atomic Energy Act of 1954,[495] Congress has sought to meet the problems of public liability and property

[490] 42 U.S.C.A. §2239(b).

[491] Thus, the Joint Committee report on the 1954 act stated that "Section 189 provides for judicial review of a final order of the Commission *entered in certain agency actions*" (H.R. Rep. No. 2181, *supra* note 5 at 29). [Emphasis supplied.] See Joint Committee Staff Study, *supra* note 3 at 71-75; McGrath v. Zander, 177 F. 2d 649 (D.C. Cir. 1949) (orders of Alien Property Custodian).

[492] Sen. Doc. No. 248, *supra* note 43 at 275: "To preclude judicial review under this bill [Administrative Procedure Act] a statute, if not specific in withholding such review, must upon its face give clear and convincing evidence of an intent to withhold it. The mere failure to provide specially by statute for judicial review is certainly no evidence of intent to withhold review."

[493] 5 U.S.C.A. §§1031 *et seq.*

[494] 5 U.S.C.A. §1032.

[495] Pub. L. 85-256, 85th Cong., 1st Sess. (1957). See Butler, "Liability Insurance for the Nuclear Energy Hazard," 60 P. U. Fort. 913 (1957).

damage which might arise from a nuclear accident. As stated by the Joint Committee,

> . . . [T]he problem of possible liability in connection with the operation of reactors is a major deterrent to further industrial participation in the [civilian reactor] program. While the [Section] 202 hearings held in 1957 indicate that it may not be the most important deterrent—that appears to be the current lack of economic incentive—the problem of liability has become a major roadblock.[496]

Although evidence available to date does not indicate that the chances for, and damages resulting from, such an accident are considerable,[497] Congress has shown salutary foresight and ingenuity in developing a system of private insurance and governmental indemnity which is made an integral part of the contracting and licensing controls of the Atomic Energy Commission.[498] The policy underlying the Congressional action, as added to the Atomic Energy Act of 1954 itself, is that

> In order to protect the public and to encourage the development of the atomic energy industry, in the interest of the general

[496] H.R. Rep. No. 435, *supra* note 223 at 1; AEC, Twenty-third Semi-Annual Report 177 (1958): "The remote possibility that privately owned nuclear reactors might have a catastrophic accident created the problem that private organizations building or operating the facilities might incur a public liability larger than could be met either by the financial structure of their organization or by the resources of the insurance industry. . . ." See *Hearings on Governmental Indemnity and Reactor Safety Before the Joint Committee on Atomic Energy*, 85th Cong., 1st Sess. 147 (1957) (hereafter cited as 1957 Indemnity Hearings): ". . . [I]n a recent poll conducted by the Atomic Industrial Forum, the unresolved liability question was rated second only to the lack of economic incentives as a roadblock to further progress" (testimony of Francis K. McCune, Vice-President, General Electric Co.); Atomic Industrial Forum, Inc., Financial Protection Against Atomic Hazards (1957).

[497] H.R. Rep. No. 435, *supra* note 223, at 3: "Assuming that there were 100 large power reactors operating in the United States, the [Atomic Energy] Commission has found that the most pessimistic of the probabilities involved lead to the estimate that there would be less than 1 chance in 50 million of any person getting killed in any year in a reactor incident as compared to 1 chance in 5,000 for getting killed in an automobile accident. It is also concluded that hypothetical property damages range from a lower limit of about one-half a million dollars to an upper limit, in the worst imaginable case, of $7 billion. This latter figure is largely due to a contamination of land with fission products. . . . There was no disagreement that the probability of major reactor accidents was exceedingly low." See testimony of AEC Chairman Strauss, 1957 Indemnity Hearings, *supra* note 496 at 11-12; AEC, Twenty-third Semi-Annual Report 177-178 (1958).

[498] The principal opposition to the enactment of governmental indemnity legislation was voiced by Rep. Holifield in a vigorous dissent to the Joint Committee report favoring the legislation, H.R. Rep. No. 435, *supra* 223 at 35-40. In his opinion, the legislation "would provide another Government subsidy to atomic power development with-

> welfare and of the common defense and security, the United States may make funds available for a portion of the damages suffered by the public from nuclear incidents, and may limit the liability of those persons liable for such losses.[499]

The system established by Congress, to be administered by the Atomic Energy Commission in conjunction with the Joint Committee, regulates both licensees and contractors of the Commission. Holders of licenses for the distribution of special nuclear material previously were required, as a condition of that license, to "hold the United States and the Commission harmless from any damages resulting from the use or possession" of such material.[500] This requirement has been modified to the extent that indemnification by the United States and limitation of liability are available to licensees and contractors [501] under new Section 170 of the Atomic Energy Act of 1954.[502]

Section 170a requires that a person holding a license or construction permit pursuant to either Section 103 or Section 104 of the act [503] must provide certain financial protection against losses arising from a "nuclear

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out any commensurate benefits to taxpayers and power consumers" and "is just another prop for industries too timid to move ahead without paternalistic Government help" (*id.* at 35-36).

[499] Section 2*i*, 42 U.S.C.A. §2012(i). See H.R. Rep. No. 435, *supra* note 223 at 15: "The primary concern of the Federal Government is with the protection to the people who might suffer damages from the new atomic energy industry. Since many of the reactors which will be built will be producing special nuclear material which is vital to the defense of the country, it is in the interest of the common defense and security to see that these companies are protected in their operations by having moneys available to them for payment of public liability claims and having limitations of liability proceedings available when those funds are insufficient. Since title to special nuclear material is in the United States, Congress has special powers and duties with respect to the use of that material. One of the other constitutional bases for the limitation of liability program is the bankruptcy power of the United States for it is improbable that any firm could survive claims against it of $500 million, over and above the insurance which might be available."

[500] Section 53e(8), 42 U.S.C.A. §2073(e)(8).

[501] See H.R. Rep. No. 435, *supra* note 223 at 15.

[502] 42 U.S.C.A. §2210.

[503] In addition, the Commission has the option to require that a licensee for special nuclear materials (Section 53 of the 1954 act), source materials (Section 63), and byproduct materials (Section 81) furnish such financial protection, but it "is not expected that ordinarily the Commission will use the authority given to it with respect to these latter three types of materials." H.R. Rep. No. 435, *supra* note 223 at 19. In its 1958 report to the Joint Committee required to be submitted under Section 170i of the statute, the AEC stated that it was studying the problem of extending insurance-indemnity requirements to licensees other than those licensed under Sections 103 or 104, BNA, Atomic Industry Reporter 4:116.

incident," [504] and also must enter into an indemnity agreement with the Atomic Energy Commission.[505] Under Section 170b and temporary Commission regulation,[506] financial protection, i.e., the ability to respond in damages for public liability,[507] must be provided in the amount of $150,000 per thousand kilowatts of thermal energy capacity authorized by the applicable license, but in no cases shall the amount of coverage be less than $250,000 for each nuclear reactor.[508]

[504] A "nuclear incident" is defined in Section 110, 42 U.S.C.A. §2014(o), as "any occurrence within the United States causing bodily injury, sickness, disease, or death, or loss of or damage to property, or for loss of use of property, arising out of or resulting from the radioactive, toxic, explosive, or other hazardous properties of source, special nuclear, or byproduct material." See H.R. Rep. No. 435, *supra* note 223 at 16: "The definition of 'nuclear incident' is designed to protect the public against any form of damage arising from the special dangerous properties of the materials used in the atomic energy program. . . . [I]t was not thought that an incident would necessarily have to occur within any relatively short period of time. For instance, the steady exposure to radiation . . . could constitute an incident. . . . The indemnification agreements are intended to cover damages caused by nuclear incidents for which there may be liability no matter when the damage is discovered, *i.e.*, even after the end of the license. . . ."

[505] Section 170a also establishes a third type of licensing condition applicable to persons which have immunity against suit, *i.e.*, state-owned educational institutions. Such an institution may be required by the Commission to "shed its immunity," H.R. Rep. No. 435, *supra* note 223 at 19-20; see 10 Code Fed. Regs. §140.16. The provision of Section 170a that the AEC "may require, as a further condition of issuing a license, that an applicant waive any immunity from public liability conferred by Federal or State law" has created difficulties for the Commission which are not yet satisfactorily resolved. In its April 1958 report to the Joint Committee, the AEC stated that, with only one exception, federal and state agencies receiving facilities' licenses from the Commission claimed they could not waive immunity from public liability because of existing statutory or constitutional law. According to the AEC, work was progressing on possible legislation to waive federal immunity from tort liability with respect to claims arising out of nuclear incidents and on a model bill for such waiver by the states up to the amount of insurance carried and the AEC indemnity. BNA, Atomic Industry Reporter 4: 115-116. (Ed. Note: By Pub. L. 85-744 (72 Stat. 837), Congress added Section 170k to the Act to exempt nonprofit educational institutions from the requirements of Section 170 and provided for the federal indemnity of $500,000 to apply to public liability in excess of $250,000 arising from a nuclear incident.)

[506] 10 Code Fed. Regs. §140.11. The temporary regulations were issued Sept. 11, 1957, shortly after enactment of Section 170 of the statute; 22 Fed. Reg. 7223, BNA, Atomic Industry Reporter 227:625. In its report to the Joint Committee in April 1958, the AEC submitted the draft of a proposed permanent regulation with respect to amounts of insurance to be carried by reactors, 10 Code Fed. Regs. §140.11, and stated that it was considering the amendment of other provisions of the temporary regulation, BNA, Atomic Industry Reporter 54: 31.

[507] Section 11j, 42 U.S.C.A. §2014(j).

[508] AEC licensees under Sections 103 and 104 of the statute were required to submit proof of financial protection to the agency within 30 days after Sept. 26, 1957, 10

Although Section 170b and the Commission's regulations permit financial protection in the form of private contractual indemnities, self insurance, other proof of financial responsibility, or a combination of such measures,[509] it is clear that insurance coverage from private sources is, and will be, the preferred method for complying with the Congressional mandate. Insurance pools established by stock and mutual companies prior to 1957 were believed capable of insuring losses up to $65 million in connection with a single nuclear accident.[510]

Provided a licensee has secured the necessary financial protection, he then is entitled to an agreement of indemnity[511] from the Atomic Energy Commission. In providing for this protection, Section 170c of the Atomic Energy Act of 1954, as amended, provides:

> The Commission shall, with respect to licenses issued between August 30, 1954, and August 1, 1967, for which it requires financial protection, agree to indemnify and hold harmless the licensee and other persons indemnified, as their interest may appear, from public liability arising from nuclear incidents which is in excess of the level of financial protection required of the licensee. The aggregate indemnity for all persons in-

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Code Fed. Regs. §140.13(a). Licensees are required to notify the Commission of any material change in proof of financial protection or in other financial information filed with the agency in connection therewith, *id.*, §140.13(e). Where an insurance policy is furnished by the licensee, notice of renewal thereof must be furnished the Commission at least 30 days prior to its expiration date, *id.*, §140.14(b). Under 10 Code Fed. Regs. §140.15(b), failure to provide proof of financial protection is grounds for suspension or revocation of a license. The proposed permanent amendment to 10 Code Fed. Regs. §140.11 would require a minimum of $3,000,000 in financial protection for any nuclear reactor, with a maximum required coverage of $60 millions, the amount of the insurance to be determined by formula based, among other things, on maximum power level, fuel cycle, and population possibly subject to a nuclear accident.

[509] 10 Code Fed. Regs. §140.12. Under this regulation, "the licensee shall not substitute one type of financial protection for another type without first obtaining the written approval of the Commission." See H.R. Rep. No. 435, *supra* note 223 at 20-21. The AEC reported to the Joint Committee, in April 1958, that 12 out of 22 licensees required to submit proof of financial protection submitted insurance policies, and one elected to show adequate resources for self-insurance (BNA, Atomic Industry Reporter 4: 115).

[510] H.R. Rep. No. 435, *supra* note 223 at 7 and 10-11; AEC, Twenty-third Semi-Annual Report 177-178 (1958); 1957 Indemnity Hearings, *supra* note 496 at 81-144.

[511] Although the Commission has not yet announced a form of indemnity agreement to be used under Section 170, "The Commission will, in due course, execute and issue agreements of indemnity," such agreements to be effective on the date of the regulations issued under Section 170 170 (Sept. 26, 1957) or the "effective date of the license authorizing the licensee to operate the nuclear reactor involved, whichever is later" (10 Code Fed. Regs. §140.17(a)). Section 170f and 10 Code Fed. Regs. §140.17(b) establish a fee of $30 per year per thousand kilowatts of thermal capacity authorized for the licensee to be issued an agreement of indemnity.

> demnified in connection with each nuclear incident shall not exceed $500,000,000 including the reasonable costs of investigating and settling claims and defending suits for damage. Such a contract of indemnification shall cover public liability arising out of or in connection with licensed activity.[512]

Under Section 170e, the liability of persons indemnified by the Commission is limited to $500 millions, together with the amount of financial protection required, with respect to any single nuclear incident.[513] Such limitation may be enforced by a proceeding instituted by the Commission or any person indemnified in the appropriate United States District Court having jurisdiction in bankruptcy over the applicant.[514]

Under Section 170d of the 1957 amendment to the Atomic Energy Act of 1954, the Commission is authorized

> . . . to treat with its own contractors in the same way it can treat with licensees under the provisions of this bill. . . . It is hoped that the Commission will adopt a policy of extending indemnity provisions to contractors and subcontractors consistent with that extended to licensees and their suppliers and subcontractors. . . .
>
> In this subsection, however, the Commission is allotted discretion as to the amount of financial protection which may be

[512] 42 U.S.C.A. §2210(c). Section 170h further provides that the "agreement of indemnity may contain such terms as the Commission deems appropriate to carry out the purposes of this section," and shall require the person indemnified to cooperate with the Commission and Attorney General of the United States in any proceedings involving payment of the indemnity. With respect to the reasons for establishing a system of governmental indemnity, rather than of insurance, the Joint Committee has stated, H.R. Rep. No. 435, *supra* note 223 at 9: "A system of indemnification is established rather than an insurance system, since there is no way to establish any actuarial basis for the full protection required. The chance that a reactor will run away is too small and the foreseeable possible damages of the reactor are too great to allow the accumulation of a fund which would be adequate. . . . [I]f, as the Joint Committee anticipates, there never will be any call on the fund for payments, the funds will have been accumulated to no purpose. Hence, in this instance it seemed wisest to the Joint Committee not to treat this as an insurance problem but to treat it as an indemnification problem. . . ."

[513] In its report the Joint Committee recognized that it might be necessary for Congress to increase the amount of the indemnity, or the amount of limitation of liability, "in the light of the particular incident" (H.R. Rep. No. 435, *supra* note 223 at 21-22).

[514] *Id.* at 22-23. Under Section 170i, the Commission is required to make a survey of the incident and report the same to the Joint Committee, as "an aid to the Congress in establishing the causes of a nuclear incident. It is, in part, an aid to the parties in any action where it is unlikely that the public would be able to obtain the full amount of technical information which might be required. . . ." (H.R. Rep. No. 435, *supra* note 223 at 24). The AEC also must report to the Joint Committee on April 1 of each year concerning operations under Section 170.

> required of its contractors before the $500 million guaranteed indemnity attaches. This authority is to be available for any type of contract which the Commission may enter into, as well as to contracts and projects which the Commission may enter into jointly with other agencies of the Government. . . .[515]

Although the Commission has not issued regulations with respect to the above provisions, persons contracting with a licensee will be afforded protection under the indemnity agreement made by the Commission with such a licensee.[516]

9. Transportation and Transmission

Areas of possible conflict between the Atomic Energy Commission and other federal and state regulatory agencies arise in connection with the transportation of atomic materials and the transmission of electricity produced from nuclear energy. Although these two phases of government regulation are generally unrelated, they have a common characteristic in that the jurisdiction of the AEC is either duplicated or supplemented, and they present possible problems of conflicting jurisdiction.

a. Transportation

Although possession of source, byproduct, and special nuclear materials must be licensed by the Atomic Energy Commission, in the case

[515] *Id.* at 21-22.

[516] As a "person indemnified" within the definition of that term in Section 11r of the statute, 42 U.S.C.A. §2014(r); see H.R. Rep. No. 435, *supra* note 223 at 17. The Joint Committee report also dealt with the problem facing carriers "transporting spent fuel elements from a reactor to a processing plant. If such a company, whether through negligence or otherwise, should have an accident which would spill the radioactive materials into a stream, this bill would afford protection to the public and to the carrier, even though the carrier is not required to be a licensee under the Atomic Energy Act of 1954. . . ." Where the carrier transports materials and assemblies, such as reactor parts with fuel elements installed therein, it usually does so without any knowledge of the contents of the shipment, which is made by a contractor of the Commission. In such cases, the only recourse of the carrier, to assure protection in the event of a nuclear accident, may be to obtain a contract of carriage directly from the Commission. See 1958 Section 202 Hearings *supra* note 32 at 274-276.

On January 16, 1958, the AEC announced that it was offering statutory indemnity to "[C]ommission prime contractors and their suppliers engaged in the operation of nuclear reactors or in operation of facilities such as gaseous diffusion plants or chemical separation plants" and "to other contractors engaged in activities involving the risk of occurrence of a substantial nuclear incident" (AEC Press Rel. No. A-9, see BNA, Atomic Industry Reporter 227:629). In May 1958 the AEC indicated to the Joint Committee that the decision not to require private insurance from contractors was being reconsidered; see BNA, Atomic Industry Reporter 4:159.

of persons transporting such materials, the ways and means for effecting such transportation come within the jurisdiction of four other federal agencies. After debate as to whether or not the Interstate Commerce Act was superseded by provisions of the Atomic Energy Act of 1946 with respect to transportation of atomic materials,[517] the Atomic Energy Commission acceded to the claims of the Interstate Commerce Commission for overriding authority in that field. In fact, the Atomic Energy Commission has temporarily relinquished its apparent authority over transportation of atomic materials not only to the Interstate Commerce Commission,[518] but also to the United States Coast Guard,[519] the Civil Aeronautics Board,[520] and the U. S. Post Office Department.[521] This has been accomplished by exempting from Atomic Energy Commission licensing regulation the interstate transportation activity of regulated carriers and the mails.[522] In effect, the AEC has granted a general license to persons subject to the jurisdiction of these four agencies, without actually relinquishing jurisdiction of the subject matter.

The continuing jurisdiction of the Atomic Energy Commission in the field of transportation is demonstrated by that agency's announcement on September 21, 1957, of proposed regulations

> . . . to establish appropriate precautions in connection with the transportation of special nuclear material to prevent accidental conditions of criticality. Requirements to protect against other hazards in the shipment of such materials are prescribed pursuant to other parts [of the AEC's regulations] . . . and in regulations of other agencies having jurisdiction over means of transportation. Accordingly, the requirements of this part are in addition to, and not in substitution for, such other requirements.[523]

[517] See Evans, Physical, Biological, and Administrative Problems Associated with Transportation of Radioactive Substances (National Research Council 1951), BNA, Atomic Industry Reporter 281: 1-2.

[518] 49 Code Fed. Regs. §§71.1-.11, 72.1-.5, 73.1-.430, 74.506-.600, 75.651-.659, 76.701-.702, and 77.802-.870.

[519] 46 Code Fed. Regs. §§146.01-4, 146.25-400.

[520] 14 Code Fed. Regs. §§29.0-71.

[521] Post Offices Services Circular 2, Pt. 121, 124, and 125 (Dec. 1, 1954); 39 Code Fed. Regs. §15.2(d), which was amended effective May 15, 1958, to limit the amount of radioactivity a package may contain, in addition to the previous limit on the amount of radiation from the surface of the package; 23 Fed. Reg. 2221 (Apr. 4, 1958), BNA, Atomic Industry Reporter 4: 126.

[522] 10 Code Fed. Regs. §§30.7, 40.62(b), 50.11(d), and 70.12

[523] Proposed 10 Code Fed. Regs. §71.1, 22 Fed. Reg. 7541 (Sept. 21, 1957)

The Commission has summarized the proposed regulations as follows:

> The following proposed rule distinguishes between transportation by licensees [for special nuclear material] and transportation by such unlicensed carriers. Where special nuclear material is to be transported by a licensee, prior Commission approval of proposed shipping procedures must be obtained for all shipments in excess of the quantities of special nuclear material specified. . . . In the case of unlicensed carriers, there normally exists a possibility that a number of small quantities of special nuclear material from different shippers might come into hazardous proximity to each other. For this reason the quantity of special nuclear material which may be delivered to a carrier authorized to transport special nuclear material without a Commission license is set considerably lower . . . except for cases where the licensee who makes the shipment is in a position to, and does, exercise such control over transportation of the shipment as to assure that the total quantity of special nuclear material in the shipment does not exceed the limits specified. . . .[524]

Although the regulations of the Interstate Commerce Commission, Coast Guard, Civil Aeronautics Board, and the U. S. Post Office usually do not require the issuance of a license as such, the packaging, marking, and container limitations imposed by these agencies constitute a form of indirect licensing control. Atomic material cannot be transported unless in conformity with these regulations.

There apparently has been no effort to make these licensing requirements uniform even where practicable. More efficient and economical administration of the transportation of atomic material, and consequently a less restrictive burden on the shippers and carriers involved, would result if the Atomic Energy Commission were to work out a uniform system of transportation requirements with the other four agencies involved, even though administration of these requirements were vested in the other agencies.

[524] *Ibid.* Appendix A to the proposed regulation lists the qualities of uranium 235 and 233 and plutonium which a licensee of special nuclear material may deliver to a carrier, without prior specific AEC approval, provided the licensee exercises "such supervision and control over the shipment as to assure that, if said special nuclear material is transported with any other quantity of special nuclear material, the total quantity of special nuclear material does not exceed the limits specified in Appendix A"; proposed 10 Code Fed. Regs. §71.22(a)(2). Appendix B lists the maximum quantity of types of special nuclear material which a licensee may deliver to a carrier unless in accordance with §71.22(a) or with special procedures approved by the Commission in connection with an application for a license for special nuclear material under §71.23.

b. Transmission

Whenever the holder of a commercial atomic energy license transmits electric energy in interstate commerce or sells it at wholesale in such commerce, the Federal Power Commission is obliged to exercise jurisdiction with respect thereto. Such authority is in fact required as a condition of the Atomic Energy Commerce license.[525]

The dual jurisdiction thus involved creates the possibility of conflicting regulatory standards. This is particularly true with respect to accounting practices. The accounting standards required to establish financial responsibility under the Atomic Energy Act [526] may well differ from those of the Federal Power Commission for rate-making purposes. Indeed, critics of the present Atomic Energy Act have attacked its Section 103 commercial licensing provisions as lacking the accounting and other financial restrictions imposed by the Federal Power Commission by statute and regulation.[527]

Further, a possible conflict in accounting practices may arise in connection with the determination of a "fair price" to be paid by the AEC for the production of special nuclear material in a licensed reactor. Section 56 of the Atomic Energy Act of 1954 [528] provides that the agency, in determining such fair price, "may give such weight to the actual cost of producing that [special nuclear] material as the Commission finds to be equitable." Any difference in the methods of computing costs of such material under accounting regulations enforced by the AEC, Federal Power Commission, or a state agency would, of course, be undesirable and possibly result in inequity to the licensee.

[525] Atomic Energy Act of 1954, Section 272, U.S.C.A. §2019; see 10 Code Fed. Regs., §50.43(c). Section 271 of the statute further provides that "[n]othing in this Act shall be construed to affect the authority or regulations of any Federal, State, or local agency with respect to the generation, sale, or transmission of electric power" (42 U.S.C.A. §2018).

[526] Section 182a, 42 U.S.C.A. §2232(a); 10 Code Fed. Regs. §50.40(b).

[527] H.R. Rep. No. 2181, *supra* note 5, at 122-123; Adams, *supra* note 239 at 168-170. In its report at the end of 1957, the Commission stated (Twenty-third Semi-Annual Report 98-99 (1958)): "Ascertaining costs for nuclear electric plants has required new applications of accounting principles. The items of capital costs of conventional plants are specified by the Federal Power Commission, for example, but as yet there is no agreement on the components of capital costs for nuclear reactors. During the past year the [Atomic Energy] Commission has studied the accounting problems inherent in power reactor construction and operations, and has developed an accounting basis for use in determining the operating economics of these new plants. . . . The Commission has been working with the Federal Power Commission and the National Association of Railroad and Utility Commissioners on revising classification of accounts to cover production of power through the use of reactors."

[528] 42 U.S.C.A. §2076.

D. Conclusions

As officials of the Atomic Energy Commission often have observed since passage of the Atomic Energy Act of 1954, a license issued thereunder is not, like a contract, a mere matter of negotiation.[529] Presumably, all requirements of the statute and regulations being satisfied, the applicant for a license will be entitled as a matter of legal right to engage in the activities covered by the 1954 act and his application.

This approach, however, oversimplifies the problem confronting the private organization or business seeking to risk its capital and resources in the development of atomic energy for peacetime uses.[530] A license could be a "gun [without] . . . ammunition" if the Commission chose not to make available to the licensee such services as supplying enriched uranium, a matter of negotiation and not of right.[531] Moreover, although an applicant may satisfy the requirements when the license is issued and may negotiate successfully for necessary supplies and services from the Commission, he can never be sure what changes in these requirements, and consequently changes in the terms of the license itself, will be made in the future.

As the McKinney Panel has found, the over-all effect of the restrictions imposed upon Section 103 and 104 licensees "appears to be contrary to the stated objectives of the [1954] Act" and constitutes "an interference by the Federal Government in the right of the private investor to risk his own money, even to go broke, if he chooses to do so." [532] Further,

> The emphasis in the 1954 Act on licensing is sound as a means of establishing equality of treatment of private participants, only if it is recognized that licensing rather than Federal ownership is to be the future course.[533]

So long as regulation of licensing is uniform and without serious changes in policy, the infant atomic energy industry can be reasonably certain of the requirements which must be met. In this respect, the

[529] Speech by Charles G. Manly, AEC Division of Civilian Application, July 27, 1955, BNA, Atomic Industry Reporter 277: 1.

[530] See Brief for Applicant in the PRDC proceeding, *supra* note 314 at 87.

[531] Upton, *supra* note 207 at 496. The Commission occupies the dual function of licensing regulator and "bargaining agent for the services" needed under a license. This means that the licensee is "dependent upon the Commission's good will alone and therefore is small consolation to lawyers accustomed to ascertaining their clients' rights and not merely negotiating their privileges" (*id.* at 498).

[532] McKinney Panel Report, *supra* note 10 at 132.

[533] *Id.* at 134.

Commission and its staff, in general, have performed an outstanding public service in establishing a unique system of federal regulation in which the interests of the government and of private industry, not always mutual, must be accommodated. The regulatory procedures established have been in general conformity with both the spirit and the letter of the Federal Administrative Procedure Act, as required by the Atomic Energy Act itself and in the interest of administrative due process.

The infirmities in the present licensing system are due not so much to the officials who administer the Atomic Energy Act of 1954 but to the statute itself, which these officials are bound to follow in promulgating the applicable regulations. The language of that act is so general in many important particulars as to be capable of differing interpretations.[584] For example, "national welfare" as used in the act has been interpreted with two entirely different emphases by proponents and opponents of private enterprise in the atomic field. The one interpretation favors minimum regulation to the extent consistent with national security and public health and safety. The other would require maximum regulation which would place private industry under complete government domination in the licensed activity and thus tend to leave the field for public agencies alone.

The result is that the 1954 act and the regulations issued thereunder contain within their provisions the possibilities for destroying the private participation which the act purports to seek and encourage. Such an event could result from a radical change in Commission membership, with a consequent reversal of current policies. Therefore, in the interests of both the government and private enterprise, the 1954 statute should be re-examined with a view to establishing more definite standards for licensing, particularly with respect to commercial production and utilization facilities. If a reasonably favorable climate of regulation is lacking and especially if a markedly unfavorable attitude is adopted by the AEC and Congress, then it is clear that atomic development will be retarded, and the public will not enjoy the full benefits of this new source of energy.

Re-examination of the antitrust procedures and conflicting jurisdictional problems arising under provisions of the present act and its regu-

[584] Stason, Atomic Energy Workshops, *supra* note 215 at 4: ". . . [T]here are only the vaguest 'standards' to guide the hand of the Commission. Whether or not licenses shall be issued in the first instance and whether or not they shall be modified or revoked subsequence to issuance, depends almost exclusively upon the uncontrolled discretion of the Commission"

lations also is desirable in the public interest. If industry is to assume the role intended and stated by Congress in developing the field of peacetime atomic energy without huge expenditures of federal funds, then the means for harassment of industry which are potentially present in the act must be modified, consistently with the public interest to encourage the development of a new and useful form of power.

The statutory deficiencies in the Atomic Energy Act of 1954 have assumed added importance in the light of amendments to that statute enacted by Congress during 1957, the cumulative effect of which is to add greatly to the powers of the Joint Committee on Atomic Energy. Indeed, it is not an exaggeration to state

> . . . that the Congress, and in particular the Joint Committee on Atomic Energy, has seized control over the civilian atomic power program and has stripped the AEC of a large measure of the responsibility, authority, and discretion which it previously had possessed and which executive agencies normally possess.[535]

Under the 1946 statute, the Joint Committee came close to assuming the authority of the Commission itself, with the agency relegated to the role of general manager of the program. This unsatisfactory division of authority was rectified in some degree by the provisions of the 1954 legislation. Yet, with the new powers exercised by the Joint Committee under the 1957 amendments, particularly with respect to detailed control over expenditures by the Commission, the pre-1954 situation may well have been re-established.

Until the respective relationships and authorities of the Congressional Committee and the Commission are definitely established, uniform and consistent administration of the licensing provisions of the Atomic Energy Act of 1954 is not assured, and a program of peaceful utilization of atomic energy may well be inhibited.

IV. ATOMIC ENERGY COMMISSION CONTRACTING[536]

Just as the issuance of licenses constitutes the most important aspect of the regulatory functions of the Atomic Energy Commission, so the

[535] Green, *supra* note 480 at 124. See letter from AEC Chairman Strauss to Rep. Cole, Aug. 3, 1957, 103 Cong. Rec. A6319-A6321 (Aug. 5, 1957); Hartwell, *supra* note 478 at 639: "To encourage the parties in a formal AEC proceeding to try their case not only judicially but also at the same time before Congress is not only in derogation of the administrative and judicial processes provided by law but will in our judgment go far toward destroying efficient and speedy administration of the development of civilian atomic power. . . ."

[536] For general background information on government contract problems and pro-

making of contracts provides the major means whereby the Commission administers and operates the atomic energy plant owned in a proprietary capacity by the United States government. Indeed, that plant is the largest single business of its kind in the United States, and probably in the free world. Atomic energy installations and other facilities have an estimated value before depreciation of approximately $7.06 billion.[537] More than 117,000 persons, including over 6,700 government personnel, are engaged in the operation of existing, and the construction of new, production facilities[538] under government control. Over one billion dollars was paid out by the Commission during fiscal year 1955 to cost-type contractors and directly to subcontractors.[539]

Commission contracting powers go further than the mere provision for the construction and operation of the government's atomic energy plant. Under the civilian power reactor program authorized by the Atomic Energy Act of 1954, the Commission's willingness to supply certain services and to contract for research has become an important adjunct to the system of licensing control established under that statute.

The Manhattan Engineer District, predecessor of the Commission, established the policy of operating its facilities through contracts with private business units. This practice was continued by the Commission when it took over the operations of the District on January 1, 1947.[540]

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cedure, see Tybout, Government Contracting in Atomic Energy (1956); Risik, "Federal Government Contract Clauses and Forms," 23 Geo. Wash. L. Rev. 125 (1954); vom Baur, "Defense in the Atomic Age, the Law, and the Bar," 9 Wyo. L. J. 25 (1954); Cuneo, "Armed Services Board of Contract Appeals; Tyrant or Impartial Tribunal?" 39 A.B.A.J. 373 (1953); Joy, "The Disputes Clause in Government Contracts: A Survey of Court and Administrative Decisions," 25 Ford. L. Rev. 11 (1956); Shea, "Government Contracts; Standard Disputes Clause: Effect of Act of May 11, 1954," 40 Corn. L. Q. 355 (1955); Moss, "Practice Before Government Agencies," 15 Fed. Bar J. 155 (1955); Schultz, "Proposed Changes in Government Contract Disputes Settlement," 67 Harv. L. Rev. 217 (1953); Anderson, "The Disputes Article in Government Contracts," 44 Mich. L. Rev. 211 (1945); Kennedy, "The Conclusiveness of Administrative Findings in Disputes Arising under Government Contracts," 4 Baylor L. Rev. 160 (1952); Etheridge, "Appeals from Administrative Decisions in Government Contract Disputes," 31 Tex. L. Rev. 552 (1953). See also "Bibliography on Government Procurement and Contractual Procedure and Related Material," published by the Law Branch of the Army Library and revised at regular intervals, which can be obtained by writing the Department of the Army, Washington 25, D.C. Numbers 2 and 3 of Volume 16, Fed. Bar J., contain an excellent summary of numerous problems relating to subcontractors of the Federal Government.

[537] AEC, Twenty-third Semi-Annual Report 302 (1958).

[538] *Id.* at 307-308.

[539] Minsch, "Subcontracting in the Atomic Energy Program," 16 Fed. Bar J. 190-191 (1956).

[540] AEC, Twenty-third Semi-Annual Report 10 (1958).

Government operation of production facilities appears to have been conclusively rejected by the Commission. This policy assumes additional importance under the Atomic Energy Act of 1954, whereby Congress sought to encourage a privately owned and operated atomic energy industry through contractual relationships and cooperation between government and business.[541]

Despite the increasing importance of the role of contracting between the Commission and private business in the development and expansion of atomic energy for both military and industrial uses, the procedural and substantive problems created by this method of administrative control have tended to be overlooked by both government and private interests. This failure is unfortunate, but not surprising, in view of the current lack of development of procedures assuring administrative due process in other fields of government contract endeavor.

A. Contracts in Administrative Law

The current attitude of the Executive Branch of the government and of the courts towards contracts between the government and its citizens stems in large part from the concept that, when entering into a contract, the government exercises a "proprietary" function.[542] This means that, since the government claims to assume the role of a private person in contractual dealings with private business, the government's actions are not necessarily held to be controlled by, or reviewable with respect to, accepted standards of administrative due process applicable to licensing and other more orthodox regulatory procedures. Moreover, government ownership of special nuclear material under the Atomic Energy Act of

[541] See BNA, Atomic Industry Reporter 221:1: "Contractor operation of Commission-owned research and production facilities lays the foundation for eventual termination of Government monopoly in this field and for integration of atomic energy development into the private enterprise system which is characteristic of this nation. Under the present atomic energy program as a whole, the Government draws upon the managerial skill of private enterprise, in return for which private enterprise acquires specialized technical knowledge in the field of atomic energy which, under present necessities of information control, is obtainable in no other manner." See also AEC Response to Questionnaire, *supra* note 77 at 1088: "The operations of AEC are carried out largely by industrial concerns and by private and public institutions under contract with the Commission. . . ." AEC, Twenty-third Semi-Annual Report 138, 161 (1958).

[542] The closest statutory definition of what constitutes a "proprietary" function is found in Section 4(2) of the Federal Administrative Procedure Act of 1946, 5 U.S.C.A. §1003(2), which refers to "any matter relating to agency management or personnel or to public property, loans, grants, benefits, or contracts" and which excludes these subjects from the requirements for public rule making.

1954 [543] gives the Commission, if it desires to exercise it, a powerful means of controlling not only contracting but also licensing under claim of exercise of the agency's "proprietary" rights.

A corollary of the doctrine of "proprietary" function is that the private citizen or business dealing contractually with the government has only a privilege, not a right.[544] Persons contracting with the government, as the Supreme Court has stated, are not "compelled or coerced into making the contract" which is considered a "voluntary undertaking on their part." [545] Should this exercise of the "privilege" be curtailed or denied in any way, therefore, neither general nor constitutional law provides an effective remedy for the injured party as a matter of right, except insofar as the courts are empowered to consider cases involving damages arising from breach of contracts.

This concept of the government's "proprietary" functions and, as a corollary, the privilege status of private parties in the field of contracts are reflected in the provisions—or lack of them—with respect to contracting in the Federal Administrative Procedure Act of 1946. Procedures under the Contract Settlement Act of 1944 [546] are specifically exempted from the Administrative Procedure Act.[547] In Section 4(2) of the Administrative Procedure Act [548] the making of rules with respect to contracts, public property, and similar "proprietary" matters is excepted from the salutary requirements of public notice and hearing procedures required of most types of federally issued rules and regulations.

[543] Section 52, 42 U.S.C.A. §2072.

[544] See Schwartz, "A Decade of Administrative Law," 51 Mich. L. Rev. 775, 843 (1953): "The government contractor . . . is seen to have only the 'privilege' of dealing with the government. He is placed in a different position from that of the private citizen whose property or personal 'rights' are adversely affected by administrative action." For what a congressional committee has termed "All in all . . . a shameful story" of unrestrained administrative over-reaching in the field of government contracts, see Heyer Products Co., Inc. v. United States, 140 F. Supp. 409, 412 (Ct. Cls. 1956).

[545] United States v. Wunderlich, 342 U.S. 98, 100, 72 S. Ct. 154 (1951). See Wells Bros. Co. v. U.S., 254 U.S. 83, 87, 41 S. Ct. 34 (1920) ("Men who take million dollar contracts for Government buildings are neither unsophisticated nor careless. . . .").

[546] 41 U.S.C.A. §§101 *et seq.*

[547] Section 2(a), 5 U.S.C.A. §1001(a); see Sen. Doc. No. 248, *supra* note 43 at 44, 196, 302, 313, where the congressional emphasis is upon the temporary wartime nature of the Contract Settlement Act as justification for the exception.

[548] 5 U.S.C.A. §1003(2); see Sen. Doc. No. 248, *supra* note 43 at 199, 257: "The exception of proprietary matters is included because the principal considerations in most such cases relate to mechanics and interpretations or policy, and it is deemed wise to encourage and facilitate the issuance of rules by dispensing with all mandatory procedural requirements. . . ."

In this connection, the rules of the Atomic Energy Commission with respect to procurement policy [549] and to the procedure of agency's Advisory Board of Contract Appeals [550] were promulgated apparently, without public participation in the rule-making process.

Although the federal government and the courts consistently adhere to the theory that the making and administration of public contracts is not a phase of administrative procedure,[551] it is clear that a "Government contract . . . is but a convenient administrative device for the Government to get its procurement work done and . . . administrative decisions of the Government's officers should be treated no differently from other administrative orders which affect private interests." [552] As is the case in most other federal agencies and departments, however, neither the statutory nor regulatory procedures of the Atomic Energy Commission recognize this obvious and important fact of governmental life.

B. Contracting Authority under Atomic Energy Act of 1946

Provisions of both the Atomic Energy Acts of 1946 and 1954 dealing with the contracting authority of the Atomic Energy Commission were, until 1957, substantially similar. The major difference arose from the implementation of sections of the later statute with respect to the use of electrical power produced by atomic energy, which authority was not sought to be exercised by the Commission under the earlier legislation. However, in 1957, Congress provided for certain special contractual treatment for publicly and cooperatively owned utilities [553] and for Con-

[549] 10 Code Fed. Regs. Pt. 5, 16 Fed. Reg. 1759 (Feb. 22, 1951).

[550] 10 Code Fed. Regs. Pt. 3, 15 Fed. Reg. 5834 (Aug. 30, 1950).

[551] See Ramey and Erlewine, "Introduction to the Concept of the 'Administrative Contract' in Government Sponsored Research and Development," 17 Fed. Bar J. 354, 355 n. 3 (1957).

[552] Schultz, *supra* note 536 at 246-47, who adds: "Be that as it may, contract notions are so deeply imbedded in the thinking of judges and businessmen that it would be revolutionary for one to deny their expectation that an individual or corporation contracting with the Government will be fully protected with traditional rights and remedies. . . ." Proposed legislation drafted by the Task Force on Legal Services and Procedure of the Commission on Organization of the Executive Branch of the Government specifically defines "the performance of all proprietary functions such as . . . the execution [or performance] of public contracts in which private rights, claims, or privileges are asserted or affected" as informal adjudication; Administrative Code, Section 202(b), Hoover Commission Legal Task Force Report, *supra* note 43 at 366.

[553] Section 111(a)(1), Pub. L. 85-162, 85th Cong., 1st Sess. (1957); see discussion, *infra*.

gressional review of contracts involving the expenditure of public funds in connection with private projects.[554]

Authority to execute contracts was specifically granted the Atomic Energy Commission under the 1946 statute with respect to four major categories of activity. Three of these provisions were extensively used by the agency. The fourth, relating to byproduct power resulting from utilization of atomic energy, proved a deadletter.

Under Section 3(a) of the Atomic Energy Act of 1946,[555] the Commission was "authorized and directed to make arrangements (including contracts, agreements, and loans)" for the conduct of research and development activities relating to nuclear processes, the theory and production of atomic energy, and similar matters of primarily scientific importance. Section 4(c)(2) [556] conferred the authority to contract with private industry for the construction and operation of production facilities for fissionable materials. Section 5(a)(5) [557] authorized contracts for the purchase of fissionable materials outside the United States, or of "any interest in facilities for the production of fissionable material or in real property on which such facilities are located." Finally, under Section 5(b)(5) and (6),[558] authority was granted the Commission to contract for supplies of source material or for any interest in real property containing source material, and for "exploratory operations, investigations, and inspections" with respect to such material.

In exercising its authority under the above sections, the Commission was permitted to forego competitive bidding by advertising "upon certification . . . that such action is necessary in the interest of the common defense and security, or upon a showing that advertising is not reasonably practicable." [559] The statutory conditions imposed upon contractors under these sections related to health and safety measures, requirements for reports and inspections, and subcontracting only with Commission approval.[560]

[554] Section 111(b), Pub. L. 85-162, 85th Cong., 1st Sess. (1957) and Section 261a, as amended, 42 U.S.C.A. §2017(a), Pub. L. 85-79, 85th Cong., 1st Sess. (1957); see discussion, *infra*.

[555] 42 U.S.C. §1803(a)(1946).

[556] 42 U.S.C. §1804(c)(2)(1946).

[557] 42 U.S.C. §1805(a)(5)(1946).

[558] 42 U.S.C. §1805(b)(5) and (6)(1946).

[559] Otherwise required by Section 3709 of the Revised Statutes, 41 U.S.C.A. §5. Under Executive Orders 10216 (Feb. 23, 1951) and 10210 (Feb. 2, 1951), Commission contracts made without competitive bidding had to contain a clause authorizing the Comptroller General to have access to, and to examine, the contractor's books.

[560] Section 3(a), 42 U.S.C. §1803(a)(1946), also provided with respect to research

Two sections of the 1946 act related to sales of electrical energy generated in connection with the production of fissionable material. The first of these provisions under Section 7(d) [561] was never utilized, since no commercial licenses which might have resulted in power generation ever were authorized. Under the second statutory provision enacted July 17, 1953,[562] the Commission was authorized, in connection with the construction or operation of its Oak Ridge, Paducah, and Portsmouth installations, to enter into contracts for electric-utility services for periods not exceeding twenty-five years. This authority served as the basis for a similar but expanded provision in the 1954 act.[563]

The Atomic Energy Act of 1946 contained no provisions dealing with the general contracting authority of the Atomic Energy Commission, other than that the agency was empowered to acquire materials, property, equipment, and facilities, and to acquire, purchase, lease and hold real and personal property required to carry out its functions.[564] Procurement regulations,[565] and the statutory [566] authority of, and regulations affecting,[567] the Advisory Board of Contract Appeals under the 1946 act were continued in effect under the Atomic Energy Act of 1954,[568] and will be discussed in connection therewith.

C. Contracting Authority under Atomic Energy Act of 1954

1. Research

Section 31 of the Atomic Energy Act of 1954 [569] is the counterpart of Section 3(a) of the earlier statute. The principal difference in language between the earlier and later provisions lies in the broadened scope of research and development activities under the 1954 act,[570] this being in accordance with the proposed aims of that statute.[571]

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that no contract "shall . . . contain any provisions or conditions which prevent the dissemination of scientific or technical information, except to the extent such dissemination is prohibited by law."

[561] 42 U.S.C. §1807(d)(1946).

[562] Section 12(d), 42 U.S.C. §1812(d)(1946).

[563] Section 164, 42 U.S.C.A. §2204.

[564] Section 12(a)(5) and (7), 42 U.S.C. §1812(a)(5) and (7)(1946).

[565] 10 Code Fed. Regs. Pt. 5, 16 Fed. Reg. 1759 (Feb. 22, 1951).

[566] Section 12(a)(1) and (c), 42 U.S.C. §1812(a)(1) and (c)(1946).

[567] 10 Code Fed. Regs. Pt. 3, 15 Fed. Reg. 5834 (Aug. 30, 1950).

[568] Note, 10 Fed. Regs. Ch. I, 19 Fed. Reg. 5628 (Sept. 3, 1954).

[569] 42 U.S.C.A. §2051.

[570] Section 3(a)(4) of the Atomic Energy Act of 1946 authorized AEC contracts for, among other things, "utilization of fissionable and radioactive materials and processes entailed in the production of such materials for all other purposes, including in-

Under Section 31 of the present statute,[572] the Commission is authorized and directed to make arrangements, including contracts, for the conduct of research, development, and training activities relating to (1) nuclear processes, (2) the theory and production of atomic energy, (3) utilization of special nuclear material and radioactive material for medical or other purposes, (4) utilization of special nuclear material, atomic energy, and radioactive material and processes entailed in the utilization or production of atomic energy or such material for all other purposes, including industrial uses, the generation of usable energy, and the demonstration of the practical value of utilization or production facilities for industrial or commercial purposes, and (5) protection of health and safety. Where the Commission "finds private facilities or laboratories are inadequate to the purpose," it is authorized to conduct research for private parties in its own facilities for the purposes stated in Section 31.[573] Although Section 169 [574] of the 1954 act prohibits the making of any subsidy to the holder of a license or construction permit under Sections 103 and 104, a payment made by the Commission to a permittee or licensee, pursuant to a contract under Section 31, is specifically permitted by Section 169.

Section 31 contains provisions with respect to contractual conditions assuring health and safety, requiring reporting, and permitting inspection of work done thereunder. As was the case under the Atomic Energy Act of 1946,[575]

> No such arrangement [under Section 31] shall contain any provisions or conditions which prevent the dissemination of scientific or technical information, except to the extent such dissemination is prohibited by law.[576]

Contracts may be made without public advertising for bids upon Commission certification that such action is necessary in the public interest or upon a showing that advertising is not reasonably practicable.[577]

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dustrial uses." Under Section 31a(4) and the 1954 act, this class of contracts has been greatly extended beyond mere "industrial uses."

[571] Sections 1, 2a and g, and 3b and d, 42 U.S.C.A. §§2011, 2012(a) and (g), and 2013(b) and (d).

[572] Section 31a(1)-(5), 42 U.S.C.A. §2051(a)(1)-(5).

[573] Section 33, 42 U.S.C.A. §2053.

[574] 42 U.S.C.A. §2209.

[575] Section 3(a), 42 U.S.C. §1803(a)(1946).

[576] Section 31d, 42 U.S.C.A. §2051(d). Control of information is covered in Sections 141-146, 42 U.S.C.A. §§2161-2166, of the 1954 act.

[577] Section 31b, 42 U.S.C.A. §2051(b); see note 559, *supra*. Detailed regulations concerning procurement without formal advertising are contained in 10 Code Fed. Regs. §§5.81-5.93.

2. Commission Production Facilities

Contracting authority of the Commission with respect to the production of special nuclear material under the Atomic Energy Act of 1954 [578] is broader than under the 1946 statute.[579] Under Section 41b of the new act, substantially equivalent to Section 4(c)(2) of the Atomic Energy Act of 1946, the Commission may continue former contracts or enter into new contracts for the construction and operation of facilities owned by the Commission for the production of special nuclear material. Such contracts must assure protection against health and safety hazards, must permit inspection by and require reports to the Commission,[580] must contain security restrictions,[581] and may be negotiated without competitive bidding under certain stated circumstances.[582] The Commission also is given authority to acquire production facilities or to acquire real estate for the construction of production facilities for its own needs, again in some cases without regard to public advertising.[583]

3. Energy Generated in Production Facilities

An important provision of the 1954 act, as originally enacted, with respect to the production of special nuclear material,[584] permitted the Commission "to dispose of usable energy generated in the production facilities or in the experimental utilization facilities owned by the Commission." [585] Concerning this statutory provision, the Joint Committee on Atomic Energy has stated:

> If the energy is sold to publicly or privately owned utilities or users, the price is to be subject to regulation by the appropriate agency, State or Federal, having jurisdiction. This section will permit the Commission to dispose of that utilizable energy it produces in the course of its own operations, but does not permit the Commission to enter the power-producing business without further congressional authorization to construct or operate such commercial facilities.[586]

[578] Sections 41-44, 42 U.S.C.A. §§2061-2064.

[579] Section 4(c), 42 U.S.C. §1804(c)(1946).

[580] Section 41b(1)-(2), 42 U.S.C.A. §2161(b)(1)-(2).

[581] Section 145a, 42 U.S.C.A. §2165(a).

[582] Section 41b provides that "[a]ny contract . . . may be made [without competitive bidding] . . . upon certification of the Commission that such action is necessary in the interest of the common defense and security or upon a showing by the Commission that advertising is not reasonably practical." See notes 559 and 577, *supra*.

[583] Section 43, 42 U.S.C.A. §2063.

[584] Section 44, 42 U.S.C.A. §2064.

[585] H.R. Rep. No. 2181, *supra* note 5 at 14-15.

[586] *Ibid.*

By a 1957 amendment to the statute, the agency was authorized to sell, or contract for the sale of, certain utilities, including electric power and steam, to purchasers within the Commission-owned communities or in the immediate vicinity thereof, where the Commission determined that such utilities "are not available from another local source and that the sale is in the interest of the national defense or in the public interest." [587]

Under the Atomic Energy Act of 1954, preference and priority in the use of Commission-produced power must be given "to public bodies and cooperatives or to privately owned utilities providing electric utility services to high cost areas not being served by public bodies or cooperatives." [588] This provision applies to contracts for the sale of energy derived from government plants the same priorities imposed upon holders of commercial licenses for a utilization or production facility for the generation of commercial power.[589]

4. Purchase of Special Nuclear and Source Materials

Under the Atomic Energy Act of 1954, the Commission is authorized to contract for the purchase of special nuclear material outside the United States.[590] This constitutes a little-known but highly important activity of the Commission in the field of contract authority.[591]

The purchase of source materials by the Atomic Energy Commission is covered in some detail in the 1954 statute. Under Section 66 [592] thereof, the agency is authorized to acquire supplies of source material, interests in real property containing such material, or rights of entry into property believed to contain such material. Section 67 [593] authorizes the Commission to lease lands belonging to the United States for mining or prospecting for source materials in special situations requiring Commission inducement of private efforts in this field.[594]

[587] Section 161s, 42 U.S.C.A. §2201(s), as added by Pub. L. 85-162, 85th Cong., 1st Sess. (1957).

[588] Section 44, 42 U.S.C.A. §2064.

[589] Sections 103 and 182c, 42 U.S.C.A. §§2133 and 2232(c).

[590] Section 55, 42 U.S.C.A. §2075.

[591] This is done largely through the Combined Development Agency (CDA), established in 1944 for joint foreign procurement by the United States and the United Kingdom. Formerly a member of CDA, Canada sells uranium to the United States under AEC contracts. Belgium, South Africa, Australia, and Portugal have contracts with CDA. See AEC, twentieth Semi-Annual Report 3-5 (1956); AEC, Twenty-second Semi-Annual Report 4-7 (1957).

[592] 42 U.S.C.A. §2096.

[593] 42 U.S.C.A. §2097.

[594] See H.R. Rep No. 2181, *supra* note 5 at 17-18: "The Commission has exercised this right in the past based on reservation to the United States of all rights to source

5. Electric Utility Contracts

The Atomic Energy Act of 1954 contains the most controversial section dealing with the contracting authority of the Commission since the agency's inception in 1947. In 1953 Congress added a subsection to the 1946 statute permitting the Commission to make 25-year contracts for the purchase of electrical power to operate the Oak Ridge, Paducah, and Portsmouth installations, without advertising for bids therefor and with authority to terminate the contracts upon payment of cancellation costs.[595] What had been enacted in 1953 as Section 12(d) of the 1946 act was proposed in the same form in the first bill which the Joint Committee reported to Congress as the Atomic Energy Act of 1954.[596]

In an attack upon the Commission's interpretation of Section 12(d), which was proposed Section 164 of the new act, two members of the Joint Committee claimed that the agency proposed

> . . . to maintain its present firm contract for TVA power to run the Paducah Plant while contracting for some 600,000 kilowatts of additional power to be delivered by the private utility group to the TVA for service in the Memphis area, several hundred miles away from any atomic-energy installation. In other words, the AEC would become a "power broker," purchasing power it does not need for an area far removed from its activities. The TVA would be forced into buying the power from the private group through AEC instead of building its own plant to serve the Memphis area.[597]

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materials in the public lands. This reservation is contained in the Act. The Commission believes that it needs to have the power to lease expressly granted to it, now that this reservation is no longer carried in the bill. . . . It is the intent of Congress that this leasing power should be invoked only where it is the only means of achieving private development of deposits of source materials in lands belonging to the United States. It is not intended to supplant the mining laws in any normal situation."

[595] Section 12(d), 42 U.S.C.A. §2204, Pub. L. 137, 83rd Cong., 1st Sess. (1953). See H.R. Rep. No. 676, 83d Cong., 1st Sess. 3 (1953): "By the arrangements that have been negotiated with the three utility companies [Ohio Valley Electric Co., Electric Energy, Inc., and Tennessee Valley Authority], the Commission is kept out of the utility business, the Congress is relieved of the necessity of appropriating an additional sum of $1 billion this year for power-generating stations for the new gaseous diffusion plants, and in the event of a shutdown in the future, the Government will not be faced with the problem of disposing of a super Muscle Shoals." In its opinion in Mississippi Valley Generating Company, Holding Company Act Rel. No. 12, 794 (Feb. 9, 1955), the Securities and Exchange Commission indicated that it considered Congress to have passed upon the validity of the MVG contract in enacting Section 164 of the Atomic Energy Act of 1954, CCH Fed. Sec. Law Rep., ¶76,330, p. 79,403.

[596] Section 164, H.R. 9757, 83d Cong., 2d Sess. (1954).

[597] H.R. Rep. No. 2181, *supra* note 5 at 115. See also dissenting opinion of SEC Commissioner Rowen in Mississippi Valley Generating Company, *supra* note 595 at

The dissenters further argued that the legislative history of the 1946 act did not substantiate the intrepretation placed by a majority of the Commission upon Section 12(d).[598]

As finally enacted,[599] Section 164 contained the questionable device of a Congressional interpretation of authority, rather than an outright grant thereof.[600] Further, the authority retained by the Joint Committee to consider a proposed contract for thirty days created serious problems with respect to the proper division of powers between the Executive and the Legislative Departments and was bound to be the subject of con-

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79,411: "The MVG plant will not make available to the AEC facilities additional electrical energy not otherwise available. . . . The power to be generated by MVG will be supplied to TVA and will be consumed in the Memphis area. . . ."

[598] H.R. Rep. No. 2181, *supra* note 5 at 115: "When the Atomic Energy Commission sought and received this authority from the Congress to make long-term contracts, and to pay cancellation charges to the utility groups involved in the event the contracts were terminated, the authority was specifically limited to utility services for the Oak Ridge, Paducah, and Portsmouth installations of the Commission. As the former General Manager, Marion W. Boyer, testified in answer to a question from Congressman Holifield at the time the authorizing legislation was being considered by the committee: 'In other words, it is limited to the power requirements for those three installations. It is not a wide-open authority.'"

[599] "The Commission is authorized in connection with the construction of the Oak Ridge, Paducah, and Portsmouth installations of the Commission, without regard to section 3679 of the Revised Statutes, as amended, to enter into new contracts, or modify or confirm existing contracts to provide for electric utility services for periods not exceeding twenty-five years, and such contracts shall be subject to termination by the Commission upon payment of cancellation costs as provided in such contracts, and any appropriation presently or hereafter made available to the Commission shall be available for the payment of such cancellation costs. Any such cancellation payments shall be taken into consideration in determination of the rate to be charged in the event the Commission or any other agency of the Federal Government shall purchase electric utility services from the contractor subsequent to the cancellation and during the life of the original contract. The authority of the Commission under this section to enter into new contracts or modify or confirm existing contracts to provide for electric utility services includes, in case such electric utility services are to be furnished to the Commission by the Tennessee Valley Authority, authority to contract with any person to furnish electric utility services to the Tennessee Valley Authority in replacement thereof. Any contract hereafter entered into by the Commission pursuant to this section shall be submitted to the Joint Committee and a period of thirty days shall elapse while Congress is in session (in computing such thirty days, there shall be excluded the days on which either House is not in session because of adjournment for more than three days) before the contract of the Commission shall become effective: *Provided, however,* That the Joint Committee, after having received the proposed contract, may by resolution in writing, waive the conditions of or all or any portion of such thirty-day period."

[600] Similar problems are created by Sections 51 and 61, 42 U.S.C.A. §§2071 and 2091, requiring submission of expanded definitions of special nuclear material and source material, respectively, for a period of 30 days to the Joint Committee.

flicting interpretation. The procedure provided in Section 164 set the pattern for Congressional review and control of Commission contracts under the Atomic Energy Act of 1954 as amended in 1957.[601]

The controversy over the sale of energy by private facilities to TVA in alleged replacement of Commission power needs from TVA, has ended in the Court of Claims.[602] Incidental to the controversy has been the conflicting interpretation of the Joint Committee's authority under Section 164. Two days after the contract between the Commission and Mississippi Valley Generating Company was executed November 11, 1954, the Joint Committee decided to waive the thirty-day waiting period under that section. On December 17, 1954, the Comptroller General approved the contract, whereupon a minority of the Joint Committee maintained that the waiting period could not be waived until a contract, approved by that official and otherwise immediately effective, was presented to Congress. On January 28, 1955, the Joint Committee

[601] Section 261a, 42 U.S.C.A. §2017(a).

[602] The early history of the MVG contract is summarized by the SEC in Mississippi Valley Generating Co., *supra* note 595, at 79, 372-79, 395. On July 11, 1955 the President ordered the AEC's contract with the Mississippi Valley Generating Company to be terminated. At that time the Attorney General stated that a "negotiated settlement" would be effected "and added that he had no idea how much the termination might cost the U.S." (BNA, Atomic Industry Reporter 1:38). On July 29, 1955 the Comptroller General ruled that the Commission had authority to use its funds to pay costs for cancellation of a contract which did not contain any provision therefor and despite the language of Section 164 of the Atomic Energy Act of 1954 (Dec. B-120188). On October 7, 1955 the Commission informed the Joint Committee on Atomic Energy that "negotiations for settlement of cancellation costs are being held in abeyance to determine whether the contract actually exists, because of circumstances surrounding the contract's making. The AEC mentions 'possible conflict of interest and public policy'" (BNA, Atomic Industry Reporter 1:146). Five days later the General Accounting Office stated that it had "recommended a go-slow policy to the Commission in reaching a settlement of the contract . . . that might circumvent the government's right to a court test on the validity of the contract" (*id.* at 1:159). Finally, in November 1955, the Commission through its General Counsel repudiated the contract for the reason that "there is a substantial question as to whether there were material violations of law and public policy in the inception of the contract which would result in its being held invalid by the courts" (*id.* at 1:203). The result was the filing on December 13, 1955, of suit by Mississippi Valley Generating Company in the Court of Claims to recover $3,543,778 in cancellation costs from the federal government (*id.* at 1:219). In its answer filed with the court, the Department of Justice prayed that the action be dismissed because the contract was "in violation of the statutes and laws of the United States and . . . unlawful, null, and void, and contrary to public policy" for the reasons that, among others, the activities of one government adviser "involved a conflict of interest so contrary to public policy as to render the alleged agreement null and void," the agreement violated Section 164 of the Atomic Energy Act of 1954, and the contract had not been before the Joint Committee for 30 days (*id.* at 2:229-230).

sought to justify rescission of its original waiver of the thirty-day period in these words:

> In our view the conditions of section 164 were satisfied regardless of the effect of the resolution of rescission. We do not believe that section 164 requires that contracts submitted to the Joint Committee thereunder be immediately effective upon the granting of waiver or the lapse of the thirty-day waiting period. *The purpose of the requirement of section 164 for a waiting period or a waiver was to accord the Congress an opportunity to review the power to make such contracts and to take appropriate legislative action if it so desired.* . . . [T]he section does not require the submission to the committee of a contract which is immediately effective in all respects upon the expiration of the waiting period or the granting of a waiver. The contract has been on file with the Joint Committee from November 11, 1954, to the present time. Thus, even if the waiver action of November 13, 1954, should be considered invalid, the prescribed waiting period of thirty days expired on February 4, 1955, the Congress having been in session since January 5, 1955. The effective date of the contract . . . is then either February 4, 1955, or December 17, 1954, depending on the effectiveness of the waiver, but this difference is not material. . . . (emphasis supplied.) [603]

By this statement, the Joint Committee itself has demonstrated the ineptness of the language of Section 164 and the questionable nature of the requirement that contracts be referred to that body for a period of thirty days. The Committee claims that it merely reviews the "power to make such contracts." The fact is that the Committee reviews the contract itself before its execution and implementation, a power which may well affect what would appear to be essentially an executive function.

6. Congressional Review of AEC Contracts

Atomic Energy Commission discretion in the making of certain types of contracts under the civilian power reactor program has been severely curtailed by action of Congress in 1957. These contracts are those under the first, second, and third rounds of the program in which the agency contributes financial support directly or indirectly to reactor demonstration projects.[604]

Congressional action was due, in part, to a decision of the Comptroller

[603] BNA, Atomic Industry Reporter 221:821.

[604] See text, *supra*, at note 16.

General with respect to the initial contract made by the Commission under the first round invitations of that program, that with Yankee Atomic Electric Company. Under that contract, dated June 4, 1956, the company was to bear construction costs of a pressurized water type reactor with an initially estimated cost of $34.5 millions, while the Commission was to undertake research and development work of up to $1 million in agency facilities and to underwrite up to $4 million of such work by the company itself. The Commission also agreed to waive its normal charge for the use of special nuclear material to fuel the reactor for a five-year period after the issuance of an agency license, at an estimated loss of revenue to the Commission of $3.3 million. Research and development work under the Yankee contract commenced in June 1956 and will continue through at least 1960.[605]

In his report to the Joint Committee February 19, 1957, on review of the Yankee Atomic contract [606] the Comptroller General criticized, among other things, the agreement by the Commission to waive its material use charge for five years,[607] as permitted under the second round invitation for small reactor plants,[608] instead of for 2½ years as provided under the first round invitation.[609] Further, according to the Comptroller General,

> . . . AEC announcements provide that material use charges may be waived up to an agreed-upon amount of money. The [Yankee] contract does not comply with this policy to the extent that it does not specify any limitation on the amount of money of the material use charge waiver but, instead, provides that AEC will waive its use charge for all special nuclear material used during the contract period.[610]

As a result of this criticism by the Comptroller General and Joint Committee sentiment "to shape the development of nuclear power along the lines of its own preference," [611] legislation was enacted by Congress in 1957 which gives, in effect, almost complete legislative control over

[605] For the text of the contract, see 1957 Section 202 Hearings, *supra* note 7 at 741-752; see statement of AEC General Manager Fields, *id.* at 727-728; AEC, Twenty-third Semi-Annual Report 105 (1958); BNA, Atomic Industry Reporter 2: 187.

[606] 1957 Section 202 Hearings, *supra* note 7 at 757-768.

[607] *Id.* at 764.

[608] AEC Press Rel. No. 953 (Jan. 7, 1957); 1957 Section 202 Hearings, *supra* note 7 at 760.

[609] Sept. 21, 1955, 2 CCH Atomic Energy Law Reporter, ¶6539; 1957 Section 202 Hearings, *supra* note 7 at 760-1.

[610] 1957 Section 202 Hearings, *supra* note 7 at 766.

[611] Green, *supra* note 480 at 124.

Commission contracts involving the expenditure of federal funds for the direct or indirect benefit of the private contracting party. This change in the operation and administration of the United States atomic energy program was effected by amendments to Section 261 of the 1954 statute [612] and by provisions of the appropriation act for fiscal year 1958.[613]

As amended, Section 261 of the Atomic Energy Act of 1954 permits only the appropriation of funds, without authorizing legislation approved by the Joint Committee and enacted by Congress, for contracts involving non-military reactors designed to produce less than 10,000 thermal kilowatts of heat. Otherwise, the basis for each individual arrangement, including contracts, agreements, or loans, which involves the expenditure of public funds for other than pure research unrelated to a specific project proposed under the civilian power reactor program, must be presented to the Joint Committee for appropriate authorization. This requires specific approval of "each of the seven arrangements contemplated under the first and second rounds of its [the AEC's] program." [614]

Section 261 was implemented by Congress in the authorization act for fiscal year 1958 [615] to effect the following procedures, thus described by the Joint Committee:

> . . . [B]efore the Commission enters into any arrangement (including contract, agreement or loan) or amendment thereto, the basis of which has not been included in the program justification data previously submitted to the Joint Committee and which involves appropriations . . ., the basis for the arrangement or amendment thereto shall be submitted to the Joint Committee, and a period of 45 days shall elapse while Congress is in session. . . .
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> . . . [S]uch arrangements or amendment must be entered into in accordance with 'program justification data' submitted in connection with the hearings [before the Joint Committee] and with the 'basis' of the arrangement. . . . The phrase 'program justification data' was intended to include the scope, policies, and criteria of the various 'rounds' of the Commission's power demonstration program, as explained by the Commission and interpreted by the [Joint] committee at the time of the hearings and outlined in committee reports.
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> The effect of the requirement with respect to conformance

[612] Pub. L. 85-79, 85th Cong., 1st Sess. (1957).
[613] Pub. L. 85-162, 85th Cong., 1st Sess. (1957).
[614] H.R. Rep. No. 571, *supra* note 241 at 9.
[615] Pub. L. 85-162, *supra* note 613, §111(a)-(b).

> of arrangements with program justification data . . . would be to prevent the Commission from changing its rules and criteria after congressional review during the authorization process. The scope, rules, and criteria of the various rounds of the program could be changed only in connection with resubmission in a subsequent authorization hearing by the Joint Committee.
>
> The contract or arrangement shall also be in accordance with the basis for the arrangement which has been previously submitted to the Joint Committee either during the hearings on the authorizing legislation, or else by the 45-day procedure set forth in the subsection. The Commission must specifically advise the committee when it is submitting a proposal to the Joint Committee as a basis for the proposed contract or arrangement. For example, during the hearings on this bill . . ., the Commission advised the Joint Committee that of the various proposals which it had under consideration, it was submitting only one (Power Reactor Development Co.) for review by the Joint Committee as a basis for a proposed contract or arrangement.[616]

That the Joint Committee will have the final word with respect to Commission contracts involving research and development for particular projects is demonstrated by the Committee's handling of the Commission's request for funds in connection with the Power Reactor Development Co. (PRDC) project. Under its contract with PRDC, the Commission was to provide pre-construction research and development assistance in AEC facilities up to a maximum of $4,450,000. PRDC and its affiliate, Atomic Power Development Associates (APDA) were to pay the remaining cost estimated to be $9 million. The Commission further agreed to waive charges for the use of special nuclear material for five years in an amount aggregating $3,702,600.[617] Two hundred and forty-four thousand dollars having been obligated by the Commission in fiscal year 1957 under the PRDC contract, the agency requested an additional $4,206,000 for authorization in fiscal year 1958, with $1,500,000 of this amount to be obligated in that year and the remainder in fiscal years 1959 and 1960.

The Joint Committee rejected both the request for authorization of funds for pre-construction research and for waiver of fuel charges, "since legal proceedings before the AEC to determine the probable safety of the proposed reactor are still pending." [618] The Committee only

[616] Sen. Rep. No. 791, *supra* note 23 at 33-35.
[617] *Id.* at 10; AEC Twenty-third Semi-Annual Report 117 (1958).
[618] *Id.* at 19.

approved for authorization "the amount of $1,500,000 . . . [to] be expended for research and development in Commission laboratories to advance the technology of the fast breeder reactor concept," [619] and not for pre-construction research and development in connection specifically with the PRDC project.

Coincident with its establishment of *de facto* control over AEC contracting involving the expenditure of federal funds, Congress also has spelled out the manner in which the agency is to make contracts with publicly and cooperatively owned utilities. This Congressional action was designed to expand the Commission's second round invitation under the civilian power reactor program.

The so-called "Cooperative Power Reactor Demonstration Program" inaugurated by Congress was legislatively launched in the authorization act for appropriations for fiscal year 1958.[620] This program requires that, in connection with power reactors proposed to be constructed by publicly and cooperatively owned utilities:

> 1. Arrangements for such projects must be effected by direct negotiations between the Commission and the equipment manufacturer or engineering organization developing, constructing, and designing the nuclear reactor and related facilities.
>
> 2. The Commission must contract with such utilities for "the provision of a site and conventional turbogenerating facilities, operation of the entire plant including training of personnel, sale by the Commission of steam [from the reactor complex to the cooperative or publicly owned organization], and other relevant matters."
>
> 3. Sale of steam by the Commission under its contract with the utility "shall be at the rate based upon cost or value of comparable steam from present or projected plants at the site area," regardless of the actual cost of producing such steam which probably would exceed that of, and be unable to compete with, fossil fuels in the foreseeable future.
>
> 4. Contracts for research and development in connection with these facilities shall be for periods of not more than 10 years.
>
> 5. The reactor installation must be dismantled at the end of the contract period in the event the utility is unwilling to purchase it "at a price to reflect appropriate depreciation but not to include construction costs assignable to research and development." [621]

[619] Section 111(a)(2), Pub. L. 85-162, 85th Cong., 1st Sess. (1957).

[620] *Id.*, Section 111(a)(1).

[621] Sen. Rep. No. 791, *supra* note 23 at 33. The Comptroller General has approved

The special treatment to be accorded contracts with publicly and cooperatively owned utilities by the Commission, by Congressional direction, stemmed from the feeling of the Joint Committee that

> Negotiations by the AEC which would result in jeopardizing the financial integrity of cooperatives and publicly owned organizations would not be warranted on the basis of advancement of the atomic technology. Neither would it be wise to set a contractual pattern on the part of the Government with these small groups and thereby create a precedent for widespread subsidy to large profitmaking private utilities later.[622]

The requirements established by Congress create a double standard of contractual relations which places the major financial and operating responsibility for reactor facilities to be operated by publicly or cooperatively owned utilities squarely upon a federal governmental agency.[623]

D. Contracting with the AEC

Although the Atomic Energy Act of 1954 did not deal comprehensively with the contracting authority of the Commission, that legislation represented a distinct improvement over the 1946 act. As under the prior statute, the 1954 legislation authorized the Commission to acquire material, property, equipment, and facilities and to purchase, lease, and hold real and personal property, as required in the exercise of its functions.[624] The President is authorized to exempt any action of the Com-

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two proposed contracts of the AEC with the Rural Cooperative Power Association, Elk River, Minn., and with the City of Piqua, Ohio, which provided for a flexible price for sale of interruptible reactor steam by the AEC to the utility concerned; Dec. B-136015, May 7, 1958, BNA, Atomic Industry Reporter 221:830.

[622] Sen. Rep. No. 791, *supra* note 23 at 17.

[623] For an initial difficulty experienced by the Commission in negotiating a contract for construction of a reactor under the cooperative program, see AEC, Twenty-third Semi-Annual Report 109 (1958). This involved the proposed construction by Rural Cooperative Power Association of Elk River, Minn., of a 22,000-electric-kilowatt boiling water reactor plant, accepted as a basis for contract negotiations under the second round invitation in April 1956. With the enactment of Pub. L. 85-162, the AEC became responsible for direct negotiations with the selected reactor manufacturer. These negotiations were terminated when the manufacturer notified the Commission that its price for building the reactor, and for accompanying research and development work, would be $10.75 million rather than the $7.93 million ceiling previously agreed upon. Also, on Sept. 20, 1957, the AEC signed a contract with Consumers Public Power District of Columbus, Nebraska, covering construction and operation of a large-scale nuclear power plant at Hallam, Nebraska. This contract, entered as the result of a proposal made under the first round invitation, was signed after the Joint Committee waived the 45-day waiting period established by Pub. Law 85-162.

[624] Section 161e and g, 42 U.S.C.A. §2201(e) and (g); see Section 174, 42 U.S.C.A. §2224.

mission "from the provisions of law relating to contracts whenever he determines that such action is essential in the interest of the common defense and security." [625]

The statute deals with several matters which directly govern provisions of a Commission contract with a prime contractor. First, the cost-plus-percentage-of-cost contract is outlawed.[626] Second, the contract may not provide "for direct payment or direct reimbusement by the Commission of any Federal income taxes on behalf of any contractor performing such contract for profit." [627] Third, where a contract is negotiated with a domestic concern without advertising, it must contain a provision permitting the Comptroller General to have access to the contractor's books for three years after the final payment is made under the contract by the United States.[628] Finally, subcontracts under a prime contract are forbidden unless authorized by the Commission.[629]

[625] Section 162, 42 U.S.C.A. §2202.

[626] Section 165a, 42 U.S.C.A. §2205(a); see, to the same effect, 10 Code Fed. Regs. §5.103. This type of contract also is outlawed by the Armed Services Procurement Act of 1947, 41 U.S.C.A. §153(b), and the Federal Property and Administrative Services Act of 1949, 41 U.S.C.A. §254(b). See Risik, *supra* note 536 at 130; Minsch, *supra* note 539 at 195.

[627] Section 165b, 42 U.S.C.A. §2205(b).

[628] Section 166, 42 U.S.C.A. §2206; see AEC Manual, Section 9111-0311. This requirement applied to Commission contracts prior to 1947 by virtue of Executive orders 10210, 16 Fed. Reg. 1049 (Feb. 6, 1951), and 10216, 16 Fed. Reg. 1815 (Feb. 27, 1951), issued pursuant to the First War Powers Act of 1941, as amended. In contracting with Yankee Atomic Electric Company under the power demonstration reactor program, the Commission agreed, subject to review by the Comptroller General, to amend the examination-of-records' provision to limit its applicability to that portion of the work performed by Yankee which was paid for by the Commission. The Comptroller General ruled that, under the Yankee contract, records relating to all work performed thereunder, and not necessarily reimbursable work, were subject to examination by the General Accounting Office (Dec. B-129114, Oct. 10, 1956). In connection with the AEC's contract with Power Reactor Development Co. (PRDC) the Comptroller General has ruled that, where research and development work by the Commission with appropriated funds would be made under separate contract subject to audit by the General Accounting Office, the prime contract between the agency and PRDC does not violate Section 166 when it fails to include a provision requiring such government audit of accounts in connection with the prime contract (Dec. B-131013, Mar. 22, 1957).

[629] Section 41b(1), 42 U.S.C.A. §2061(b)(1). See Minsch, *supra* note 539 at 194-195: "This somewhat unique statutory restriction on subcontracting is actually but a logical concomitant of the general scheme of the Atomic Energy Act of 1954 (and its predecessor statute) for ensuring, in the interests of the common defense and security and the health and safety of the public, that the AEC will have adequate control over the production and use of special nuclear material." Approximately one-third of the over $1 billion paid by the Commission directly under contracts during fiscal year 1955 went to subcontractors, *id.* at 190-191.

1. Contracting in General

The negotiation, execution, and administration of a contract with the Atomic Energy Commission does not have the same procedural and substantive safeguards which are afforded the businessman or firm seeking a license from that agency. Absent the assimilation of contract procedures to the requirements of administrative due process, the principal safeguard that the prospective government contractor has is his own sense of caution and care in negotiating the terms of the agreement with the agency or department involved. In spite of the general success of the Atomic Energy Commission's program in satisfactorily administering a contract program involving billions of dollars with little public criticism and litigation, healthy self-interest should never be forgotten by the private businessman or concern in negotiating with the Commission.

Like every other agency and department of the federal government, the interests of the Atomic Energy Commission are paramount in negotiating and administering a contract with a private party. Indeed, the basic procurement policy of the Commission, in its own words, is "that supplies and services be procured by the methods most advantageous to the government." [630] In one of the two reported decisions in which he has reversed a recommendation of the Commission's Advisory Board of Contract Appeals, the AEC General Manager has stated that he was "not convinced the rights of the Government should be relinquished by any action of mine which would not have adequate support in the record." [631]

Otherwise stated, "the Government has no paternalistic attitude towards its contractors," and the "contracting officer is going to make the best 'deal' he can for the Government and takes his obligation to protect the Government's interest with seriousness." [632] The General Counsel of the Navy Department has issued this advice in that regard:

> I believe there has been a great deal of misunderstanding about the very character of a Government contract. There are some people who apparently have felt that getting a Government contract means "getting in on the gravy"—that you just

[630] 10 Code Fed. Regs. §5.21; see, to the same effect, §§5.101 and 5.501.

[631] Raecolith Flooring Company, AEC ABCA Dkt. No. 3 (Board's recommendations rejected Sept. 1, 1950), BNA, Atomic Industry Reporter 221:311.

[632] Moss, *supra* note 536 at 159. He adds: "Many contractors seem to be laboring under the impression that the Government will 'take care of them' regardless of contractual provisions. . . . Nothing is further from the truth. The Government is, in fact, a sharp trader, and its officers are trained in that regard. . . ."

> sign up with the Government, and the money begins to roll in. But nothing could be farther from the truth. The Government has a carefully-worked out, meticulous and responsible system of purchasing, designed to provide quality, as well as quantity, which meets the complex and precise requirements of defense and at the very best price. As a result, the so-called 'Government contract' that we hear about has become, not a simple document that can be disposed of with a casual glance; on the contrary, just as the legal requirements and many of the goods which are called for by a Government contract are highly complex, the Government contract has also become complex. . . .
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> . . . [T]he Government does not sit in a paternalistic capacity with its contractors. It does not undertake to "take care" of anybody or to "guarantee" them against loss or against anything else. Its only position is that of a contractor dealing at arms length.[633]

The misconception that the government contracts in other than an attitude of hard bargaining may even be encouraged by the agency or department concerned. The emphasis in attracting would-be bidders for government contracts often is that the entire matter is solely one of "public relations." [634] This approach is used to some extent by the Atomic Energy Commission.[635]

In this connection, it always should be remembered that the government is represented by legal counsel in preparing and negotiating contracts with private persons.[636] This follows logically from the govern-

[633] Vom Bauer, *supra* note 536 at 29 and 31.

[634] Moss, *supra* note 536 at 166.

[635] "Counselor, advisers, or agents are not necessary to obtain business from the AEC, its contractors or subcontractors. Such persons cannot obtain AEC business which the reader of 'Selling to AEC' cannot obtain for himself." (AEC, Selling to AEC (1956), reproduced in BNA, Atomic Industry Reporter 221 : 121). This statement goes beyond the salutary warning needed against use of "five percenters" and "influence peddlers" and encourages the businessman not only to seek business from the Commission but to execute a contract therefor without adequate expert engineering or legal advice.

[636] Vom Baur, *supra* note 536 at 32: "However, there are some Government contractors who appear to feel that they do not need legal advice. They sometimes enter into contracts with the Government without benefit of counsel, and sometimes afterwards complain bitterly when they find out the exact nature of the rights and obligations which they have unwittingly assumed. True, the Government cannot insist that a contractor be represented by counsel. That is his own personal business. But I may say frankly, speaking personally at least, that in my opinion it is very greatly to the advantage of the Government, as well as to that of the contractor, to have him represented by a lawyer. He should be so represented not only at the outset of the negotiations so that the contractor may understand clearly what he is getting into, but

ment's understandable desire to make the best contract possible from its point of view.[637] The need for adequately protecting his business and legal interests is required of the contractor dealing with the Atomic Energy Commission, particularly with respect to cost contracts for large research and development projects. These so-called "administrative contracts" [638] deal only in the broadest terms with the rights and obligations of the parties.[639]

A contract negotiated by a private contractor with any government department or agency is not one negotiated between, or to be administered by, equals. The traditional concept of the Executive Department

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also in the course of the performance of the contract, and in cases before the Armed Services Board of Contract Appeals." See Ramey and Erlewine, *supra* note 551 at 360, n. 8: "In AEC contract negotiations are normally carried on in the field by a 'team' under the leadership of the field manager of operations . . . and with the advice and assistance of the Assistant General Counsel, or other attorney, the Director of Finance and other appropriate staff. . . ."

[637] See Beryllium Corp., AEC ABCA Dkt. No. 6 (Recommendations adopted by General Manager Dec. 19, 1949), BNA, Atomic Industry Reporter 221:312; "Contractor committed to construction of complete buildings for lump-sum consideration cannot recover from Government amount paid sub-contractor in reimbursement for expenses which, because of Government's need for speed, had been overlooked in computation of price."

[638] The term first was used by the AEC in 1951; AEC, Ninth Semi-Annual Report 52 (1951): "The type of cost contract used to a large extent by the Commission for development work may perhaps best be described as an 'administrative contract.' A main emphasis here, as in many other contracts, is upon cooperation between the Government and the contractor to accomplish the particular task. . . ."

[639] See BNA, Atomic Industry Reporter 221:4-5. For a discussion of the "steady trend away from a fixed and definite contract," see Moss, *supra* note 536 at 160-161. The most comprehensive discussion of the "administrative contract" is contained in Ramey and Erlewine, *supra* note 551 at 354 *et seq.* According to the authors, an "administrative contract" is merely a "memorandum of understanding," with a "'charter-like' nature," using "a minimum of legal or technical jargon" (*id.* at 363, 364, 365). In such an agreement, "[t]he parties are not overly concerned with the legal consequences of their relationships in terms of enforcement through litigation, but are careful that the agreement will pass muster with the court of first instance in Government contracts, the General Accounting Office" (*id.* at 355). Although cooperation between the Commission and its contractors is certainly to be sought, and ordinarily assured, this theory of cooperation to the exclusion of spelling out the legal relationship between the government agency and the private party hardly converts the "administrative contract" into a partnership between the parties. Nor does the "growing use of the regulatory approach [to government contracts, emphasizing a detailed contract between the parties] seriously endanger . . . the cooperative, mutual agreement approach to the administrative contract" or defeat "the very purposes" of government contracting (*id.* at 371). If any misunderstanding requiring administrative or judicial relief arises under the contract, it is the private party, not the government, which will find the loose language of the administrative contract the doorway to an adverse decision. Unfortunately for the private contractor, the government is not ordinarily forced to use that doorway.

and the courts that no real difference exists between government and private contracts [640] is unrealistic. The doctrine of sovereign immunity gives the government the choice of determining the forum in which disputes and suits with respect to a contract may be determined. Indeed, "the Government, as a contractor, has insisted on and received favorable treatment in its contracting capacity which it would not receive under ordinary principles of private contract law." [641] The contracting officer, who administers the contract and initially determines disputes thereunder, is hardly an unbiased or disinterested party to the proceedings. Finally, the government has the ultimate authority, on behalf of the Atomic Energy Commission, to seize facilities of a manufacturer who refuses or fails to honor a mandatory order "to obtain prompt delivery of any articles or materials the procurement of which has been authorized by the Congress exclusively for the use of . . . the Atomic Energy Commission." [642]

2. Types of AEC Contracts [643]

The Atomic Energy Commission uses three general types of contracts. The first, the unit-price contract, is used in purchases of supplies, materials, equipment, and other items on which a definite price can be fixed by unit of sale. Purchases of uranium concentrate from uranium processors fall into this category.[644]

Construction programs are largely effected through the use of lump-sum contracts. This is also the type of contract used by the Commission in contracting for research by educational and other types of institutions, the latter being required to put up a certain percentage of the cost of the project.

[640] *E.g.*, United States v. Wunderlich, 342 U.S. 98, 100, 72 S. Ct. 154 (1951); Martinsburg & P.R. Co. v. March, 114 U.S. 549, 553-554, 5 S. Ct. 1035 (1884); see Schultz, *supra* note 536 at 218-219, 222-223.

[641] Schultz, *supra* note 536 at 220.

[642] Selective Service Act of 1948, 50 U.S.C.A. App. §468(a). The armed services are the only other branch of the federal government with this authority.

[643] For excellent discussions of this subject, see BNA, Atomic Industry Reporter 221: 1-7 and 1 CCH Atomic Energy Law Reporter, ¶571 ff.

[644] See 10 Code Fed. Regs. Pt. 60, providing for purchases by the Commission of uranium at guaranteed minimum prices pursuant to contract (§60.1(d)). In connection with a contract by the Commission for the purchase of four to seven million pounds of high purity magnesium annually over a period of 5 years, the Comptroller General has ruled that the Commission lacks authority to contract beyond one year in the absence of special provision therefor, and that, while ". . . no question will be raised about earlier contracts [by the AEC], the principles [in the decision] will apply in the future" (Dec. B-130815, April 2, 1957); see BNA, Atomic Industry Reporter 3: 133

Finally, there is the cost type contract, in which the government pays for the contractor's costs plus a negotiated fixed fee. This category of contract has been used for the construction and operation by private business of agency-owned facilities and represents the so-called "administrative contract." Under this type of agreement, its terms are stated in broad and general terms, the particulars to be developed and agreed upon as the work progresses.

3. AEC Contract Clauses

Like other federal government agencies,[645] the Atomic Energy Commission seeks to standardize clauses contained in the various types of contracts which it makes.[646] This is effected by establishing one series of clauses, the inclusion of which in every contract for over $500 is required,[647] and another series of clauses the inclusion of which is recommended in each type of contract to which applicable.[648]

a. Mandatory Clauses

Mandatory clauses or articles contained in Atomic Energy Commission contracts cover a multitude of public sins which the Congress, by legislation, has seen fit to proscribe.[649] The settlement of disputes also is prescribed in a mandatory contract clause.

In the public policy category of mandatory clauses are the prohibitions against

1. Convict labor;[650]
2. Contingent fees;[651]

[645] See Risik, *supra* note 536 at 132-133.

[646] See AEC Manual, Section 9111-022: "It is the policy of AEC to use standard contract articles and forms wherever practicable. Uniformity in form and substance of contract articles and forms tend to assure impartial treatment of all contractors, expedites negotiation and contract review, and facilitates contract administration." Yet the Joint Committee has found that AEC "contract negotiations have developed a set of unrelated and complicated proposed contracts [under the civilian power demonstration reactor program]. Apparently the terms of each proposal have depended upon the request of the proposer, and the AEC has established no across-the-board standards. Accordingly, there is considerable variation between the types of assistance to be provided under the contracts [negotiated or being negotiated under the first, second, and third-round invitations] . . ." (Sen. Rep. No. 791, *supra* note 23 at 15-16).

[647] AEC Manual, Section 9111-031.

[648] *Id.*, Section 9111-041.

[649] See Gantt, "Labor Provisions of Government Contracts and Subcontractors," 16 Fed. Bar J. 331 (1956).

[650] AEC Manual, Sections 9111-032 and 9116-073. See 18 U.S.C.A. §436, 41 U.S.C.A. §35(d); Gantt, *supra* note 649 at 352-354.

[651] AEC Manual, Section 9111-033.

3. Non-discrimination in employment;[652]
4. Benefits to members of Congress;[653]
5. Assignment of claims;[654]
6. Work in excess of eight hours;[655]
7. Payment of less than minimum wages established by Secretary of Labor;[656] and
8. Purchases of foreign goods contrary to the Buy American Act.[657]

These clauses, together with the Commission's statements of policy with respect to aiding "small business," [658] represent the government's attempt to implement, at the behest of Congress, prevailing social and economic policies.[659]

[652] *Id.*, Sections 9111-035, 9116-083, and 4228-01 *et seq.* See Executive Order 10557, 19 Fed. Reg. 5655 (Sept. 3, 1954); Gantt, *supra* note 649 at 366-370.

[653] AEC Manual, Section 9111-036. See 18 U.S.C.A. §874, 40 U.S.C.A. §276c, 41 U.S.C.A. §51 (the so-called "anti-kickback" acts); Gantt, *supra* note 649 at 348-352.

[654] AEC Manual, Section 9111-037. See 31 U.S.C.A. §203, 41 U.S.C.A. §15.

[655] AEC Manual, Section 9111-0314. See 40 U.S.C.A. §§324-326; Gantt, *supra* note 649 at 342-348.

[656] AEC Manual, Section 9111-0315. See 40 U.S.C.A. §§276a *et. seq.* (Davis-Bacon Act); Gantt, *supra* note 649 at 333-342. The Walsh-Healey Public Contracts Act, 41 U.S.C.A. §§35-45, extends to workers employed under Government supply contracts the protections afforded by the Davis-Bacon Act and the Eight-Hour Laws; see Gantt, *id.* at 354-366.

[657] AEC Manual, Sections 9111-0317-0318 and 9110-019a-019b. See 41 U.S.C.A. §§10a-10d (Buy American Act); Gantt, *supra* note 649 at 364.

[658] 10 Code Fed. Regs. §§5.24, 5.69(a)(2)-(4), 5.506. For a discussion of AEC policies with respect to "small business," see BNA Atomic Industry Reporter 2:110; AEC, Twenty-third Semi-Annual Report 303 (1958); Minsch, *supra* note 539 at 191, n.3 (nearly of the AEC direct payments to subcontractors "went to small business firms"); and Risik, *supra* note 536 at 134: "This clause is generated by a statement of government policy contained in several pieces of legislation to the effect that small business concerns must receive a fair share of government contracts. The purpose of this clause is laudable; it is not conceivable that our economy could function properly without small business concerns. But, it is difficult to see how a pious prayer such as the utilization-of-small-business-concerns helps the situation. The enforceability of such a covenant is doubtful to say the least, and at worst, a contractor might seek to escape responsibility for the acts of his small business concern subcontractors."

[659] Risik, *supra* note 536 at 133-134, 136: "Several clauses find their way into government contracts which actually have only a remote connection with the basic purpose of a contract. . . . There has been an increasing tendency to use government procurement to implement social and economic policies. . . . The effect of these philosophies is a severe headache to the draftsman of a government contract. Not only does the contract become cluttered with impediment which are not encountered in commercial contracting, but the net result is frequently poor and meaningless draftsmanship. If government contracts could be shorn of these extraneous matters in some way, without necessarily freeing the contract from being subject to such national policies as are deemed by the Congress or an administration to be wise, these

Other mandatory clauses deal with disputes, to be discussed hereafter; assignments of contracts without the permission of the Commission;[660] safety, health, and fire protection;[661] permits and licenses required to be obtained by the contractor from local authorities;[662] security;[663] litigation and claims;[664] required bonds and insurance;[665] and renegotiation of profits.[666] Aside from the disputes clause, particularly important to the contractor are the mandatory clauses which (1) permit the Comptroller General to have access to the contractor's books for three years after a final payment under the contract in question,[667] and (2) require the contractor immediately to notify the Commission whenever "an actual or potential labor dispute is delaying or threatens to delay the performance of the work."[668]

b. Non-Mandatory Clauses

Suggested articles to be contained in Commission contracts cover every type of situation which may be involved in the agency's procurement work.[669] Even though primarily or entirely drafted by the govern-

contracts would compare favorably with good commercial documents with respect to simplicity of content, length, and quality of draftsmanship."

[660] AEC Manual, Section 9111-038.

[661] *Id.*, Section 9111-039.

[662] *Id.*, Section 9111-0310.

[663] *Id.*, Section 9111-0312.

[664] *Id.*, Section 9111-0319.

[665] *Id.*, Section 9111-0320.

[666] *Id.*, Section 9111-0321; see Renegotiation Act of 1951, 50 U.S.C.A. App. §§1211 *et seq.* Under Sections 102(a) and 103(a), 50 U.S.C.A. App. §§1212(a) and 1212(c), all contracts with the Atomic Energy Commission "to the extent of the amounts received or accrued by a contractor or subcontractor" on or after January 1, 1951, are made subject to the renegotiation procedure.

[667] AEC Manual, Section 9111-0311. This clause also requires the prime contractor to insert a similar provision in subcontracts. See Comp. Gen. Dec. No. B-129114 (Oct. 10, 1956).

[668] AEC Manual, Section 9111-0313. See Mid West Contracting Co., AEC ABCA Dkt. No. 35 (Board's recommendation adopted by General Manager April 29, 1953), BNA, Atomic Industry Reporter 221: 328: "Contract specification's requirement that contractor satisfy himself as to general and local labor conditions which can affect cost under contract bars his recovery of additional costs incurred when he was required to use plumbers instead of pipelayers to install iron water pipes; contractor was obligated by local custom and local union rules to use plumbers, instead of pipelayers, and he could and should have discovered this by reasonable inquiry required of him under contract specification; less than total observance of union jurisdictional boundaries in installing subdivision water lines does not relieve contractor of obligation to use plumbers since he was engaged in overall large federal construction where many other trades and unions were employed."

[669] AEC Manual, Sections 9111-04 through 096.

ment, such clauses tend to be strictly construed against the contractor and in favor of the government.[670]

E. Settlement of Contract Disputes at Administrative Level

Controversies arising under government contracts traditionally have been sought to be settled by the use of a disputes clause inserted in the contract itself at the insistence of the public agency. In addition, many agencies like the Atomic Energy Commission have appointed a semi-independent body generally known as a Board of Contract Appeals to review decisions of the contracting officer, with or without that decision being binding on the head of the agency. A third method of contract dispute settlement at the administrative level relates to the authority of the Comptroller General.

1. The Disputes Clause [671]

The government has used two types of disputes clauses which empower the contracting officer, as the government's representative, to settle all controversies arising under the contract, such decision to be final and conclusive, subject only to administrative review. The first, the "all disputes" clause, permits the contracting officer to decide all questions of law and fact.[672] The second, and more common,[673] type is the "facts disputes" clause, which leaves to the contracting officer's final determination only questions of fact.

The Atomic Energy Commission has adopted the "facts dispute" clause.[674] This clause provides:

> Except as otherwise provided in this contract, any dispute concerning a question of fact arising under this contract which is not disposed of by agreement shall be decided by the Con-

[670] See Frank Belluscio & Sons, Inc., AEC ABCA Dkt. No. 4 (Board's recommendations adopted by General Manager Nov. 16, 1950), BNA, Atomic Industry Reporter 221: 311-312, strictly construing a "changes" article.

[671] For a general discussion of this type of contract provision, used in some form or another in government contracts since after the Civil War, see Joy, *supra* note 536 at 13-17; Schultz, *supra* note 536 at 219-220.

[672] See, *e.g.*, Graham Mfg. Co. v. U.S., 91 F. Supp. 715, 716 (D. Cal. 1950).

[673] Generally, Article 15 of the contract, see Shea, *supra* note 536 at 356; Joy, *supra* note 536 at 11.

[674] AEC Manual, Section 9111-034. 10 Code Fed. Regs. §3.1 specifically provides that such a clause may be included in subcontracts, a practice which is not commonly found in the contract appeals procedure of other agencies, see Cuneo, "Disputes Between Subcontractors and Prime Contractors Under Government Contracts, 16 Fed. Bar J. 246, 253 (1956).

> tracting Officer, who shall reduce his decision to writing and mail or otherwise furnish a copy thereof to the contractor. Within 30 days from the date of receipt of such copy, the contractor may appeal by mailing or otherwise furnishing to the Contracting Officer a written appeal addressed to the Commission, and the decision of the Commission shall, unless determined by a court of competent jurisdiction to have been fraudulent, arbitrary, capricious, or so grossly erroneous as necessarily to imply bad faith, or is not supported by substantial evidence, be final and conclusive: Provided, That if no such appeal to the Commission is taken, the decision of the Contracting Officer shall be final and conclusive. In connection with any appeal proceeding under this clause, the contractor shall be afforded an opportunity to be heard and to offer evidence in support of its appeal. Pending final decision of a dispute hereunder, the contractor shall proceed diligently with the performance of the contract and in accordance with the Contracting Officer's decision.

This clause contains five component parts with respect to procedure at the administrative level. First, the contracting officer has sole authority to decide "a question of fact arising under this contract" on which mutual agreement is not reached with the private contractor. This provision is detailed in the Commission's rules to require the contracting officer to issue, and to serve upon the contractor, a "decision" consisting of a statement of his decision, specific findings of fact thereon, and a copy of the rules governing appeals to the agency's Advisory Board of Contract Appeals.[675]

Second, the clause gives the contractor thirty days from the date of receipt of a "decision" by the contracting officer to file his appeal with the Commission, that is, the Advisory Board of Contract Appeals.[676]

[675] 10 Code Fed. Regs. §3.10. In the Board's view, specific findings of fact are ". . . important. . . . Not only do such Findings formulate the issues for appeal . . . but they evidence a vital part of the mental processes essential to any decision. Until the formal Findings of Fact have been completed, any purported decision (no matter how designated) is tentative by the very nature of human thinking. The ultimate decision must rest on, and be supported by, the Findings of Fact, and absent such Findings, there is no decision . . ." (Frontier Drilling Co., AEC ABCA Dkt. No. 74 (Board's recommendations adopted by General Manager July 1, 1955), BNA, Atomic Industry Reporter 221 : 374).

[676] 10 Code Fed. Regs. §§3.11-12. The 30-day requirement has been liberally construed by the Board in favor of the contractor, J. F. Byrd, AEC ABCA Dkt. No. 22 (Board's recommendations adopted by General Manager June 6, 1951), BNA, Atomic Industry Reporter 221 : 325; Sound Construction and Engineering Co., Dkt. No. 63 (Board's recommendations adopted Dec. 23, 1954), BNA, Atomic Industry Reporter 221 : 355; Frontier Drilling Co., *supra* note 675.

Third, if no appeal is taken, the decision of the contracting officer is "final and conclusive." Fourth, the Commission must afford procedure for the contractor to be given a hearing before it, which has been done through the Advisory Board of Contract Appeals. Fifth, the contractor must proceed "diligently" with the work during the pendency of the dispute.

The government often has taken the position that the procedure established by the disputes clause represents a true form of arbitration consistent with principles of arbitration applicable to private contracts.[677] The facts, however, do not support this claim. The contracting officer is hardly an impartial third party, completely disinterested in the result of the settlement of the dispute,[678] in spite of the AEC Board's praiseworthy efforts to improve the status of the contracting officer in contract appeals procedure.[679] The contracting officer's job is to keep the contract moving, with maximum benefit to the government, and the disputes clause procedure provides a "relatively inexpensive and rapid method of settling controversies." [680] The disputes clause may afford some measure of due process in the settlement of controversies arising under a contract while it is being carried out, but it is not a true agreement to arbitrate

> . . . because the decision is made by a representative of the Government. The bargaining power of the Government is

[677] Joy, *supra* note 536 at 11, 13; Anderson, *supra* note 536 at 220.

[678] See, *e.g., Review of Finality Clauses in Government Contracts, Hearings before House Judiciary Committee on H.R. 1839 et al.*, 83d Cong., 1st and 2d Sess. 24 (1954), in which the representative of the American Bar Association stated, in part: "Such a contracting officer may not intend to do any wrong; unwittingly, he is just not impartial. . . ." Other commentators are less charitable, see, *e.g.*, Schultz, *supra* note 536 at 224.

[679] See Otis Williams & Co., AEC ABCA Dkt. No. 88 (Board's recommendations adopted by General Counsel Nov. 8, 1956), BNA, Atomic Industry Reporter 221:388: "Contracting officers have many duties in connection with the execution of, and performance under, both prime and subcontracts. In most of these, they act purely as agencies of the Commission as a party to a contractual arrangement. But when a contracting officer proceeds under the 'disputes articles' of a prime or a subcontract, to decide a dispute, he then acts in a quasi-judicial capacity, obligated to proceed impartially, and without favoritism either to the subcontractor, to the contractor or to the Commission. Once he has rendered his decision, his judicial connection with the dispute ceases. . . . If the dispute was under a prime contract, he reverts to his status as an agent of the Commission and appears, in that capacity, as appellee. . . . [W]hen the dispute reaches this Board, appearances by counsel are on behalf of the proper parties, and a purported appearance for the contracting officer in his *judicial* capacity is as impossible and as improper as would be the appearance in an appellate court by counsel for the trial judge. . . ."

[680] Joy, *supra* note 536 at 20.

very great since many contractors depend upon Government contracts for their very existence, and are thus in no position to force their demands upon the Government. As a result, the disputes clause is heavily in favor of the Government.[681]

2. Advisory Board of Contract Appeals

Chartered in April, 1948, the Advisory Board of Contract Appeals of the Atomic Energy Commission represents a salutary, although incomplete, attempt by that agency to assure a measure of due process in the consideration of disputes appealed to the Commission from the contracting officer. Authority for the creation of the Board stems from Section 12(a) of the 1946 Act and Section 161a of the 1954 Act authorizing the Commission to "establish advisory boards to advise with and make recommendations to the Commission . . . administration." [682]

This type of intra-agency review procedure also has been used effectively in other agencies of the government. Some of these boards follow the pattern of the Atomic Energy Commission Advisory Board, the decisions of which are merely recommendations.[683] Others [684] follow the pattern of the Armed Services Board of Contract Appeals, the decisions of which are binding on the agency involved.[685]

[681] Shea, *supra* note 536 at 356.

[682] 42 U.S.C. §1812(a)(1946); 42 U.S.C.A. §2201(a). The general administration of advisory boards to the Commission, including the Advisory Board of Contract Appeals, is provided for in 10 Code Fed. Regs. Pt. 7, adopted Sept. 1, 1955, in "the midst of a growing controversy over what has been termed in press reports as 'big business domination' of the drive to develop industrial uses of atomic energy" (BNA., Atomic Industry Reporter 1:107). For a discussion of the antitrust problems arising with respect to AEC advisory boards, see Jacobs and Melchior, *supra* note 350 at 531-533. (Ed. Note: On February 3, 1959, 10 C.F.R., Part 3 of the AEC's Rule was amended to place the hearing of contract appeals under the agency's hearing examiner, 22 Fed. Reg. 726.)

[683] General Services Administration Board of Review, established March 7, 1950; Veterans' Administration Construction Appeals Board and Supply Contract Appeals Board, established April 8, 1949, and March 12, 1954, respectively.

[684] Department of Interior Board of Contract Appeals, established December 29, 1954; Contract Disputes Board for Commodity Credit Corp., established April 4, 1946; and Army Corps of Engineers Claims and Appeals Board, established August 9, 1946. Army overseas commands also have Boards of Contract Appeal with jurisdiction of claims up to $50,000, see Joy, *supra* note 536 at 17.

[685] Established May 1, 1949, and merging the former War Department and Navy Department Boards of Contract Appeals created August 24, 1942, and December 1, 1944, respectively. See Cuneo, *supra* note 536 at 376: "The charter of the Board also states that 'when an appeal is taken pursuant to a disputes clause in a contract which limits appeals to disputes concerning questions of fact, the Board may nevertheless in its discretion hear, consider, and decide all questions of law necessary for the complete adjudication of the issue,' and unless the contract provides otherwise,

a. Jurisdiction

Although obviously exercising considerable influence on the Atomic Energy Commission with respect to contract disputes, the Commission Advisory Board of Contract Appeals is exactly what its title signifies—an advisory body. Its decisions are merely recommendations to the General Manager, who, in every reported case but two through 1957, has approved such recommendations.[686] As the Board itself has stated, it is only "the creature of the Commission, and it has only such power as the Commission has chosen to confer." [687]

The Boards' jurisdiction primarily is established by the scope of the disputes clause itself and by Commission regulation. Thus, the Board is limited by that clause to settling controversies which arise "under the contract." It does not have jurisdiction over questions of general law connected with, but not directly arising under, the contract, nor can it deal with controversies after the contract is completed.[688] Further, the Commission's regulations stipulate that

> The General Manager of the Commission is the designated representative to decide finally all appeals arising under the "disputes articles" of commission contracts and subcontracts. The Commission has established an Advisory Board of Contract Appeals to assist the General Manager in his discharge of this responsibility by hearing the appeal and recommending to the General Manager appropriate disposition of the appeal. . . .[689]

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if it appears that a claim for unliquidated damages is involved in the appeal, 'the Board shall, insofar as the evidence permits, make findings of fact with respect to such claim without expressing an opinion on the questions of liability.' . . . The wisdom of the Secretaries in giving the Armed Services Board administrative authority not set forth in the contract was recognized by the Court of Claims in McWilliams Dredging Company, 118 Ct. Cl. 1, 16 (1950). The court likened the Board as the representative of the Secretary, to an owner who would reverse his representative if he were wrong, not because the contract gave him the authority to make a final decision, but because it would be the natural and fair way for an owner to act. The courts have said that mistakes should be corrected within the agency whenever possible. Edmund J. Rappoli Company, Inc., 98 Ct. Cl. 499 (1943)."

[686] Raecolith Flooring Company, *supra* note 631; F. H. McGraw & Co., AEC ABCA Dkt. No. 60 (Board's recommendations rejected by General Manager Aug. 20, 1957), BNA, Atomic Industry Reporter 221:396 (cost-plus-fixed-fee contractor not entitled to reimbursement for expenses incurred in unsuccessfully contesting unfair labor practice charge before National Labor Relations Board).

[687] Frontier Drilling Co., *supra* note 675; see, to the same effect, C. H. Leavall & Co., AEC ABCA Dkt. No. 112 (Board's recommendations adopted by Deputy General Manager Oct. 24, 1957), BNA, Atomic Industry Reporter 221:397.

[688] *Ibid.*

[689] 10 Code Fed. Regs. §3.1.

In construing the above grants of power, the Board has severely limited its authority. Thus it has held that

> . . . [T]he rules do not establish the Board as an advisor at large to the General Manager. Its advice can be sought, and given, only where the appeal falls within the first sentence of Section 3.1, namely a dispute arising *under* a contract or subcontract. . . .
> . . . Finally, the Board's jurisdiction is limited by the language of the particular disputes clause involved. Section 3.2 of the Rules provides for an appeal only where it arises "under the disputes article" of the contract involved. Absent a disputes article, the Board has no power to pass on any issue. . . .[690]

In exercising its limited jurisdiction, the Board also is governed by the provisions of Public Law 356 enacted by Congress May 11, 1954. This statute, which is fundamental law in the field of Government contracts, provides:

> No provision of any contract entered into by the United States, relating to the finality or conclusiveness of any decision of the head of any department or agency or his duly authorized representative or board in a dispute involving a question arising under such contract, shall be pleaded in any suit now filed or to be filed as limiting judicial review of any such decision to cases where fraud by such official or his said representative or board is alleged: Provided, however, That any such decision shall be final and conclusive unless the same is fraudulent or capricious or arbitrary or so grossly erroneous as necessarily to imply bad faith, or is not supported by substantial evidence.
> No Government contract shall contain a provision making final on a question of law the decision of any administrative official, representative, or board.[691]

In construing the operation of the above provisions upon contract appeals within the Atomic Energy Commission, the Advisory Board has stated:

> It will be noted that this statute does not operate to deprive "any administrative official, representative or board" of jurisdiction over questions of law. It says, and means, only that whereas (under Section 1 of the same statute) decisions on questions of fact are final (absent the qualifications set out in the proviso to that section), decisions on questions of law are subject to judicial redetermination. *But it is impossible for*

[690] Frontier Drilling Co., *supra* note 675.
[691] 41 U.S.C.A. §§321-322.

Contracting Officers or their superiors to pass on claims without reaching decisions on matters of law. Nor can this Board fulfill its advisory function without similar action, if a dispute involving such issues is otherwise properly before it. (Emphasis supplied.) [692]

The "proper" presentation of legal issues to the Advisory Board, however, poses the problem, heretofore unsatisfactorily resolved, of how to differentiate between questions of fact and questions of law. This problem arises most acutely in judicial review of administrative decisions.[693] It also has arisen in the field of contract law because of the understandable desire of procurement agencies to insulate themselves from judicial intervention in the exercise of a so-called "proprietary" function.[694]

The problem is not academic for contractors with the Atomic Energy Commission. It is almost impossible for the contractor to decide when the contracting officer, under the "disputes" clause, has decided a question of fact which, unless appealed to the Advisory Board within thirty days, will be binding upon him in any administrative or judicial proceeding involving the contract. The safest course for the contractor to take is to appeal within the prescribed time.[695]

[692] Frontier Drilling Co., *supra* note 675.

[693] See Schwartz, *supra* note 544 at 854-857; Hoover Commission Legal Task Force Report, *supra* note 43 at 216-217: ". . . [I]t is seldom that any issue on judicial review of administrative action is purely a question of law, see Dobson v. Commissioner, 320 U.S. 489, 500-501 (1943). In almost every case the question of law depends in part upon the facts." As the foregoing report points out, the ultimate point in this judicial and legislative fetish of trying to distinguish facts from the law was reached in National Labor Relations Board v. Hearst Publications, 322 U.S. 111 (1941). In this decision the Supreme Court, in sustaining a decision of the Board that newsboys were "employees" of a newspaper under the Wagner Act (question of law) based upon the facts of the situation, "applied a restrictive review of fact issues rather than a broad review of legal questions." The judiciary's attitude in this chronic problem of court review is praiseworthy, because it is based on a healthy desire to prevent encroachment by the courts upon the authority of the Executive Branch. However, the insistence of the latter upon this restrictive scope of review is a part of the policy of administrative agencies to limit any judicial review of their decisions. One solution is to require courts, by legislation, to apply the law to the facts in all cases, see Section 207(g) of proposed Administrative Code, Hoover Commission Legal Task Force Report, *supra* note 43 at 374: "The reviewing court shall determine all relevant questions of law and interpret any constitutional and statutory provisions involved, and it shall apply such determination to the facts duly found or established, whether or not such court is the trier of the facts. . . ."

[694] Etheridge, *supra* note 536 at 556; Moss, *supra* note 536, at 163; Joy, *supra* note 536 at 20-21; Schultz, *supra* note 536 at 246.

[695] Etheridge, *supra* note 536 at 556-557; Cuneo, *supra* note 536 at 377: "Another difficulty is to determine whether the dispute is factual or legal. The uncertainty of

The problem again arises at the Advisory Board level. Under its charter, the latter considers the "appeal . . . de novo, and independent findings of fact will be made, although the findings of fact of the contracting officer may be adopted by the Board in whole or in part." [696] This type of review, of course, is not a true trial *de novo* in which the findings of fact of an administrative body would not be entitled to any legislative or judicial conclusiveness.[697]

The Advisory Board has endeavored to clarify the distinction between reviewable questions of fact, to which may be allied issues of law, and non-reviewable issues of law standing alone. It has held itself without jurisdiction to interpret a contract lacking a disputes clause.[698] However, the Board will make "some preliminary rulings" on legal issues where necessary to determine its own jurisdiction or "to put a factual dispute in its proper setting." [699] As a practical matter, like other intra-agency contract review boards, the Advisory Board of the Atomic Energy Commission probably will hear and decide an appeal from an initial determination of a contracting officer as an issue of fact to which issues of law are incidental.

b. Nature of Proceeding

On paper, the conduct of hearings by the Advisory Board appears to be highly informal and possesses none of the attributes of formal

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arriving at any clear-cut definition of what constitutes a question of 'law' or 'fact' has generally been recognized by lawyers. . . . Whenever there is any doubt as to what should be done, the wise course to follow is to appeal. In most cases the effort and cost involved are negligible."

[696] 10 Code Fed. Regs. §3.22.

[697] For a statutory equivalent of this quasi-*de novo* administrative review, see 49 U.S.C.A. §16(2) and 7 U.S.C.A. §210, providing for review of reparations' orders of the Interstate Commerce Commission and Department of Agriculture. "Such restriction on the scope of review is inconsistent with a complete retrial of the facts under a trial de novo" (Hoover Commission Legal Task Force Report, *supra* note 43 at 219).

[698] Frontier Drilling Co., *supra* note 675.

[699] The Board held, in part, *ibid.*: "While, under such an ['facts disputes'] article, the Board can—and frequently must—make some preliminary rulings on legal issues where necessary either to determine (as here) jurisdictional questions, or to put a factual dispute in its proper setting, it is clear that the Board cannot pass on an appeal which raises only legal issues. . . . The present dispute raises only a question as to the interpretation of the contract. By long settled rule, the interpretation of contract clauses, although a dispute *under* a contract, is a dispute over issues of law. It follows that the Board has no jurisdiction. . . ." But see Retenbach Engineering Co., AEC ABCA Dkt. No. 11 (Board's recommendations adopted by General Manager May 29, 1951), BNA, Atomic Industry Reporter 221:313: "Dispute over whether contract gave Government or contractor responsibility for rerouting traffic around construction site is question of fact determinable by Board under contract's disputes clause."

adjudication [700] or of an adversary proceeding. Such hearings, by rule, are required to "be informal, with no fixed form of procedure." [701] These are no formal rules of evidence,[702] and parties may be represented "by any authorized person." [703]

Although neither the Atomic Energy Commission nor its Advisory Board of Contract Appeals ever has publicly taken the position with respect to contract review proceedings, there exists some sentiment that such proceedings are in the nature of an airing of grievances or of a friendly discussion.[704] The substance of contract appeals procedure and the issues at stake repudiate this characterization. So does the government's own position in the proceedings by always being represented by legal counsel. In fact as well as in theory, a proceeding before the Advisory Board of Contract Appeals of the Atomic Energy Commission is litigation in the substantial sense and clearly quasi-judicial.[705] Indeed, a prominent and long-time member of contract review boards in the Department of Defense has stated:

> Hearings before the Board have been described as being informal. This does not mean that they are of a roundtable discussion or conference variety. The procedure and atmosphere more closely resemble a court trial without a jury.[706]

[700] Under Section 2(d) of the Administrative Procedure Act, 5 U.S.C.A. §1001(d), made applicable to Commission proceedings by Section 181 of the 1954 Atomic Energy Act, adjudication is the formulation of any agency order which finally disposes of any matter other than by rule making. "Formal" adjudication is that which is "required by statute to be determined on the record after opportunity for an agency hearing" (Section 5, 5 U.S.C.A. §1004).

[701] 10 Code Fed. Regs. §3.23.

[702] *Id.*, §3.23(d): "Testimony and evidence may be submitted without regard to the formal rules of evidence. . . ."

[703] *Id.*, §3.23(g).

[704] See, *e.g.*, Moss, *supra* note 536 at 166, n. 26: "For example, one member of the ASBCA [Armed Service Board of Contract Appeals] argues openly that the Board's primary function is to provide contractors with a place to air their grievances, regardless of the validity thereof: a sort of wailing wall so to speak." This view coincides with the misconception that Government contracting is largely a matter of public relations.

[705] Vom Baur, *supra* note 536 at 32-33; Moss, *supra* note 536, at 163-164; see Plaine, *supra* note 1 at 78: ". . . [P]ossibly the relationship between the AEC and the contractors [under so-called reimbursement-type 'administrative contracts'] could be considered, on analysis, as a branch of 'administrative law.'" It also can be argued that Pub. L. 356 requires a hearing on the record within the meaning of Section 5 of the Administrative Procedure Act and that such a right to a formal hearing is required by the Constitution, even without the provisions of Pub. L. 356; see United States v. Blair, 321 U.S. 730, 734-737, 64 S. Ct. 820 (1944); United States v. Jos. A. Holpuch Co., 328 U.S. 234, 238-241, 66 S. Ct. 1000 (1946); Morgan v. U.S., 298 U.S. 468, 477-482, 56 S. Ct. 906 (1936).

[706] Cuneo, *supra* note 536 at 435.

3. Comptroller General

In addition to an appeal from the initial determination of a contracting officer to the Advisory Board of Contract Appeals, an Atomic Energy Commission contractor has another means of administrative review in the General Accounting Office, headed by the Comptroller General.[707]

This procedure has been well summarized, as follows:

> The GAO, while not a party to the contract, may enter the picture whenever vouchers are presented to it by an administrative agency for "direct settlement" with a contractor, or whenever a disbursing officer or head of an administrative agency requests an advance decision. The GAO also enters the picture when a contractor makes a claim against the United States where payment has been denied. It can deny payment or demand payment back; if the latter is refused, it can collect directly from any other governmental funds that may be due a contractor, and failing that method, it may request that the Attorney General sue on behalf of the United States in the appropriate court. It can also pay claims denied by the contracting agency, and a contractor dissatisfied with a decision of a contracting officer or board of contract appeals has a second opportunity for administrative review. Unlike the departmental review, however, this GAO review is optional and is not a prerequisite to filing a court action. . . .
>
> From the point of view of the contractor the administrative review procedure of the GAO is not too dissimilar from departmental review. If anything, it is more informal. The statutes under which the GAO is authorized to settle and adjust claims by and against the United States prescribe no definite form of procedure for the presentation and settlement of claims, leaving it entirely to the Comptroller General. Moreover, as an arm of Congress the GAO would appear to be excluded from the requirements of the Administrative Procedure Act, under Section 2(a). On the other hand, there may be some advantage to arguing a case to accountants, rather than lawyers, where the issue is cost accounting; there may also be psychological satisfaction in dealing with an office closer to the source of payment. And, of course, if the amount is worth fighting about, it is nice to have a second chance before resort to the courts.[708]

This administrative forum offers the advantage to the contractor of securing a determination of both his legal rights and the factual ques-

[707] Pursuant to Section 305 of the Budget and Accounting Act of 1921, 31 U.S.C.A. §74.

[708] Schultz, *supra* note 536 at 230-232. See Joy, *supra* note 536 at 41.

tions under the contract, without being limited on further judicial review to the restrictions of Public Law 356. Where both the contractor and agency submit a dispute to the Comptroller General, it may not later be redetermined by a board of contract appeals. Should the agency unilaterally submit the dispute to the Comptroller General, the contractor does not lose his rights to administrative and judicial review under the disputes clause and, indeed, may immediately bring suit in the courts on the grounds that the agency, by its actions, has waived the procedure provided under that clause.[709]

F. Judicial Review of Contract Disputes

1. Exhaustion of Administrative Remedies

Except where the Atomic Energy Commission voluntarily might waive the requirements of the disputes clause, the contractor is required to exhaust his administrative—or, more properly, contractual—remedies before he may proceed in court.[710] This means that a dispute arising under the contract must be disposed of, first, at the contracting officer level; second, at the Advisory Board level; and, third, at the General Manager level, all in accordance with the regulations of the Commission.

This exhaustion of remedies at the various administrative levels does not mean that the agency can delay its decision indefinitely, thus keeping the contractor out of the courts. Two years between the time of filing of a notice of an appeal of a contracting officer's decision and the date of a final decision by the agency has been held by the courts to be reasonable, but it appears that any further delay would be treated as a breach of the contract by the government which immediately would be actionable.[711]

2. Judicial Forums Available

Two judicial forums are available to the contractor once the administrative proceeding stage has been passed. These are the Court of Claims and the Federal District Courts.

Both of these tribunals have jurisdiction over suits involving "any claim against the United States . . . founded upon any express or im-

[709] Brooks-Callaway Co. v. U.S., 97 Ct. Cl. 689, 704 (1942); H.P. Andrews Paper Co., ASBCA Dkt. No. 2486 (1955).

[710] Cuneo, *supra* note 536 at 377; Joy, *supra* note 536 at 21-22; Etheridge, *supra* note 536 at 558-559; see Schwartz, *supra* note 544 at 831.

[711] Southeastern Oil Florida v. U.S., 115 F. Supp. 198, 201 (Ct. Cl. 1953); Wessel, Duval & Co. v. U.S., 126 F. Supp. 79, 81 (D.N.Y. 1954); see Joy, *supra* note 536 at 26.

plied contract with the United States; or . . . for liquidated or unliquidated damages in cases not sounding in tort." [712] However, the amount in suit is limited in the District Courts to $10,000. No such limitation is imposed by Congress on the jurisdiction of the Court of Claims.

The practical efficacy of submitting contract appeals to the courts is subject to some question, in view of the cost and time involved and the possibility that the government will fight the case to the Supreme Court if necessary.[713] Indeed, one such contractor, who travelled the road to the Supreme Court via the Court of Claims and lost, thereafter told a Congressional committee:

> Contractors are reluctant to go into the Court of Claims unless they are grossly wronged. It is a costly and time-consuming process to litigate a dispute under a Government contract. It is usually in their best interest to accept a decision and go about their established business. . . .[714]

As a result of the Supreme Court's decision in that case, *United States* v. *Wunderlich*,[715] the burden on the contractor to overturn an adverse decision by a contracting officer became almost impossible to meet.

3. Scope of Judicial Review

Prior to the *Wunderlich* decision in 1951, the courts clearly had established the rule that the decision of the contracting officer would not be disturbed unless it involved "fraud or such gross mistake as would necessarily imply bad faith, or a failure to exercise an honest judgment." [716] In *Wunderlich*, which involved a "facts dispute" clause similar to that used by the Atomic Energy Commission, a majority of the Supreme Court narrowed the scope of review to allegations and proof of actual fraud, that is

> . . . conscious wrongdoing, an intention to cheat or be dishonest. . . . If the standard of fraud that we adhere to is too limited, that is a matter for Congress.[717]

[712] Court of Claims—28 U.S.C.A. §1491; district courts—28 U.S.C.A. §1346(a)(2).

[713] Schultz, *supra* note 536 at 249-250, who recommends that the $10,000 limitation imposed in the district courts by the Tucker Act of 1887 is now unrealistic and should be raised to at least $100,000.

[714] G. P. Leonard, Vice-President of Wunderlich Contracting Co., petitioner in United States v. Wunderlich, *supra* note 640, in a statement to the House Judiciary Committee on July 30, 1953, *Hearings on H.R. 1839 et al., supra* note 678 at 10.

[715] *Supra* note 640.

[716] Kihlberg v. U.S., 97 U.S. 398, 402 (1878); see United States v. Moorman, 338 U.S. 457, 461, 70 S. Ct. 288 (1950).

[717] 342 U.S. 98, 100. 72 S.Ct. 154 (1951). Three justices (Douglas, Reed, and Jack-

Matter for Congress that decision did become. The standard imposed thereby was recognized as "a departure from the previously settled law" and "a clear invitation to injustice." [718] After prolonged hearings,[719] Congress in May 1954 enacted Public Law 356.

The latter statute overrules the decision in *Wunderlich*. As noted previously, the legislation reinstates the pre-1951 scope of contract review by providing that the final decision by the contracting agency, in cases where there is a disputes clause, "shall, unless determined by a court of competent jurisdiction to have been fraudulent, arbitrary, capricious, or so grossly erroneous as necessarily to imply bad faith, or is not supported by substantial evidence, be final and conclusive." This language is incorporated in the disputes clause used by the Atomic Energy Commission.[720] The Commission clause also conforms to the statutory requirement that the decision of any administrative officer cannot be final with respect to questions of law.

Not only did Public Law 356 restore a rule of law which gave the contractor some semblance of contractual due process, it also added the requirement of substantial evidence to underlie the agency decision. This means that, for such a decision to be sustained, it must be supported in the record on review by "such relevant evidence as a reasonable mind might accept as adequate to support a conclusion." [721] The new evidentiary standard represents a definite reform in contract review procedure, since theretofore the decision of the contracting officer or agency could be sustained by a court on a mere preponderance of the evidence. The provision clearly was designed to bring into this field of judicial review at least one of the salutary standards required by the Administrative Procedure Act.[722] Further, Public Law 356 has been construed

son) vigorously dissented, stating in part, 342 U.S. 101: "But the rule we announce has wide application and a devastating effect. It makes a tyrant out of every contracting officer. He is granted the power of a tyrant even though he is stubborn, perverse or captious. He is allowed the power of a tyrant though he is incompetent or negligent. He has the power of life and death over a private business even though his decision is grossly erroneous. Power granted is seldom neglected." See Palace Corp. v. U.S., 110 F. Supp. 476, 478 (Ct. Cl. 1953), literally interpreting the Wunderlich rule.

[718] Etheridge, *supra* note 536 *at* 567; see Cuneo, *supra* note 536 at 374; Joy, *supra* note 536 at 18; Schultz, *supra* note 536 at 221-224.

[719] *Hearings on H.R. 1839 et al., supra* note 678; see H.R. Rep. No. 1380, 83d Cong., 2d Sess. (1954) and Sen. Rep. No. 32, 83d Cong., 1st Sess. (1953).

[720] AEC Manual, Section 9111-034.

[721] Edison Co. v. N.L.R.B., 305 U.S. 197, 229, 59 S. Ct. 206 (1938); see Shea, *supra* note 536 at 358-359; Schwartz, *supra* note 544 at 852-853.

[722] Section 10(e)(B)(5), 5 U.S.C.A. §1009(e)(B)(5) (". . . the reviewing court . . . shall . . . hold unlawful and set aside agency action, findings, and conclusions

to permit consideration by a reviewing court of evidence outside the so-called "administrative record" considered by the deciding officer of the contracting agency.[723]

G. Conclusions

Except with respect to the controversy involving Mississippi Valley Generating Company, the contract policies and procedures of the Atomic Energy Commission have not of themselves evoked substantial adverse comment or criticism. Indeed, the agency appears to have done an outstanding job in establishing and operating a multi-billion dollar atomic energy plant in the United States.

This does not mean, however, that the contract procedures of the Commission cannot be improved. Such improvement only can be effected when the Commission and contractors alike recognize procurement as a form of administrative procedure and dispel the present theory

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found to be . . . unsupported by substantial evidence. . . ."); H.R. Rep. No. 1380, *supra* note 719 at 4-5. For decisions construing the provisions of Public Law 356, see Allied Contractors, Inc. v. U.S., 124 F. Supp. 366 (Ct. Cl. 1954) (contractor need not take appeal from contracting officer's decision on question of law); Atlantic Carriers v. U.S., 131 F. Supp. 1, 5 (D.N.Y. 1955) (dismissing libel in admiralty for government breach of charter party by returning ship in damaged condition, the court holding: "A question of 'law' is not a 'claim' of which the court acquires immediate jurisdiction before the administrative fact-finding process is completed. Questions of law usually arise only after the disputed questions of fact relegated to administrative determination have been resolved. If a claim arising under a disputes clause involves *solely* questions of law, then immediate jurisdiction may properly be held to be present"); United States v. Lennox Metal Mfg. Co., 131 F. Supp. 717, 732-733 (D.N.Y. 1954), *affirmed* 225 F. 2d 302, 318-319 (2d Cir. 1955) (holding substantial evidence rule of Administrative Procedure Act and dissents in Wunderlich case enacted into contract law by Public Law 356); Wagner Whirler and Derrick Corp. v. U.S., 121 F. Supp. 664 (Ct. Cl. 1954) (overruling decision of contracting officer for lack of substantial evidence therefor in record).

[723] Volentine and Littleton v. U.S., 145 F. Supp. 952, 954 (Ct. Cl. 1956): "There is logic in the Government's position. But we do not adopt it. It would require two trials in many cases involving this question. The first trial would include the presentation of the 'administrative record' and its study to determine whether, on the basis of what was in it, the administrative decision was tolerable. But the so-called 'administrative record' is in many cases a mythical entity. There is no statutory provision for these administrative decisions or for any procedure in making them. The head of the department may make the decision on appeal personally or may entrust anyone else to make it for him. Whoever makes it has no power to put witnesses under oath or to compel the attendance of witnesses or the production of documents. There may or may not be a transcript of the oral testimony. The deciding officer may, and even in the departments maintaining the most formal procedures, does, search out and consult other documents which, it occurs to him, would be enlightening, and without regard to the presence of the claimant."

that the contracting function of the government is exactly analogous to that of a private party. Congressional authority to, in effect, review certain types of Commission contracts presents a new and complicating factor in the relations between private industry and the federal agency.

Within the Commission itself, the Advisory Board of Contract Appeals should be reconstituted as a true intra-agency review body, with final—not advisory—authority to pass upon the initial determinations of contracting officers. The success of, and general public confidence in, the Armed Services Board of Contract Appeals which has authority to bind the Secretary of Defense, points the way towards a similar development within the Atomic Energy Commission.

The fiction that the Board only makes findings of fact, and reaches conclusions of law incidental thereto, also should be laid to rest. This can be done by amending the Rules of Procedure of the Board. There exists no sound reason why the Board cannot consider mere questions of law, which consideration, of course, would be reviewable in the courts as at present. Such a step would benefit both the agency and contractors. The latter would be encouraged to confine the settlement of all disputes arising under or in relation to a contract within the intra-agency review framework, without any resort to the courts.

Any Commission or industry misconception that a proceeding before the Board is merely a forum to air grievances also should be dispelled. Form and theory to the contrary, such a proceeding is a quasi-judicial hearing in which adverse interests litigate. The present emphasis of the Commission's regulations on informality and lack of evidentiary rules is misleading and detrimental to the interests of both the government and the contractor.

Time and effort are expended by both sides in a proceeding which could be shortened by greater formality and regard for the rules of evidence. The often repeated argument that informality simplifies administrative proceedings is not borne out by the facts. Informality lengthens the record and permits the introduction of arguments completely unrelated to the subject matter of the proceeding. More important, however, the contractor choosing to take his case to the courts must do so with a record which is difficult for the latter to review in many cases because of disregard for the rules of evidence at the agency level. In this, the contractor probably is the chief sufferer since he is seeking to reverse an agency decision.[724] Indeed, the substantial evidence

[724] Even those who favor the "administrative contract" admit that "judicial enforcement of total performance by either party would be difficult" (Ramey and Erlewine, *supra* note 551 at 354; see Moss, *supra* note 536 at 160-161)

rule used by the courts since 1954 to review contract decisions would seem to require that the record be made by practical and reasonable use of the rules of evidence.

Finally, and most important, the contractor must realize the nature of the transaction in which he engages when he contracts with the government. The fine print on the back of a government contract form is just as binding as the clauses of a contract prepared on typing paper. Despite the government's insistence at times on speed in negotiating and executing the contract, the private party should approach the transaction with the same care and caution which he would use in other legal matters affecting his business.

PART V

INTERNATIONAL CONTROL OF ATOMIC ENERGY

Chapter I

ATOMS FOR PEACE: THE NEW INTERNATIONAL ATOMIC ENERGY AGENCY †

BERNHARD G. BECHHOEFER * AND ERIC STEIN **

On October 26, 1956, seventy states signed an international agreement described as the Statute of an International Atomic Energy Agency. This signing followed a conference of over a month in which eighty-two states participated.[1] All of the participating states supported the text which resulted from this conference—a truly remarkable result considering that the subject of the conference was atomic energy with its far-reaching international security implications. The Agency came into existence on July 29, 1957, as a result of the ratification of the statute by the requisite number of states. On October 1 when its first General Conference convened in Vienna, the Agency had fifty-four members.

The International Atomic Energy Agency in several respects is

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[1] See Official Records of the 1956 Conference on the Statute of the International Atomic Energy Agency (hereinafter referred to as the statute), IAEA/CS/OR.39, p. 2, for the unanimous adoption of the statute. The text of the statute (reproduced as Appendix A, Item 10) is contained in booklet form in IAEA/CS/13. For the list of the states which signed the statute see IAEA/CS/OR. 40, pp. 11-15.

unique among international organizations. In the first place, it combines two functions. It has the positive function of seeking "to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world." [2] Also, it has the negative function of insuring, "so far as it is able, that assistance provided by it or at its request or under its supervision or control, is not used in such a way as to further any military purpose." [3]

When President Eisenhower first launched the idea of the Agency in the United Nations on December 8, 1953, he indicated that one of its prime objectives should be to "begin to diminish the potential destructive power of the world's atomic stockpiles." [4] This envisioned utilizing the Agency to siphon off fissionable materials from wartime uses to peacetime uses.[5] Thus one function aims at raising standards of living; the other theoretically relates to the over-all problem of disarmament.[6]

Another unusual feature of the Agency is that there will in fact be three different types of relationships between the Agency and its members. This is reflected in the statute, particularly in the provisions on the selection of the Board of Governors.[7] The first type of relationship will apply to those members which now produce substantial quantities of fissionable materials; [8] those states probably will not apply

[2] Statute, art. II, first sentence.

[3] Statute, art. II, second sentence.

[4] U.N. General Assembly Off. Rec., 8th Session (1953), Plenary Meetings, A/PV.470, p. 443 at 452, par. 122.

[5] The same thought was repeated by Mr. Lewis Strauss, Chairman of the United States Atomic Energy Commission, in the International Conference on the Statute. He expressed the hope that the creation of an International Atomic Energy Agency ". . . will divert important amounts of fissionable material from atomic bomb arsenals to the uses of benefit to mankind, and those amounts will steadily grow with the maintenance of peace. More tons of these materials will be devoted to welfare, fewer tons to weapons and warfare." IAEA/CO/OR.1, p. 11. However, see the United States note of May 1, 1954 handed by Secretary of State Dulles to Soviet Foreign Minister Molotov [in Atoms for Peace Manual, S. Doc. No. 55, 84th Cong., 1st sess. 274 (1954)] to the effect that ". . . this proposal [for an international atomic energy agency] was not intended as a measure for the control of atomic weapons. . . ."

[6] For the position of the Soviet Union on the relation between negotiations for the Agency and disarmament negotiations, see Appendix A, Items 1 and 7, and footnotes 74 and 129 *infra*.

[7] Statute, art. VI, par. A.

[8] The statute defines fissionable materials in art. XX as follows:

"1. The term 'special fissionable material' means plutonium—239; uranium—233; uranium enriched in the isotopes 235 or 233; any material containing one or more of the foregoing; and such other fissionable material as the Board of Governors shall

in the foreseeable future for any assistance whatsoever from the Agency.[9] The second type of relationship will involve the states that have substantial quantities of "source material" (uranium and thorium) [10] and therefore will be in a position to make contributions to the Agency as well as to receive benefits from the Agency.[11] This same category would include countries such as Norway, Sweden, and the Netherlands, which have developed considerable technical skills in the field of atomic energy but lack, at the present time, source materials. The third type of relationship will involve those members that have neither technical skills nor source materials. These states constituting most of the membership will derive benefits from the Agency but their contributions, if any, are likely to be much smaller than the benefits which they will derive.

While the states in this third category received texts of the draft statute as early as August 1955 and made suggestions both in the U. N. General Assembly and to the negotiating states, they did not participate directly in the negotiations until the convening of the International Conference.[12] Many of the changes in the statute made at the conference resulted from their suggestions.[13]

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from time to time determine; but the term 'special fissionable material' does not include source material.

"2. The term 'uranium enriched in the isotopes 235 or 233' means uranium containing the isotopes 235 or 233 or both in an amount such that the abundance ratio of the sum of these isotopes to the isotope 238 is greater than the ratio of the isotope 235 to the isotope 238 occurring in nature." *Cf.* the definition of "special nuclear material" in §11y of the United States Atomic Energy Act of 1954, 68 Stat. 921, 42 U.S.C.A. §§2011 *et seq.* (P.L. No. 703, 83d Cong., 2d sess., August 1954).

[9] This group includes the United States, the United Kingdom, Canada, and the U.S.S.R. and perhaps France. The Chairman of the U.S. Atomic Energy Commission estimated that France would seek Agency assistance. (*Hearings before the Committee on Foreign Relations,* U.S. Sen., 85th Cong., 1st sess., on Exec. I, May 14-20, 1957, p. 117.)

[10] Art. XX of the statute defines "source material" in the following manner:

"3. The term 'source material' means uranium containing the mixture of isotopes occurring in nature; uranium depleted in the isotope 235; thorium; any of the foregoing in the form of metal, alloy, chemical compound, or concentrate; any other material containing one or more of the foregoing in such concentration as the Board of Governors shall from time to time determine; and such other material as the Board of Governors shall from time to time determine." *Cf.* the definition of "source material" in the U.S. Atomic Energy Act of 1954, 42 U.S.C.A. §2014(x).

[11] *E.g.*, France, the Union of South Africa, Belgium, Czechoslovakia, Portugal, Australia.

[12] Ambassador Morehead Patterson, U.S. representative in the initial negotiating group, states in his Report to the President: "Many comments have been received either through communications to the State Department or through statements made in the recent debate on this subject in the Tenth General Assembly. These com-

Three drafts emerged successively during the negotiations:

1. The text of August 22, 1955, prepared by the initial negotiating group of eight states, referred to below as the eight-power draft;[14]

2. The text of April 18, 1956, prepared by the enlarged negotiating group of twelve states, referred to as the twelve-power draft;[15] and

3. The final text approved by the International Conference.[16]

Separate and parallel negotiations were carried on between the United States and the Soviet Union until the Soviet Union joined in the negotiating group of twelve in November 1955.[17]

A. Membership

The initial membership of the Agency is limited to states which are members of the United Nations or of any of the specialized agencies which sign the statute within the specified period and ratify it.[18] As a practical matter, all states are eligible for initial membership excepting the Chinese Communist regime, North Korea, East Germany, Outer Mongolia, and Viet Minh. These regimes are neither members of the United Nations nor of any of the specialized agencies. States other than the initial members may become members "after their membership has been approved by the General Conference upon the recommendation of the Board of Governors." [19]

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ments indicate that differences in viewpoints as disclosed to date are mainly concentrated on a few points such as: a) composition and manner of selection of the Board of Governors of the Agency; b) relationship of the Agency to the United Nations; c) procedures for approval of the budget and prorating among States of operating expenses. The United States and the other negotiating States have sought to give full consideration to the viewpoints expressed by all of the States." 34 Dept. of State Bul. 5 at 6 (1956).

[13] The vast majority of the amendments to the statute offered at the International Conference were proposed by these states. Approximately half of the amendments brought to vote at the Conference were adopted. For a list of amendments and their authors see IAEA/CS/INF.4/Rev. 1, dated October 3, 1956.

[14] Published in 33 Dept. of State Bul. 666-672 (1955).

[15] Annex III of the Report of the Working Level Meeting on the Draft Statute of the International Atomic Energy Agency, Doc. 31, Washington, D.C., July 2, 1956; also IAEA/CS/3, September 10, 1956, as corrected by IAEA/CS/3/Corr. 1 and IAEA/CS/3/Corr. 2.

[16] See note 1 *supra*.

[17] See Appendix A, Item 1.

[18] Statute, art. IV, par. A. The statute was opened for signature on October 26, 1956. Statute, art. XXI, par. A. Fifty-seven states deposited their ratification in time to become "initial members."

[19] Statute, art. IV, par. B. This provision also applies to members of the United Nations or one of the specialized agencies which have not signed the statute within ninety days after it was opened for signature. See Appendix A, Item 2.

B. Organs of the Agency

The Agency has three organs: the General Conference composed of all members,[20] the Board of Governors,[21] and the staff headed by a director general.[22] The negotiators at an early stage concluded that in distributing responsibility among these three organs, the Board of Governors would be given preponderant authority.[23] This conclusion was due to the fact that the great bulk of contributions to the Agency would come from the very few states that had fissionable materials or large resources of uranium. These states, which were the only negotiators of the earlier drafts, were sure to play a large role on the Board of Governors. As the group of negotiating states broadened, the powers of the General Conference vis-a-vis the Board of Governors have increased. This was in response to the strong views expressed by many states, particularly in the General Assembly and the International Conference.[24]

[20] Statute, art. V.

[21] Statute, art. VI.

[22] Statute, art. VII.

[23] See the remarks of Mr. Morehead Patterson in his Report, 34 Dept. of State Bul. 5 at 6 (1956): "It was clear that the membership as a whole could not deal with the day-to-day technical problems which would confront the Agency. Therefore, we provided in the Statute for a Board of Governors with broad authority to make most of the necessary decisions for the Agency. The membership as a whole—described in the Statute as the General Conference—maintains its control over the Board of Governors through election of a number of its members and through complete control over the purse."

See also the eight-power draft, which already provided (in art. VII, par. H), "The Board of Governors shall be charged with complete authority to carry out the functions of and determine the policies of the Agency in accordance with the present Statute subject to its responsibilities to the General Conference. . . ."

[24] Already in the debates in the Ninth General Assembly (in 1954) some delegations called for increased participation by underdeveloped countries in the drafting of the statute. *E.g.*, Mr. Barrington (Burma) said that "it was to be regretted that Asia and Latin America had not been called upon to take part in the organization of the international agency. . . ." U.N. General Assembly Off. Rec., 9th Session (1954), First Committee, A/C.1/SR.723, p. 371 at 372. Similar views were expressed by Mr. Menon (India). *Id.*, A/C.1/SR.725, p. 381. Increased representation of the "have-nots" on the proposed board as well as in the negotiations was advocated by a number of countries in the Tenth General Assembly (1955). See particularly *Syria*, U.N. General Assembly Off. Rec., 10th Session (1955), First Committee, A/C.1/SR.764, p. 39 at 43; *Indonesia, id.*, A/C.1/SR.765, p. 45 at 47; *Israel, id.*, A/C.1/SR.765, p. 45 at 48; *Liberia, id.*, A/C.1/SR.766, p. 53 at 55; *India, id.*, A/C.1/SR.768, p. 63 at 65. The Indonesian representative said: "I have already cautioned against repeating the inequalities of the earlier industrial revolution, with its sharp division between the 'haves' and the 'have-nots,' between the producers of manufactured goods and the suppliers of raw materials. . . . It is our sincere hope that the governing

From the very outset of the negotiations, the General Conference was given control over the purse strings.[25] The budget of the Agency required the approval of the General Conference.[26]

Among the additional powers granted to the General Conference at the International Conference is the authority to make "decisions" (as distinguished from recommendations) on matters referred to it by the Board.[27] If this amounts to a delegation of decision-making authority it may be of practical importance particularly in the event of the inability of the Board to decide upon a course of action. The General Conference was also given the authority to "discuss any questions or any matters within the scope of this Statute or relating to the powers and functions of any organs provided for in this Statute, and may make recommendations to the membership of the Agency

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body of the agency will, in the first place, be founded on the principle of equitable geographic distribution. This means, naturally, that the Asian, African and Latin American Continents must be adequately represented on this body." *Id.*, A/C.1/PV.765, pp. 22-23. In regard to the position of the underdeveloped countries see also William R. Frye, "Atoms for Peace: 'Haves' Vs. 'Have-Nots'" in 35 Foreign Policy Bul. 41 (1955).

[25] See art. VI, par. D, subpar. 5, and art. XVI of the eight-power draft; art. V, par. D, subpar. 5, and art. XIV of the twelve-power draft.

[26] The General Conference under Article V (E) 6 will approve reports to be submitted to the United Nations as required by the Relationship Agreement between the Agency and the United Nations, except reports referred to in par. (C) of art. XII, or return them to the Board with its recommendations. (The reports provided in par. (C), art. XII, concern non-compliance by a state with orders of the Board of Governors to remedy violations of "safeguards" agreements.) Under art. III of the Draft Relationship Agreement (General Assembly Document A/3620, July 23, 1957), the Agency must submit (a) reports covering Agency activities at each regular session of the General Assembly; (b) reports when appropriate to the Security Council "whenever, in connexion with the activities of the Agency, questions within the competence of the Council arise"; and (c) reports to the Economic and Social Council and to other organs of the United Nations on matters within their special competence.

[27] Statute, art. V, par. F, subpar. 1. This provision was part of the Indonesian-Pakistanian amendment (IAEA/CS/Art. V/Amend. 8). Mr. Ahmad (Pakistan) stated: "This amendment has been submitted with the idea of giving greater authority to the General Conference within the scope of the present statute. . . . If . . . there is any matter on which the Board of Governors is unable to arrive at a decision or on which it may definitely and explicitly want the opinion or the decision of the General Conference, then we think that instead of the present phraseology, the General Conference should be authorized to take decisions on those matters which are specifically referred to it by the Board." IAEA/CS/OR.18, p. 46. Mr. Surjotjondro (Indonesia) remarked that ". . . the insertion . . . will add a very useful constitutional provision for a matter which we are justified in anticipating will come up in the course of the operation of the agency" IAEA/CS/OR.19, p. 9. This amendment was adopted by 63 votes to 1, with 14 abstentions. IAEA/CS/OR.22, p. 46.

or to the Board of Governors or to both on any such questions or matters." [28] This language follows closely article 10 of the United Nations Charter concerning the powers of the United Nations General Assembly. While the Board of Governors still makes final decisions on most matters and while the powers of the General Conference are confined to those expressly granted to it in the statute, nevertheless, this authority of the General Conference to make recommendations is significant. The Board of Governors is certain to give the greatest weight to the recommendations of the General Conference. The legislative history raises some doubt whether the authority to make "recommendations to the membership" means only general recommendations applicable to all members or whether it includes also specific recommendations directed to an individual member. The authority to make recommendations of the latter type would provide a rather powerful means of pressure on individual members.[29]

[28] Statute, art. V, par. D. This addition also originated in the amendment proposed at the Conference by Indonesia and Pakistan. IAEA/CS/Art. V/Amend. 8. In regard to this amendment Mr. Michaels (United Kingdom) said: ". . . [W]e recognize that perhaps the arrangements in the Agency should be brought a little more closely into line with those which now apply to the United Nations as a whole." IAEA/CS/OR.18, p. 38. The Pakistanian representative remarked: "This paragraph . . . is taken from the Charter of the United Nations where the powers of the General Assembly *vis-a-vis* the special organs of the United Nations are defined. . . . By the introduction of this new paragraph, the powers of the General Conference . . . would be widened." IAEA/CS/OR.18, pp. 44-45. The Czechoslovak representative remarked: "Views that the General Conference should be an organ with decisive authority in matters concerning the Agency's activities have been expressed by many Governments in their comments on the original draft, as well as in the opening statements of many delegations at our Conference." IAEA/CS/OR.18, p. 41. The amendment was adopted by 76 votes to none, with 4 abstentions. IAEA/CS/OR.22, p. 42.

[29] The importance of this new wording seems to lie in the power to make recommendations to the *membership* of the Agency, because the former art. V, par. E, subpar. 1, of the twelve-power draft had already provided for the power "to make recommendations to the *Board of Governors* on any matter relating to the functions of the Agency." (Emphasis added.) (The phrasing "within the scope of this Statute or relating to the powers and functions of any organs" does not seem to differ substantially from "relating to the functions of the Agency.")

The amendment in its original form used the words "to the *members*." (Emphasis added.) Mr. Michaels (United Kingdom) argued against this on the ground that a situation should be avoided in which the General Conference would make recommendations to individual member states which were in conflict with arrangements made by the Board, and that therefore the term "membership" rather than "members" should be used. See IAEA/CS/OR.18, p. 38. The Mexican representative said: "As we understand it, the United Kingdom representative proposes that the General Conference should be given authority to address recommendations to the members of the Agency as a whole, and not to an individual member or group of members. If that understanding is correct, the result, in our opinion, would be to restrict the

This increase in the powers of the General Conference [80] as the negotiations progressed [81] is reminiscent of the United Nations where the authority of the General Assembly was considerably increased at the San Francisco conference in contrast to the original Dumbarton Oaks proposals worked out by the great powers with emphasis upon the functions of the Security Council.[82]

The most difficult and controversial question which arose in the negotiations prior to the International Conference was the composition and manner of selection of the Board of Governors.[83]

A number of formulae for the composition of the Board were considered and rejected. At one time, a system of weighted voting based

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powers and functions of the General Conference. The provision would lose any practical value." IAEA/CS/OR.19, p. 17. The Chairman of the Conference stated before the amendment was brought to vote: "I understand that the sponsors of this amendment will accept the proposed substitution of the words 'to the membership' for the words 'to the members.'" IAEA/CS/OR.22, p. 41.

[80] See Appendix A, Item 3.

[81] This progress is described by Mr. Michaels (United Kingdom) in the following manner: "I would point out to the Committee that the original draft of this statute, which was circulated in August 1955, gave the Board of Governors a very large degree of direct responsibility, not only in carrying out, but in initiating and approving the policies to be followed by the Agency. A number of countries criticized this arrangement because they felt that on certain broad matters of policy affecting the actions of the Board they should be more closely subordinated to the over-all direction of the General Conference. The twelve-power negotiating group, at its meeting in March of this year, took these criticisms very seriously, and although I will not enumerate them here, a number of very substantial changes were made to meet the views expressed. . . . [T]the article as it now stands describes reasonably satisfactorily the relative field of responsibility of the Board and the General Conference. To try to give the General Conference the attributes of the executive organ of the Agency, for which by its very nature it is not fitted, would, in view of my delegation, lead only to inefficiency and misunderstanding. It would leave the Board without effective influence or authority. As was pointed out by the representative of Portugal, the operation of the Agency undoubtedly would require decisions which cannot wait a year between meetings of the General Conference." IAEA/CS/OR.18, pp. 36-37.

[82] Compare chapter V, sec. B, of the proposal for the Establishment of a General International Organization [Dumbarton Oaks, Washington, October 7, 1944, 11 Dept. of State Bul. 368 (1944)] with arts. 10, 11 and 14 of the Charter of the United Nations. For the history of this development see Bentwich and Martin, A Commentary on the Charter of the United Nations 35 (1950), and Gilchrist, "The United Nations Charter with Explanatory Notes of Its Development at San Francisco . . . ," 413 International Conciliation 452-454 (1945).

[83] Concerning the Board, the original outline of the statute transmitted to the Soviet Union on March 19, 1954 (see Appendix A, Item 1) provided in art. II, par. C, subpar. 1, for a "limited membership" representing governments in which it "might be desirable to take account of geographic distribution and membership by prospective beneficiaries," and that "the principal contributors would be on the Board of Governors."

on contributions was suggested but was discarded largely because of the technical difficulties of evaluating the contributions in different types of materials. The advisability of granting permanent seats to the most advanced atomic powers was also studied and rejected because of the impossibility of developing long-term criteria for permanent membership.[34] As the number of negotiating powers increased, the proposed number of the Board members increased. The additional seats would be filled mainly by "atomic have-nots," thus diluting the influence of the "atomic powers" in the Board. The debate in the United Nations General Assembly created pressures in this direction.[35]

The twelve-power draft and the final text provide for a Board of twenty-three of which ten are elected by the General Conference.[36] The remaining thirteen are chosen by the outgoing Board on the basis of (a) their potential for contributions in materials and skills, and (b) a pattern of geographic representation for the major regions of the world. The top five "atomic powers" [37] may claim what amounts in fact to continuing membership as long as they retain their leading position in the atomic energy field—regardless of whether they actually contribute to the Agency and regardless of any geographic criteria.[38]

Despite widespread criticism in the International Conference of the composition of the Board and despite a number of amendments suggested particularly by the Afro-Asian states to increase their representation on the Board, the provisions of the twelve-power draft were adopted without change by the conference.[39] All the negotiating

[34] See Report by Ambassador Morehead Patterson, 34 Dept. of State Bul. 5 at 6 (1956). Art. II, par. C, subpar. 2 of the first American outline [Atoms for Peace Manual, note 5 *supra* at 267] stated that "arrangements could be worked out to give the principal contributing countries special voting privileges on certain matters, such as allocations of fissionable material."

[35] See note 24 *supra*.

[36] Art. VI, par. A, subpar. 3 of the twelve-power draft and identical article in the statute. The membership of the Board will be twenty-three, on the assumption that "the five members most advanced in the technology of atomic energy" continue to be the United States, United Kingdom, U.S.S.R., Canada, France, or continue to represent three geographic areas. If the five represented more or fewer than three areas, it would change the size of the Board. The eight-power draft in art. VII, par. A provided for a Board of 16. Five of the members would be the most important contributors of technical assistance and fissionable material, five others selected from the principal producers and contributors of source materials, and only six were to be elected by the General Conference.

[37] At present the United States, the Soviet Union, the United Kingdom, France, and Canada.

[38] See Appendix A, Item 4.

[39] Seven amendments to art. VI were proposed, five of them dealing with the com-

powers including the Soviet representative urged strongly that no change be made in the formula on the ground that no better formula could be contrived in view of the political realities.[40]

However, two concessions were made to the critics of this formula. First, it was provided that the question of a general review of the provisions of the statute should be placed on the agenda of the fifth annual session of the General Conference.[41] In the debate, it was made clear that the composition of the Board would be included in such review. In particular, the special representation of the producers of source materials would be reconsidered since many additional states during the next five-year period were likely to become large-scale producers of either uranium or thorium.

The second concession related to the composition of the Prepara-

position and selection of the members of the Board. These five amendments were sponsored respectively by: *Denmark and Iran,* IAEA/CS/Art. VI/Amend. 2; *Philippines,* IAEA/CS/Art. VI/Amend. 4; *Liberia,* IAEA/CS/Art. VI/Amend. 5; *Egypt, Ethiopia, Indonesia and Syria,* IAEA/CS/Art. VI/Amend. 6; and *Italy,* IAEA/CS/Art. VI/Amend. 7. None of these amendments was adopted. Amendments 2 and 7 were withdrawn. Amendment 4, though not formally withdrawn, was not pressed to a vote. Amendment 5 was rejected by 31 to 15 votes, 20 abstaining. Amendment 6 was rejected by 26 to 26 votes with 18 abstaining. (Amendments 5 and 6 attempted to increase the participation of Africa and the Middle East.) Art. VI as a whole was adopted by 71 votes to 1, with 3 abstentions.

[40] The Soviet representative, Mr. Zarubin, said: "The draft article before the Committee seems to be the reasonable compromise. . . . [I]n a spirit of co-operation the delegation of the Soviet Union has decided not to move any amendments to draft article VI. . . . [T]he delegation of the Soviet Union hopes that the same spirit of co-operation will prevail among other delegations, and it appeals to all to accept article VI of the draft statute as it stands." IAEA/CS/OR.20, p. 3.

Mr. Wadsworth, U.S. representative, agreed. "As the representative of the Soviet Union has just said, since the outset of the negotiations on the statute over two years ago, the question of the Board has presented arduous and complicated problems. It was only with considerable difficulty that agreement was reached among the original eight Negotiating States on the formula which was contained in the draft statute of 22 August 1955. . . . [S]ince this formula represents a finely balanced compromise, even one small part cannot be changed without affecting the whole." IAEA/CS/OR.20, pp. 4-6.

Mr. Bhabha, representative from India, remarked: ". . . [W]e recognize that the composition as set up in the present draft has been arrived at by give and take on all sides, and we cannot, therefore, expect to have those particular articles changed that we do not agree with without, naturally, others also asking for a change in articles with which they do not agree. We are, therefore, prepared to accept this article as it now stands and to support it." IAEA/CS/OR.20, p. 12.

[41] Statute, art. XVIII, par. B. Interesting to recall is the analogy to the United Nations Charter: The critics of the Great Power veto at the San Francisco conference were placated in part by the inclusion in the Charter of a provision for a review and revision of this instrument (art. 109 of the Charter). See Goodrich and Hambro, Charter of the United Nations, Commentary and Documents 539-540 (2d ed., 1949).

tory Commission set up under the statute with the task of completing the arrangements necessary for the actual establishment of the Agency. All six elected representatives on the Preparatory Commission were chosen from among the Afro-Asian and Latin American group.[42] Similarly, the first Board of Governors includes four Latin American states and seven states from the Middle East and Far East.[43]

C. Functions of the Agency

1. Peaceful vs. Military Purposes

All Agency functions relate solely to the utilization of atomic energy for *peaceful* purposes. The Agency is directed to ensure, "so far as it is able," that its assistance is not used in such a way as to further any "military purpose." [44]

During the International Conference, France introduced an amendment defining "military purpose" as follows: "The only uses of atomic energy which shall be regarded as uses for non-peaceful purposes are military applications of the atomic explosion and of the toxicity of radioactive products." [45] This amendment seems to be based on the conclusion that the greatest menace to the world from the military use of the atom arises as a result of nuclear explosions and from the toxicity of radioactive materials. The concept of "military purpose" thus would be limited to these uses only and would not include, for instance, the use of nuclear fuel in the propulsion of a submarine, an aeroplane, or a missile; the menace from these latter uses is not much greater than that arising from the use of conventional fuels for similar objectives. Under the French amendment the use of power derived from atomic fuel in a munitions plant, for instance, would not constitute a military use.

In urging the adoption of a restrictive definition of "military purposes" the Indian representative suggested that any state having a military program should be ineligible for any Agency assistance, since, for instance, material made available to such state, under Agency

[42] See Appendix A, Item 5.

[43] The first Board of Governors is composed of the United States, Canada, United Kingdom, U.S.S.R., France, Portugal, Czechoslovakia, Australia, Brazil, India, South Africa, Sweden, Japan, Italy, Rumania, Egypt, Pakistan, Indonesia, Korea, Guatemala, Peru, Turkey, and Argentina. The 10 states listed last were elected by the first General Conference.

[44] Statute, art. II, second sentence.

[45] IAEA/CS/Art. XX/Amend. 1.

safeguards, for its non-military program would release corresponding materials for its military program.[46]

During the conference, it became apparent that any attempt to define "military purpose" in the statute would raise more problems than it would solve. France never brought its amendment to a vote.[47] It would not have been desirable for the Agency to adopt a definition that by implication would sanction, for example, the use of Agency assistance for an atomic submarine. The present text sets up a broad standard under which the Board of Governors will have to develop criteria applicable to specific situations as they may arise.

2. Atomic Power

From the beginning of the negotiations, recognition has been given to the principle that the Agency shall have a broad responsibility for *all* phases of development of the peaceful uses of atomic energy. However, the portion of President Eisenhower's address to the General Assembly of December 8, 1953, that had the greatest effect on public opinion throughout the world was his statement that ". . . peaceful *power* from atomic energy is no dream of the future. That capability, already proved, is here—now—today." [48] Thus, the function of the Agency which has received the greatest public attention is to furnish atomic fuel for the production of electric power.[49] The functions of the Agency, however, extend to many other matters such as research, training, exchange of information, and development of standards of health and safety.[50] The Report of the Preparatory Commission to the General Conference recognizes that on the basis of current eco-

[46] IAEA/CS/OR.28, pp. 66-67.

[47] France withdrew its amendment with the understanding that its substance should be considered by the Preparatory Commission. IAEA/CS/OR.36, p. 33. There also was a proposed revision of the French amendment submitted by India. See Conference Room Paper No. 17. This revision read: "Any military purpose shall mean the production, testing or use of nuclear, thermonuclear and radiological weapons." This revision also was withdrawn, the Indian delegate commenting: "We agree that this matter should be noted in the future and we do not wish at this stage to press this particular amendment to a vote." IAEA/CS/OR.36, p. 34.

[48] Atoms for Peace Manual, note 5 *supra* at 5.

[49] It is widely expected that, in the long run, the development of reactors and, in particular of power reactors, will be the most important peaceful application of atomic energy, and that the Agency's assistance to its members in this field may in time become the most extensive of its activities. Report of Preparatory Commission of the International Atomic Energy Agency (PRECO), G.C.1/1, GOV/1 (New York 1957) par. 43.

[50] See Statute, art. III.

nomics, the initial Agency programs are likely to stress these other functions.[51]

3. Training and Research

The final text of the statute reflects the importance of the function of training—a recognition that the absence of trained technicians and engineers may be a serious obstacle to early development of worldwide electric power derived from atomic fuels.[52] There is every indication that the Agency will place great emphasis in its early years on the subject of training.[53]

It should be noted that the Agency is authorized to encourage and assist research and "to perform any operation or service useful in research." [54] While there is no express provision authorizing Agency research,[55] it is doubtful whether the Agency could successfully carry out its safeguard and health and safety functions or attract qualified personnel without some research program. The Preparatory Commission suggested that the Agency undertake research programs in connection with "its statutory functions, such as waste disposal, health and safety, and methodology of safeguards and should also encourage such work in Member States." [56] However, the Commission did not specifically recommend the immediate establishment of Agency laboratory facilities, but merely that "The Agency should examine at an

[51] PRECO Report, note 49 *supra*, par. 43.

[52] Note, *e.g.*, the inclusion of the words "and training" in art. III, par. A, subpar. 4 of the statute, which originated in a Polish amendment. IAEA/CS/Art. III/Amend. 2/ Rev. 1. This addition was adopted by 78 votes. IAEA/CS/OR.22, p. 11.

[53] PRECO Report, note 49 *supra*, par. 70. A number of amendments were proposed during the International Conference which would provide for specific activities of the Agency, such as the amendments submitted by Bolivia and Ecuador to establish a world university of the atom (IAEA/CS/Art. III/Amend. 9), the Haitian amendment to provide for granting scholarships by the Agency (IAEA/CS/Art. III/Amend. 1), and the Polish amendment to publish an international periodical devoted to the peaceful uses of atomic energy (IAEA/CS/Art. III/Amend. 2/Rev. 1). These amendments were all defeated on the ground that the functions of the Agency should be general and the decision on specific activities should be left to the Board of Governors. (*E.g.*, the argument of Mr. Wadsworth, representative of the United States in IAEA/CS/OR.16, p. 17).

[54] Statute, art. III, par. A, subpar. 1.

[55] The first United States outline (see Appendix A, Item 1) mentioned "data developed as a result of its own activities" (art. III, par. C, subpar. 2), which would imply independent research by the Agency. In the later drafts no such clause can be found. However, there is nothing in the statute to prohibit research by the Agency as long as it is for peaceful uses and furthers the purposes of the statute.

[56] PRECO Report, note 49 *supra*, par. 30, and generally pars. 20-41.

early date the need for the establishment of laboratory facilities at its headquarters." [57]

4. Health and Safety Standards

The Agency has broad functions in the field of health and safety. It is authorized "to establish or adopt . . . standards of safety for protection of health and minimization of danger to life and property (including such standards for labour conditions). . . ." It may "provide for the application of these standards to its own operations as well as to the operations making use of materials, services, equipment, facilities, and information made available by the Agency or at its request or under its control or supervision. . . ." [58] As in the case of safeguards against diversion of materials, it may also "provide for the application of these standards, at the request of the parties, to operations under any bilateral or multilateral arrangement, or at the request of a State, to any of that State's activities in the field of atomic energy. . . ." [59] States receiving Agency assistance must agree to meet Agency health and safety standards.[60]

The authority of the Agency to prescribe such standards is not confined to the type of hazards peculiar to operations utilizing nuclear materials. Likewise there is nothing to prevent the Agency from applying to operations coming under its jurisdiction far more stringent standards than the country where the operation takes place applies to its operations. In such an event, as a practical matter, the Agency would probably have to rely for enforcement of these higher standards on its own inspectors. It could not readily utilize the local authorities even in policing non-radiological hazards if those authorities applied different and less stringent standards.

It would seem advisable for the Agency in setting up the standards in this field to cooperate as fully as possible with the state where the facility is located; in general, the Agency should insist on more rigorous standards than those prescribed by local laws only in the interest of preventing hazards affecting more than one state (for example, reactor incidents which would contaminate a considerable area or waste disposal affecting international waterways).[61]

[57] PRECO Report, note 49 *supra*, par. 104.

[58] Statute, art. III, par. A, subpar. 6.

[59] *Ibid.*

[60] Statute, art. XI. par F subpar. 4(b); and art. XII, par. A, subpars. 1 and 2.

[61] For a discussion of analogous problems arising from federal v. state regulations in this field, see State Regulation of Atomic Energy, Part III of this volume.

Health and safety standards and practically every function of the Agency, excepting the procurement and disposal of materials and the operation of the safeguard system against diversion, are of some concern to various specialized agencies of the United Nations. This makes it essential that there should be a clear-cut division of functions.

The Draft Relationship Agreement between the United Nations and the Agency [62] takes note of this situation and suggests as one of the principles of that relationship that the United Nations recognize "the International Atomic Energy Agency . . . as the agency, under the aegis of the United Nations as specified in this Agreement, responsible for international activities concerned with the peaceful uses of atomic energy in accordance with its Statute, without prejudice to the rights and responsibilities of the United Nations in this field under the Charter." [63] If this principle is carried out, the present and prospective programs of some of the specialized agencies in the atomic energy field may be considerably curtailed.[64]

5. Exchange of Information

The Agency is to disseminate the information obtained from the members and encourage the exchange of information among them. The statute differentiates between information arising from assistance extended by the Agency and other information. With respect to the former, "Each member *shall* make available to the Agency" all such information.[65] The obligation in connection with information from other sources is much less sweeping: each member "*should* make available such information as would *in the judgment of the member* be helpful to the Agency." [66] This latter loose undertaking and the obligation to share in the administrative budget seem to be the duties which a member assumes through signing and ratifying the statute. Other obligations arise only in connection with specific agreements between the member and the Agency concerning the receipt of benefits, contributions to the Agency, or the application of safeguards on re-

[62] General Assembly Document A/3620 of July 23, 1957.

[63] *Id.* at art. I. This provision follows closely the suggestions of the Secretary General of the United Nations in a study of the question of the relation of the Agency to the United Nations. Par. 4, General Assembly Document A/3122 of April 20, 1956, reproduced in IAEA/CS/5, Sept. 24, 1956.

[64] See Appendix A, Item 6.

[65] Statute, art. VIII, par. B (emphasis added).

[66] Statute, art. VIII, par. A (emphasis added).

quest. The Preparatory Commission recommended a fairly extensive initial Agency program for exchange of unclassified information.[67]

Under article III, paragraph A, subparagraph 5 of the statute, it would be possible to extend the Agency safeguards system into the field of information. Theoretically, therefore, the United States and other governments could turn over classified data to the Agency.[68] As a practical matter, this is unlikely to happen since data available to the Agency will generally become available to all of its members.[69]

The Director General and the staff of the Agency are required not to "disclose any industrial secret or other confidential information coming to their knowledge by reason of their official duties for the Agency." This provision was included by the Conference on the initiative of Switzerland.[70]

D. Agency Facilities

The Agency is authorized "to acquire or establish any facilities, plant and equipment useful in carrying out its authorized functions, whenever the facilities, plant and equipment otherwise available to it in the area concerned are inadequate or available only on terms it deems unsatisfactory." [71] This emphasizes a more gradual acquisition of facilities than another provision that "the Agency shall as soon as practicable establish or acquire" *storage* facilities and certain types of other facilities.[72] These provisions are the end product of discussions which commenced on the day of President Eisenhower's address as to whether the Agency should be "a bank"—should have actual possession of fissionable materials—or a "clearing house" merely arranging as an intermediary for the international distribution of fissionable materials from one country to the other. The statute clearly authorizes the Agency to be a "bank" and contemplates such a result. The Agency may, however, operate also as a "clearing house."

[67] PRECO Report, note 49 *supra*, pars. 58-65.

[68] For the provisions of U.S. law, see 42 U.S.C.A. §§2164, 2153, 2154 (Atomic Energy Act of 1954, note 8 *supra*, §§144, 123, 124).

[69] The Department of State interprets the statute as imposing "no obligation for us to furnish any information. In no case is it contemplated that we furnish the Agency or Members of the Agency classified information." *Hearings before the Senate Foreign Relations Committee*, note 9 *supra*, at 55.

[70] Statute, art. VII, par. F. IAEA/CS/Art. VII/Amend. 5/Rev. 1, adopted in revised form (Conference Room Paper No. 4) by 76 votes to none. IAEA/CS/OR.26, p. 12.

[71] Statute, art. III, par. A, subpar. 7.

[72] Statute, art. IX, par. I.

The Preparatory Commission concluded that "it would be premature at this stage to make definite proposals regarding the timing of the steps the Agency will have to take" to acquire storage facilities.[73]

E. Agency Safeguards

There were three possible ways of dealing with the problems of safeguards against diversion of fissionable materials into military uses. First, international transfer of fissionable materials for peaceful uses might have taken place without any safeguards. The result of this course would have been that in a short time a number of states would have been in a position to develop atomic weapons.[74] It certainly would not be in the interest of world peace if a large number of states were in a position to use or threaten to use atomic weapons. There is less danger when three states have atomic weapons than when more than eighty states have them. In this respect, it is possible that the interests of the United States and of the Soviet Union might coincide.

A second possible course would have been to delay the development of the peaceful uses of atomic energy because of the danger to world peace through diversion to military purposes. In view of the rapid worldwide increase in power requirements and imminent shortages of conventional fuels any such course would have inevitably handicapped efforts to improve world standards of living.

The statute follows a third and middle course which permits the development of peaceful uses with safeguards designed to deter the development of new weapons programs. The success of the system of safeguards will depend on a wide variety of factors including technological and political developments.

The statute establishes the basic principle that safeguards will be *imposed* only in connection with agreements between the Agency and states which are beneficiaries of Agency projects.[75] States do not sub-

[73] PRECO Report, note 49 *supra*, par. 102. The only other technical facilities with which the Commission deals in its Report are laboratory facilities, PRECO Report, pars. 103 and 104.

[74] The possible increase of the production of atomic weapons resulting from peaceful uses was used by the Soviet Union as an argument against international co-operation in the field of peaceful uses of atomic energy. See, *e.g.*, the Aide-Memoire of September 22, 1954 in the Atoms for Peace Manual, note 5 *supra*, 278 at 281.

[75] Art. XI, par. F of the statute reads (in part): "Upon approving a project, the Agency shall enter into an agreement with the member or group of members submitting the project, which agreement shall: . . . 4. Include undertakings by the member or group of members submitting the project (a) that the assistance provided shall not be used in such a way as to further any military purpose; and (b) that the

mit to the system of safeguards merely by ratifying the statute. A further step is essential.

The Soviet Union during the negotiations has on the surface at least made a complete about-face in its attitude toward safeguards. Pointing to the fact that weapons grade plutonium is a neccessary by-product of the operation of every power reactor, the Soviet Union initially opposed all safeguards (and for that matter any agency dealing with quantities of fissionable materials) in the absence of a prohibition of atomic weapons. Gradually the Soviet Union altered its position until it accepted the present provisions of the statute with some vague warnings about infringement of sovereignty through operation of the inspection system.[76]

It is possible that the changed attitude was influenced by the discussions on the subject of safeguards which took place in Geneva in August 1955 immediately following the United Nations Scientific Conference. The exchange of notes between the United States and the Soviet Union on this subject indicates the probability of further bilateral discussions with the Soviet Union on the problem of safeguards.[77]

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project shall be subject to the safeguards provided for in art. XII, the relevant safeguards being specified in the agreement. . . ." The Agency could not waive the inclusion of the safeguard provision in the project agreement. See art. XI, par. F, subpar. 4, and art. III, par. D referring to "agreements . . . which *shall* be in accordance with the provisions of the statute." [Emphasis added.] What would be the situation if the safeguards specified in the agreement are for some reason less stringent than the "relevant" safeguards specified in article XII? Could the Agency under article XII nevertheless enforce the "statutory" safeguards? There may be some support for an affirmative answer in the language of the statute and particularly in the fairly detailed enumeration of the safeguards therein. However, such detailed enumeration may well have been due solely to the desire to avoid complaints on the part of beneficiary states that the proposed project agreements worked out by the Board bore no relation to the obligations which they thought they assumed when they signed the statute. It was agreed among the eight negotiating states that some provisions specifying the nature of the safeguards should be included in the statute. These provisions were vastly expanded and improved in subsequent drafts.

[76] See Appendix A, Item 7.

[77] The Soviet Union in its Aide-Memoire of July 3, 1956 (United States Department of State Press Release No. 527, Oct. 6, 1956, p. 28) stated that "the consideration of this problem [of the extension of the Agency safeguards to bilateral agreements] could be resumed after the statute is adopted by the Conference and after it is ratified by the countries involved." In its answer of August 15, 1956 (*id.* at 30, 31), the United States pointed to the fact that it will take some time until the Agency safeguards will be operative and that the United States Government is therefore interested in standardizing the already existing safeguards. Mentioning the statement of the Soviet Union that it had already initiated a program for rendering assistance to a number of states and that the same was true with respect to the United Kingdom and

The statute elaborates in considerable detail the Agency safeguards,[78] which include the right of the Agency

> 1. To approve the design of specialized equipment and facilities, including nuclear reactors;
> 2. To require the observance of Agency prescribed health and safety measures;
> 3. To require the maintenance and production of operating records;
> 4. To call for and receive progress reports;
> 5. To exercise stringent controls over the operations connected with production of power where diversion of fissionable materials to weapons can most readily take place, and to approve means to be used for chemical processing of spent fuel elements;
> 6. To establish a system of inspection through a staff of international inspectors.[79]

The statute deals in some detail with remedies in the event of non-compliance with the safeguard requirements.[80] Inspectors shall report any non-compliance to the Director General, who shall transmit the report to the Board of Governors. The Board shall call upon the recipient state to remedy forthwith any non-compliance which it finds to have occurred. The Board shall report the non-compliance to all members and to the Security Council and General Assembly of the United Nations. If the non-compliance constitutes a potential or actual threat to international peace, the Security Council could exercise its considerable powers under the United Nations Charter, assuming, of course, that the five permanent members agree. The General Assembly might also exercise its recommendatory authority on the basis of the report of the Board.[81]

Canada (France having similar plans), the Department of State, in the interest of assuring the effectiveness of the Agency proposed an early commencement of staff level talks to explore the possibility of reaching uniform safeguards for bilateral agreements not less comprehensive than the present ones of the Agency. The United States Aide-Memoire also mentioned that Canada, France and the United Kingdom indicated their interest in participating in such talks.

[78] Statute, art. XII, par. A, subpars. 1-6.

[79] For the functions of the inspectors see art. XII, par. A, subpar. 6, par. B and par. C of the statute. The inspectors supervise the compliance with health and safety standards and safeguards against diversion both in the Agency facilities and in the facilities of its members under project and other agreements.

[80] Statute, art. XII, par. C, and par. A, subpar. 7. The purpose of art. XII, par. A, subpar. 7 is not at all clear in view of the almost identical provision in art. XII, par. C.

[81] For full discussion of the powers of the Security Council and the General Assembly in this respect see Goodrich and Simons, the U.N. and the Maintenance of International Peace and Security (1955).

In the event of non-compliance, the Board may direct curtailment or suspension of assistance provided by the Agency and call for return of materials and equipment made available to the recipient member. Obviously, the "recapture" of misused material would depend ultimately on the cooperation of the recipient state. The Agency may also suspend the non-complying member from exercise of the rights and privileges of membership.[82]

It would seem that the finding of non-compliance by the Board may serve as a basis for immediate withdrawal of any Agency assistance and for other remedial measures.[83] The state affected will no doubt be given full opportunity to present its defense. However, it would appear that under the statute such a state does not have the right to avoid or delay the remedial measures by invoking the procedure for settlement of disputes discussed below.[84]

The provisions for sending inspectors designated by the Agency "after consultation" with the state involved into territories of recipient states permit access of these inspectors "at all times to all places and data and to any person who by reason of his occupation deals with materials, equipment, or facilities . . . to be safeguarded, as necessary to account" for the materials, to check on compliance with health and safety measures and other conditions of the Agency project agreements.[85] These are truly unprecedented inspection powers which apply regardless of the type or extent of Agency assistance. Yet, these provisions resulted in relatively little controversy during the International Conference.[86] They may, however, cause considerable difficulty when

[82] Statute, art. XII, par. C, and art. XIX, par. B. Since the suspension can only take place in accordance with art. XIX, it seems that all the requirements of par. B of art. XIX must be present, namely, *persistent* violation of the statute or agreements, unless art. XII, par. C can be read as providing for an independent basis for suspension in accordance with the *procedure* laid down in art. XIX.

[83] As to anticipated effect of remedial measures see *Hearings before the Senate Foreign Relations Committee,* note 9 *supra* at 60, 121.

[84] Pp. 776 and 777.

[85] Statute, art. XII, par. A, subpar. 6.

[86] Switzerland proposed 2 changes in subpar. 6 of art. XII, par. A of the statute. The first of them was to clarify that the persons subject to control by Agency inspectors are only those who because of their occupations deal with materials, equipment, and facilities supplied by the Agency. The second envisaged that the inspectors be accompanied by representatives of the state concerned, if the state requested it and the inspectors are not impeded thereby. See IAEA/CS/Art. XII/Amend. 1/Corr. 1 and Corr. 1/Rev. 1. See also Conference Room Papers Nos. 6 and 13 and the Swiss statement in IAEA/CS/OR.37, p. 102, for changes from the original wording of the amendments. Both amendments were accepted by 77 votes to none with no abstentions. For rather unenlightening statements on the scope of inspection, see IAEA/CS/OR.29, pp. 17, 62, 87.

the time comes to apply them. Substantially the same powers of access, however, are given to the United States audit inspectors under the bilateral agreements concluded by the United States.[87] Some countries which are parties to these agreements might prefer to have the inspection performed by an international agency rather than by nationals of the United States.[88]

The principal opposition to the safeguards provisions in the twelve-power draft came from India. Practically the entire debate on safeguards in the conference centered on the three reservations entered by India.[89] The main thrust of the Indian objection was directed against the inclusion of source materials [90] in the accountability system and against the almost unrestricted right of the Agency to dispose of the by-product weapon grade material produced in operation of the power reactors. This latter right was considered essential to the safeguards system for a number of reasons, one of which was to prevent states

[87] See, *e.g.*, art. X of the agreement for cooperation between the United States and France, 102 Cong. Rec. 10398 (June 29, 1956). For detailed comparison of Agency and U.S. bilateral safeguards provisions, see *Hearings before the Senate Foreign Relations Committee*, note 9 *supra*, at 72-77.

[88] One of the problems that might confront the Agency in working out its system of inspection, namely the composition of inspection teams, was brought to the attention of the Conference in the proposed Philippines addition to article XII (IAEA/CS/Art. XII/Amend. 4) reading as follows: "Any mission of inspection to determine any diversion to military end contrary to this statute shall consist of at least three members: one from the Union of Soviet Socialist Republics and two others from the five members most advanced in the technology of atomic energy referred to in sub-paragraph A-I of Article VI of this statute." (U.K., U.S., U.S.S.R., Canada, France.) This amendment received no substantial support. For an explanation of the motivation of this amendment, see the statement of the Philippine representative in IAEA/CS/OR.27, p. 36.

Mr. Virgin, Swedish representative, remarked: "The recruitment of the staff of inspectors and the selection of members of a mission will obviously give rise to many problems. . . . My delegation feels that on those questions one should not go into further detail in the statute itself than has been done, but that it should be left to the Agency to find an appropriate course of action and to arrange in each particular case for the inspection under the general rules of the statute and, of course, of any agreement between the Agency and the recipient member country. The consultation envisaged in paragraph A 6 to which I just referred will give ample opportunity to the recipient country to give its views for the consideration and guidance of the Agency. . . . It would mean introducing an entirely new principle if staff members from particular countries or group of countries were to be given the right of being represented in a given function of an international organization." IAEA/CS/OR.27, pp. 67-68. For further statements in opposition to the Philippine amendment, see IAEA/CS/OR.24, p. 67 (Australia); IAEA/CS/OR.30, pp. 26 (U.S.S.R.). The Philippine delegation did not press the amendment to a vote. IAEA/CS/OR.30, p. 47.

[89] See Appendix A, Item 8.

[90] See note 10 *supra* for the definition of this term.

from stockpiling greater quantities of weapons grade by-product than they could presently use for peaceful purposes.[91] India contended that the statute would give the Agency perpetual and far-reaching power to affect the economic life of states. The ingenious compromise solution reached in the conference retains the accountability of source materials but restricts the right of the Agency with respect to the "special fissionable materials recovered or produced as a by-product"; the states will have the right to retain (under continuing Agency safeguards) such quantities of the by-product materials as they can use "for research or in reactors, existing or under construction." [92]

The discussion on the safeguards occupied about half of the conference debates. The compromise solution removed the last obstacle to the unanimous approval of the statute.

While the provisions of the statute concerning safeguards are fairly detailed, the agreements between the Agency and its members will very likely have to go into considerably greater detail. The only restriction on the terms of the agreements is that all their provisions "shall be in accordance with the provisions of the statute. . . ." [93]

The elaboration and establishment of a detailed system of safeguards will pose a great challenge to the Board of Governors; outstanding scientific skill coupled with wise political counsel will be required to meet this challenge.[94] If the Agency grows into an active

[91] For the United States view see the statement by Mr. Wadsworth, United States representative, in IAEA/CS/OR.29, pp. 59-61.

[92] Statute, art. XII, par. A, subpar. 5. See Conference Papers Nos. 19 and 21, containing the amendments adopted in the statute. As a practical matter under existing technology very little plutonium or U-233 would come under this exception at the present time, and the states will thus be required to dispose of the bulk of these materials as instructed by the Agency. In addition, states would have the right to require that special fissionable materials produced as a result of such operations and deposited with the Agency, "be returned promptly to the member or members concerned for use under the same provisions as stated above." Thus economic and political factors could not deprive states of the plutonium and other fissionable by-products produced from their reactors. At the same time, states would not be permitted to accumulate idle stockpiles of plutonium readily usable for atomic weapons.

[93] Statute, art. III, par. D.

[94] As the representative of Pakistan, Mr. Ahmad, put it, "It will be up to the Board of Governors, as it considers different specific situations and as it attempts to implement agreements which the statute provides for, to consider most carefully where there is a necessity for applying rigidly the rules contained in the statute in this specific case, and I take it that it will, in a realistic way, seek for each project technical solutions which, while upholding the main ideas of control, will burden the recipient country with the minimum of difficulties." IAEA/CS/OR.28, pp. 24-25. The Report of the Preparatory Commission contains the following recommendations for implementation of safeguard programs:

body, its standards of safeguards for security as well as of health and safety will have direct influence on national standards developed by member states. The Agency may contribute to worldwide uniformity of these vital standards.[95] Unprecedented questions will arise in coordinating the inspection and enforcement functions between the Agency and the member states or groups of states such as EURATOM.

F. Supplying of Materials

The statute makes a differentiation between fissionable materials and other materials which may be useful to the Agency.[96]

Theoretically, the Agency is to accept any amounts of special fissionable materials offered to it subject only to reaching agreement on a proper price and matters incidental to the transfer.[97] This would carry out the underlying concept advanced by President Eisenhower in the General Assembly in 1953 that the Agency should siphon off the supplies of fissionable materials from military to peacetime uses.[98]

"(a) The safeguard procedures should keep pace with the development of the Agency's activities, starting with problems related to the transport and storage of source and special fissionable materials and extending to the use of these materials in Agency-sponsored projects and to their subsequent treatment;

"(b) The safeguard procedures should be adapted to the specific character of each individual project and the degree of potential risk of material diversion. The safeguards should ensure adequate accountability in accordance with the statutory provisions, including both physical security and material accountability measures to the extent required; . . ." PRECO Report, note 49 *supra*, par. 84(a) and (b).

[95] Secretary of State Dulles pointed out to the Senate Foreign Relations Committee: ". . . if there is no such organization with a standard system of controls, then you may get into a situation where nations will shop around and buy their materials from the nation which imposes the least controls . . . and in the end the whole control system would break down." *Hearings before the Senate Foreign Relations Committee*, note 9, *supra* at 8.

[96] The definitions of the various types of materials as defined in art. XX (notes 8 to 10 *supra*) bear resemblance to those of the United States Atomic Energy Act of 1954, 42 U.S.C.A. §2014(x) and §2014(y). The definitions in the statute are, however, more specific than those of the Act. Definitions similar to those of the Atomic Energy Act of 1954 are contained in the bilateral agreements between the United States and other countries. See, *e.g.*, art. I, pars. H and I, of the Agreement for Co-operation Between the United States and France, 102 Cong. Rec. 10398 (June 29, 1956). The Indian amendment (IAEA/CS/Art. XX/Amend. 2), which had proposed that irradiated source material should be excluded from the definition of special fissionable material (art. XX, par. 1), was not adopted by the International Conference.

[97] Statute, art. IX, par. A. This provision does not have the restriction contained in par. B for source materials, namely, the power of the Board of Governors to "determine the quantities of such materials which the Agency will accept. . . ."

[98] See text at note 4, *supra*. For the proposition that such was the purpose of the language in par. A of art. IX, see Mr. du Plessis (representative of the Union of

In contrast, the Agency would accept only such quantities of source materials and other materials as determined by the Board of Governors.[99] Without such a provision, the Agency might be overwhelmed with materials useful in connection with atomic energy programs but in surplus supply.

The statute does not specify whether the contributed material will be sold or leased to the Agency; nor does it fix the legal form of the transaction through which the material will be made available by the Agency to the recipient state.[100] This commendable omission will allow the Board to work out agreements tailored to different types of projects and fitting the requirements of national legislation.[101] As long as the safeguards obligations are effectively imposed, the question of the legal form of the transaction is relatively unimportant.[102]

One of the most difficult problems in connection with the supplying of materials will be the determination of the amount the Agency will pay for the contributed materials. This is intertwined with the problems of financing of the Agency and will be dealt with later in that connection.

No member may require that the materials it makes available to the Agency be kept separately by the Agency or designate the specific project in which they must be used.[103] It seems to be the purpose of

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South Africa), who said: "Article IX . . . does not give the Agency the right to refuse these materials since such a right would be incompatible with the disarmament purposes of the Agency." IAEA/CS/OR.20, p. 28.

[99] Statute, art. IX, par. B.

[100] The statute uses the inconclusive term "reimbursement" in art. XIII to describe the payment made to contributing members. The terms "withdraw" used in art. XII, par. A, subpar. 7, and "return" in art. XII, par. C of the statute are also inconclusive.

[101] For problems arising under the United States Atomic Energy Act of 1954 in regard to the title to fissionable material and the forms of transaction used, see text at note 171, *infra*.

[102] For the solution adopted by EURATOM see Treaty establishing the European Atomic Energy Community (EURATOM), and connected documents, Secretariat of the Interim Committee for the Common Market and EURATOM, Brussels, 1957, Chap. VI.

[103] See art. IX, par. J of the statute. This provision refers both to material stored with the Agency and those stored by the member in accordance with art. IX, par. A, second sentence, for in either case the materials are "made available." While a member has not the right to demand that its contribution be used for a specific project, the article does not seem to preclude the Agency from agreeing to such a use. To what extent would such agreement bind the Agency? Does the express exclusion of the right to demand the use of a contribution in a specific project exclude any and all conditions, *e.g.*, the condition that the contribution be *not* used in a specified area or for a certain type of project? Ambassador Wadsworth suggested that such a

this provision to ensure that all contributed materials are available for all approved projects.

Once a member has notified the Agency of its intention to make a contribution, the member must be in a position to make delivery immediately to the recipient state as instructed by the Agency or to the Agency itself to the extent that such materials are "really necessary for operations and scientific research in the facilities of the Agency." [104] However, the member in its discretion may decide whether it will retain possession of the material pending instructions to deliver or make an agreement with the Agency for storage in the Agency's depots.[105] The latter alternative will be feasible, of course, only when the Agency has established its storage facilities.

One great problem that will confront the Agency is the location of storage facilities when they are established. The headquarters of the Agency in Vienna would not be a particularly suitable location for storage facilities. In storing special fissionable materials in its possession, the Agency is under obligation to insure the geographical distribution of these materials in such a way as not to allow concentration of large amounts of such materials in any one country or region of the world.[106] It will be difficult to find locations where the fissionable materials could be disposed of on short notice in the event of an attempt to seize them. A possible location would be on an island where in an emergency they could be dumped into the sea.

According to the statute, unless the Board decides otherwise, the materials shall initially be made available for the period of one year.[107]

A provision of this nature was probably necessary since the chief contributors would not wish to bind themselves for any longer period until they could determine how well the Agency was functioning.

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condition "would be contrary to the spirit of paragraph J of Article IX" and would result in "chaos fairly soon." For extensive discussion of this problem see *Hearings before the Senate Foreign Relations Committee,* note 9 *supra* at 154-156.

[104] Statute, art. IX, par. D. This means that a state is obliged to deliver materials to the Agency only for the Agency's own immediate needs. Therefore, the Agency acts as a "bank" only for the materials stored at the request of the supplying member. All other material is transferred directly from the contributing to the recipient country. The word "really," which is bad English, was designed to emphasize the immediate character of the Agency's own requirements for operations and research. It was introduced in the twelve-power draft on Soviet insistence.

[105] Statute, art. IX, par. A, second sentence.

[106] Statute, art. IX, par. H, third sentence.

[107] Statute, art. IX, par. F, second sentence. The statute does not say specifically whether the period covered by the contribution must be determined in the agreement with the contributor and whether the Board has discretion to modify such period.

However, it is somewhat unrealistic. The Agency projects will require a continuous supply of fissionable materials. It will be necessary for the Agency, before it approves a project, to have some assurance of a continuing supply of fissionable materials for the life of the project. The bilateral agreements of the United States generally provide for the supply of materials for at least five years.[108] In comparison, an Agency project would not be particularly attractive if it could guarantee materials only for one year. The United States has already indicated its intention to make materials available to the Agency for a longer period. On the final day of the conference, Chairman Lewis Strauss of the United States Atomic Energy Commission delivered a message of the President of the United States:

> To enable the International Atomic Energy Agency, upon its establishment by appropriate governmental actions, to start atomic research and power programs without delay, the United States will make available to the Agency, on terms to be agreed with that body, 5,000 kilograms of a nuclear fuel uranium 235 from the 20,000 kilograms of such material allocated last February by the United States for peaceful uses by friendly nations. . . . In addition to the above mentioned initial 5,000 kilograms of uranium 235, the United States will continue to make available to the International Atomic Energy Agency nuclear materials that will match in amount the sum of all quantities of such materials made similarly available by all members of the International Agency, and on comparable terms, for the period between the establishment of the Agency and July 1, 1960. The United States will deliver these nuclear materials to the International Agency as they are required for Agency approved projects.[109]

During the General Conference in Vienna, Portugal offered to make available to the Agency 100,000 kilograms of "black oxide of uranium in concentrated form," and the Soviet Union and the United Kingdom reaffirmed their intention to contribute respectively 50 and 20 kilo-

[108] *E.g.*, in art. XI of the Agreement for Co-operation between the United States and Cuba, 102 Cong. Rec. 10396 (June 29, 1956), and between the United States and the Dominican Republic (also art. XI), *id.*, 10401 at 10402.

The Atomic Energy Commission on November 18, 1956, announced that it is prepared to furnish fuel requirements beyond the term of ten years. Statement by the Chairman of the Atomic Energy Commission, AEC Press Release, Nov. 18, 1956, p. 3.

[109] IAEA/CS/OR.40, p. 7. The announcement of the Atomic Energy Commission, referred to in the preceding footnote, leaves the door open for arrangements between the United States and the Agency on terms similar to those of the bilateral agreements.

grams of 20% enriched uranium.[110] The Chairman of the United States Delegation stated that the United States would match these contributions referring to the terms of the President's message.[111] It should be pointed out that the President's offer to match contributions of other states was generally interpreted to refer only to fissionable materials and not to source materials.[112]

G. Project Agreements

The principal obligations of members of the Agency including the obligation to submit to safeguards and to health and safety regulations will arise only when the member signs a project agreement with the Agency. The statute specifies the principal elements which must be included in such agreement.[113]

A majority of members of the Agency will have at the outset little technological skill in the field of atomic energy. For such a state to secure a power reactor through the Agency, it must obtain fissionable materials, technical advice, reactor components, and financing.

The applicant state will receive its fissionable materials from the Agency as a result of an agreement with the Agency. On the other hand, reactor components and much of the technical advice are likely to be obtained from sources outside of the Agency.[114] The terms and conditions under which the services and components are obtained must

[110] See the statement of Mr. Nutting in the 718th meeting of the First Committee of the 9th General Assembly on November 16, 1954, that the United Kingdom was prepared to hold available 20 kilograms of fissionable material as initial contribution to the Agency. U.N. General Assembly Off. Rec., 9th Session (1954), First Committee, A/C.1/CR.718, p. 347 at 348. The Soviet Union on July 18, 1955, stated that it is ready "to deposit into an international fund for atomic materials under an international agency for atomic energy 50 kilograms of fissionable materials, as soon as agreement has been reached on the creation of such an agency." Note of the Soviet Ministry of Foreign Affairs to the American Embassy, in United States Department of State Press Release No. 527, Oct. 6, 1956, p. 11.

[111] U.S. Press Releases, Vienna General Conference, Nos. 4, 7 and 8.

[112] Mr. Strauss during the Senate Hearings stated that the figure of 5,000 kilograms referred to 20 percent enriched uranium. At the same time it was contemplated that the bulk of uranium to be utilized would be enriched only to the extent of 2 or 3 percent. "If this [the uranium made available] had been stated, for example, in terms of 2 or 3 percent, the figure of 5,000 kilograms would have been multiplied. If one were mentioning it in terms of 100 percent enrichment, it would be yet another figure." *Hearings before the Senate Foreign Relations Committee*, note 9 *supra* at 111.

[113] See art. XI, par. F of the statute.

[114] The Preparatory Commission recommended that the Agency be in a position to provide technical advice to its members. PRECO Report, note 49 *supra*, par. 49.

be set forth in the project agreement with the Agency.[115] The Agency has no responsibilities in connection with financing the project but "upon request the Agency may also assist any member or group of members to make arrangements to secure necessary financing from outside sources to carry out such projects. In extending this assistance, the Agency will not be required to provide any guarantees or to assume any financial responsibility for the project." [116]

H. Relation to Bilateral, Multilateral, and National Programs

An important aspect of the functions of the Agency revolves around its relation to the bilateral agreements for developing peaceful uses of atomic energy (such as some forty bilateral agreements for cooperation between the United States and other states) and multilateral arrangements (such as the EURATOM plan negotiated by the six members of the European Coal and Steel Community [117] and the proposed scheme of the Organization for European Economic Cooperation).[118] To what extent will the Agency replace bilateral and multilateral arrangements for international cooperation in the atomic energy field? [119] To what extent will the parties to these arrangements utilize the Agency system of safeguards against diversion for military uses?

[115] Statute, art. XI, par. F, subpar. 3. It is interesting to note that no specific provision is made in this subparagraph with reference to supply of information, unless the term "services" is meant to include supplying of information. Furthermore, subpar. 3 seems to be limited to situations where a project is assisted by the Agency or by the Agency and a "member." What if assistance is given by a non-member?

[116] Statute, art. XI, par. B. This wording originated in amendment IAEA/CS/Art. XI/Amend. 1, contained in revised form in Conference Room Paper No. 5, sponsored by all 20 Latin American countries, which was adopted by 57 votes to none. IAEA/CS/OR.28, pp. 2-5.

[117] Treaty establishing the European Atomic Energy Community, Secretariat of the Interim Committee for the Common Market and EURATOM, Brussels, 1957. For an earlier description of the EURATOM plan see "Report of the Intergovernmental Committee on European Integration" (Brussels, 1956), reprinted in Univ. of Mich. Law School Summer Institute, Workshops on Legal Problems of Atomic Energy 201-215 (1956). See also Knorr, EURATOM and American Policy (1956).

[118] For a description of this scheme see "Report of the Special Committee for Nuclear Energy to the Council," with annexes and decisions adopted by the Council on July 18, 1956, in Joint Action by O.E.E.C. Countries in the Field of Nuclear Energy (1956). For an earlier report, see Possibilities of Action in the Field of Nuclear Energy (O.E.E.C.) (1956). On both EURATOM and O.E.E.C. plans, see Knorr, Nuclear Energy in Western Europe and United States Policy (1956).

[119] The Chairman of the United States Atomic Energy Commission discussed these problems before the Senate Committee on Foreign Relations and concluded that there would not be a duplication of activities. "The task is so great and the opportunities so broad that, for a number of years, the combined activities of the United States—

During the United Nations General Assembly discussions of the Agency in the fall of 1954, in response to a question by Mr. Vyshinsky, Ambassador Lodge indicated that the United States did not contemplate that the Agency would have exclusive authority for international transfers of fissionable materials for peaceful uses of atomic energy.[120] During the negotiations on the Agency statute it became apparent that one of the prime objectives of the Agency—prevention of the diversion of fissionable materials to military uses—could be totally defeated if the United States, the United Kingdom, or the Soviet Union in their bilateral agreements should make fissionable materials available to other countries under less onerous safeguards than those provided in the Agency statute.[121] Obviously, if safeguards are to be effective, the systems of safeguards under bilateral and multilateral agreements must in general conform to the Agency safeguard system.

A step in this direction was made by the United States in providing in its more recent bilateral agreements for safeguards substantially identical to those in the statute.[122] Furthermore, states which are parties to these agreements undertook upon the establishment of the Agency to consult with a view to transferring the administration of

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together with countries with which we already have or will negotiate direct agreements—and of the world Agency should all serve a constructive, harmonious purpose." *Hearings before the Senate Foreign Relations Committee,* note 9 *supra* at 85 and 86.

[120] In the 715th meeting of the First Committee Mr. Vyshinsky said that the meaning of the term "clearing-house" used for the activities of the Agency was not clear to him. He interpreted it to mean that if projects for the use of fissionable material transferred through the International Agency from one state to another were made contingent upon approval by the International Agency, the Agency would have the right to approve or reject the plans established by states for the use of fissionable materials for peaceful ends. This would constitute a violation of international law, if the decisions of the Agency should be unacceptable to the states concerned. U.N. General Assembly Off. Rec., 9th Session (1954), First Committee, A/C.1/SR. 715, p. 329 at 333.

In the 717th meeting Mr. Lodge answered that in practice the Agency would have no control over the use of fissionable material except when such material was specifically earmarked for Agency projects. Thus any state would be free to transfer fissionable materials to another state without having to secure the consent of the Agency. A/C.1/SR.717, p. 341 at 343.

[121] A meeting of experts was held in Geneva immediately following the scientific conference in August 1955 to discuss the question of uniform safeguards. See generally United States Department of State Press Release No. 527, Oct. 6, 1956, and Appendix A, Item 1. See also note 95 *supra.*

[122] In regard to the standardization of safeguards, see the United States Aide-Memoire of August 15, 1956, United States Department of State Press Release No. 527, Oct. 6, 1956, pp. 29-30, and the model article, *id.* at 31. For actual safeguards provisions in a "power-bilateral," see arts. XIII and XIV of the agreement between the United States and Australia, 102 Cong. Rec. 10412 at 10414 (June 29, 1956).

the safeguards to the Agency; either party was given the right to terminate a bilateral agreement if such consultations do not lead to an understanding.[123] It remains to be seen whether the Soviet Union would be willing to take a similar step with respect to the arrangements to which it is a party.[124] The scheme proposed by the Organization for European Economic Cooperation for the control of its activities in the nuclear field calls for arrangements with the Agency "with regard to the exercise of the control on the territory of countries participating both in the Organization and in the Agency."[125] The Agency statute now specifically provides that the Agency safeguards system (including inspection by Agency inspectors) may be extended "at the request of the parties, to operations under any bilateral or multilateral arrange-

[123] On December 1, 1957, 39 bilateral agreements for cooperation were in force between the United States and other states. Of this total 29 were agreements for cooperation in the research reactor field and 10 were "power bilaterals." A number of other agreements are in the process of completion. On U.S. bilateral agreements, see Fisher, L'Energie Atomique et les États-Unis 241-296 (1957).

Before the middle of 1956 the agreements did not refer to the International Agency. Agreements concluded after that time took into consideration the future establishment of the Agency in the following manner:

"The Government of ———————— and the Government of the United States of America affirm their common interest in the establishment of an international atomic energy agency to foster the peaceful uses of atomic energy. In the event such an international agency is created:

"1. The parties will consult with each other to determine in what respects, if any, they desire to modify the provisions of this agreement for cooperation. In particular, the parties will consult with each other to determine in what respects and to what extent they desire to arrange for the administration by the international agency of those conditions, controls, and safeguards, including those relating to health and safety standards, required by the international agency in connection with similar assistance rendered to a cooperating nation under the aegis of the international agency.

"2. In the event the parties do not reach a mutually satisfactory agreement following the consultation provided in paragraph A [*sic*] of this article, either party may by notification terminate this agreement. In the event this agreement is so terminated, the Government of ———————— shall return to the United States Commission all source and special nuclear materials received pursuant to this agreement and in its possession or in the possession of persons under its jurisdiction." See United States Department of State Press Release No. 527, Oct. 6, 1956, p. 33, and, for a practical example, art. XII, par. A, of the Agreement for Cooperation with France, 102 Cong. Rec. 10400 (June 29, 1956).

[124] See note 77 *supra*.

[125] Sec. III, par. 12, subpar. a of the decisions adopted by the Council of the European Organization for Economic Cooperation on 18th July, 1956, Joint Action by O.E.E.C. Countries in the Field of Nuclear Energy 132-133 (1956). For the type of security controls and safeguards contemplated, see *id.* at 57-73. For the controls and safeguards contemplated by EURATOM, see Treaty establishing the European Atomic Energy Community, note 117 *supra*, arts. 77-85.

ment." [126] During the International Conference, at the suggestion of Thailand, this provision was further broadened to permit the safeguards system and the health and safety system to be extended "at the request of a state to any of that state's activities in the field of atomic energy." [127] This obviously is a further step in the direction of making possible a uniform international system of safeguards.

The remaining steps necessary to transfer the concept of uniform safeguards from the realm of ideas have not yet been taken: first, an agreement among states disposing of fissionable materials outside the Agency that they will require in each instance the acceptance of the Agency system of safeguards as a condition of turning over the materials; and second, the ultimate establishment of a system of safeguarded disarmament which would apply the system of safeguards universally to the entire atomic establishment of all states including those possessing atomic weapons. In view of the present Soviet attitudes, the outlook for the attainment of this last goal in the foreseeable future is most unpromising. Nevertheless, the Agency could create a working model of an inspection system which on a vastly broadened scale would be useful in a disarmament program.[128]

The United States, the United Kingdom, and the Soviet Union supported the Thai suggestion but gave no indication that their own programs would be subjected to Agency safeguards. The Soviet Union has on a number of occasions stated that it will supply fissionable materials to other countries without any safeguards excepting an agreement by those countries to devote the materials only to peaceful purposes.[129] However, to date the Soviet Union has apparently not offered

[126] Art. III, par. A, subpar. 5 of the statute. This provision was first included in the twelve-power draft.

[127] Statute, art. III, par. A, subpar. 5. Mr. Khoman, representative from Thailand, remarked in the Conference: ". . . [I]f for no other reasons than those of equality and equity, as well as the reason that the *eventual establishment of world-wide security from atomic danger is possible,* these safeguards shall not be restricted to the present boundaries but extended to all the countries of the world." [Emphasis added.] IAEA/CS/OR.15, p. 65.

[128] "The Agency will not, of course, achieve atomic disarmament, nor was it conceived to attempt that. However, it can promote United States objectives in the field of disarmament by creating a practical working model of an inspection system, and a climate of international opinion in support of our objectives. This, we may hope, will facilitate establishment of the broader controls needed for a successful disarmament agreement" (statement of Mr. Lewis Strauss, *Hearings before the Senate Foreign Relations Committee,* note 9 *supra* at 87).

[129] Mr. Zarubin, representative of the Soviet Union, stated at the Conference: "The Agency should impose upon no country control that might infringe upon its sovereign rights. . . . It is . . . necessary to note that the agreement on the peaceful

significant quantities of fissionable materials to countries other than those which it fully controls.

Most of the inter-governmental discussions of the relationship of the Agency to bilateral or multilateral programs of cooperation have concentrated on the systems of safeguards. However, the success or failure of the Agency will depend equally upon working out a proper relationship on other phases of the program. It is apparent that the United States, the United Kingdom, and the Soviet Union can through bilateral or multilateral agreements make available all types of assistance which the Agency might provide. If the terms offered by one of these states are more favorable than those offered by the Agency or if the procedures are less cumbersome, then there would be little incentive for a state to request assistance from the Agency.

If the Agency is to play a meaningful role in the development of the peaceful uses of the atom, it will be necessary to work out some form of relationship between the Agency program and bilateral and multilateral programs. Three possible types of relationship immediately suggest themselves.

1. The United States (and also the United Kingdom and the Soviet Union) might gradually arrange for the Agency to take over the bilateral and multilateral programs in their entirety. Some of the recent bilateral agreements of the United States provide for consultations between the parties after the establishment of the Agency with a view to possible modifications of the agreements.[130] Any change in the agreements would require the consent of both parties. The present policy of the United States, however, contemplates continuance and expansion of bilateral programs of cooperation.[131]

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utilization of atomic energy concluded between the Soviet Union and other countries does not contain any conditions which might infringe upon the sovereign rights of countries participating therein. The Soviet Union considers that a sufficient guarantee is to provide in the draft statute that countries must be obligated not to make use of the assistance which they receive from the Agency for the production of atomic weapons, and must submit reports with respect to the assistance received. The system of guarantees contemplated under the draft statute would have meaning if it had been connected with the prohibition of the atomic weapon and if it had been made applicable to both the recipient countries and the countries giving assistance." IAEA/CS/OR.3, pp. 31-35. For the position taken by the Soviet Union in regard to safeguards, see also Appendix A, Item 7.

[130] See note 123 *supra*.

[131] As to relationship of the International Atomic Energy Agency to bilateral and multilateral arrangements see *Hearings before the Senate Foreign Relations Committee* (statements of Mr. Lewis Strauss and of Mr. Gerard C. Smith), note 9 *supra* at 86 and 165.

2. The bilateral and multilateral arrangements might continue with the parties requesting the Agency to assume the responsibility for the administration of safeguards. The statute contemplates this possibility, which was discussed above.[132]

3. The bilateral and multilateral arrangements might continue to cover the same broad fields where the Agency furnishes assistance. In this event, in order to avoid unnecessary duplication of activities, it might be advisable for the three Great Powers to agree that certain specific types or sizes of reactors would be furnished with the assistance of the Agency while countries in their separate programs would concentrate on other types or sizes.[133] EURATOM and the Organization for European Economic Cooperation have under study the establishment of "common installations" (or "joint undertakings"), such as isotope separation and chemical processing plants.[134] Coordination of Agency activities with these multilateral arrangements will also be necessary.

In the absence of some arrangement to correlate the various programs, the Agency might find that practically all feasible projects were being undertaken outside the Agency.

I. Privileges and Immunities

The statute grants the Agency such legal capacity and privileges and immunities in the territory of each member "as are necessary for the exercise of its functions." [135] The delegates of the members and Governors (members of the Board) with their staff as well as the Director General and the staff of the Agency are accorded privileges and immunities "necessary in the independent exercise of their functions. . . ." [136] Separate agreements to be negotiated between the Agency and the members are to define the legal capacity, privileges, and immunities so conferred.[137] These limited "functional" privileges follow generally the provisions in the Charter of the United Nations and the statutes of some specialized agencies of the United Nations.[138]

[132] Statute, art. III, par. A, subpars. 5 and 6.

[133] See statements in note 131 *supra*.

[134] On EURATOM "joint enterprises," see Treaty establishing the European Atomic Energy Community, note 117 *supra*, arts. 45-51. On O.E.E.C. "joint undertakings," see Joint Action by O.E.E.C. Countries in the Field of Nuclear Energy 23-52 (1956).

[135] Statute, art. XV, par. A.

[136] *Id.*, par. B.

[137] *Id.*, par. C.

[138] See, *e.g.*, art. 105 of the United Nations Charter, which, contrary to the Covenant

The question arises whether or not the grant of the legal capacity, privileges, and immunities was intended to become effective from the date of the ratification of the statute in the absence of separate agreements. It is pertinent to note that the final draft omits the eight-power draft provision to the effect that the requirement of separate agreements is "without prejudice to the immediate effectiveness" [139] of the grant of the legal capacity, privileges, and immunities.[140]

J. Settlement of Disputes

"Any question or dispute concerning the interpretation or application" of the statute, not settled by negotiation, "shall be referred to the International Court of Justice in conformity with the Statute of the Court unless the parties concerned agree on another mode of settlement." [141] In order to bring a matter before the Court under this provision, it will apparently be necessary for the parties to conclude a special agreement unless both parties had previously accepted the compulsory jurisdiction of the Court. The provision in the eight-power draft which would have conferred unequivocally upon the Court compulsory jurisdiction in this matter has been abandoned.[142] This is clearly a concession to the opposition on the part of the Soviet Union to the compulsory jurisdiction of the International Court in any form or shape.

The statute provides that both the General Conference and the Board of Governors "are separately empowered, subject to authorization from the General Assembly of the United Nations to request the International Court to give an advisory opinion on any legal question aris-

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of the League of Nations, does not provide for diplomatic immunities but only (as in the case of the Agency) for limited privileges. The provisions in the constitutions of other specialized agencies are similar. See, *e.g.*, art. 67 of the Constitution of the World Health Organization; art. 40 of the Constitution of the International Labor Organization.

[139] Art. XVII, par. C of the eight-power draft.

[140] For a view that limited privileges are available even in absence of separate agreements, see the excellent statement of Mr. Leonard C. Meeker, Assistant Legal Advisor, Department of State, in *Hearings before the Senate Foreign Relations Committee*, note 9 *supra* at 161.

[141] Statute, art. XVII, par. A.

[142] Art. XIX, par. E, the relevant provision of the eight-power draft, read: "The Parties to the present Statute *accept* the jurisdiction of the International Court of Justice with respect to any dispute concerning the interpretation or application of the Statute. Any such dispute may be referred by any Party concerned to the International Court of Justice for decision unless the Parties concerned agree on some other mode of settlement. . . " [Emphasis added.]

ing within the scope of the Agency's activities." [143] The General Assembly was to grant such authorization on all questions "other than a question concerning the mutual relationships of the Agency and the United Nations or the specialized agencies." [144]

The above-quoted provision of the statute referring to advisory opinion is broad enough to cover not only disputes among member states but also disputes between the Agency on one hand and a member on the other. The latter type of dispute would include differences arising between the Agency and a recipient state over the interpretation of a project agreement. Under the statute, any such project agreement is to "make appropriate provision regarding settlement of disputes." [145] It is hoped that the Board will develop a formula to be included in all project agreements—for a speedy and binding solution of such disputes in the event the efforts at a settlement by the Director General and the Board should fail. A possible formula would be to refer the dispute to the International Court of Justice for an advisory opinion which the parties would undertake to accept in advance.[146] Another possible

[143] Statute, art. XVII, par. B. This provision is based on art. 96, par. 2 of the United Nations Charter which provides that "other organs of the United Nations and specialized agencies, which may at any time be so authorized by the General Assembly, may also request advisory opinions of the Court on legal questions arising within the scope of their activities." It is of somewhat academic interest to speculate whether under this article, the Agency would be considered a "specialized agency." The Agency cannot be a party to a contentious proceeding before the International Court since the Statute of the International Court of Justice provides in art. 34, par. 1, that only *states* can be parties in cases before it. It is interesting to note that the Draft Relationship Agreement between the United Nations and the International Atomic Energy Agency (General Assembly Document A/3620, July 23, 1957, arts. I and XX) apparently does not consider the International Atomic Energy Agency a specialized agency. Article I of the Agreement refers to the Agency as "autonomous." Article XX refers to the relationships of "The Agency with any specialized agency."

[144] See art. X, Draft Relationship Agreement between the United Nations and the International Atomic Energy Agency, General Assembly Document A/3620, July 23, 1957.

[145] Statute, art. XI, par. F, subpar. 6. This provision originated in an amendment submitted by the Netherlands. IAEA/CS/Art. XI/Amend. 3. In view of its adoption, a Swiss amendment (IAEA/CS/Art. XVII/Amend. 1/Corr.1) designed to provide for the settlement of disputes of any kind and including disputes with the Agency was withdrawn.

[146] Although this formula by itself would of course not establish compulsory jurisdiction of the Court over the Soviet Union, the Russians nevertheless may be expected to oppose it. They may oppose it perhaps somewhat less vigorously and—it is hoped—less successfully than the original text of the disputes article in the eight-power draft. For a possible procedure utilizing the advisory opinion of the International Court of Justice in an arbitration procedure see sec. 21 of the Headquarters Agreement between the United States and the United Nations, signed June 26, 1947. U.N. General Assembly Off. Doc., Second Session (1947), Resolutions, 169 (II), p. 91.

formula would be to provide for arbitration by a special commission which could develop into an expert judicial body on matters relating to atomic energy.[147]

K. Financing of the Agency

One of the most difficult problems confronting the Agency will be that of financing its operations. The reason, of course, is that most activities in the field of atomic energy involve vast expenditures.

It is clear that the International Agency, at the outset, will have the financial resources to carry on only a small fraction of the total activities associated with the peaceful development of atomic energy.

The statute recognizes four methods of financing Agency activities. First, administrative expenses [148] will be included in a separate budget and apportioned among the members in accordance with a scale to be fixed by the General Conference. The General Conference, in fixing this scale, shall be guided by the principles adopted by the United Nations in assessing contributions of member states to the regular budget of the United Nations.[149] In the early years of the Agency, only a small fraction of the eighty-seven states eligible for initial membership will be the beneficiaries of power projects. Most of the remaining members will be unwilling to accept large assessments which would be utilized for the general administration of the Agency without any direct benefit to them, thus limiting the funds assessed in this manner.[150]

[147] As pointed out above, a beneficiary state cannot avoid or delay the measures imposed by the Board for noncompliance with the safeguards provisions by invoking the dispute settlement provisions contained in art. XVII or in the project agreement. Any effort to provide for such avoidance or delay in the project agreement would seem to be contrary to the safeguards provisions of the statute, and particularly to art. XII, par. C.

[148] Administrative expenses are defined in art. XIV, par. B, subpar. 1 of the statute to include (a) costs of the staff of the Agency (other than the staff employed in connection with materials, services, equipment and facilities required in carrying out the Agency's functions or necessary for Agency projects); cost of meetings, expenditures required for the preparation of Agency projects and for the distribution of information, as well as (b) costs of implementing safeguards and expenses incurred in the "syphoning off" of special fissionable material not used for any project. The expenses under (a) are apportioned to the full extent. According to par. C of art. XIV, the expenses under (b) are apportioned only to the extent that they are not recoverable under agreements regarding the application of safeguards between the Agency and parties to bilateral and multilateral arrangements.

[149] Statute, art. XIV, par. D.

[150] During the Preparatory Commission discussions some question arose as to the scope of expenditures which could properly be included within the administrative budget. For example, it was contended that the cost of a fellowship program could

A second method of financing the Agency would be through borrowing. Under rules and limitations to be approved by the General Conference, the Board of Governors has the authority to exercise borrowing powers on behalf of the Agency without, however, imposing on the individual members of the Agency any liability in respect of the loans.[151] While the language of the statute is most ambiguous, presumably loans would be utilized chiefly for the construction of Agency facilities and not for the day-to-day operations of the Agency.[152]

A third method of financing is through voluntary contributions. The Board of Governors is authorized to accept voluntary monetary contributions made to the Agency.[153] There are a number of parallels for financing international bodies in this manner, for example, the United Nations agency supporting the Palestine refugees. However, the amount of voluntary contributions which states might be willing to make is likely to be limited.

The fourth method of financing the Agency is through charges imposed in project agreements between the Agency and states recipient of materials and services. Such charges will include costs of special fissionable materials and of their handling and storage and probably a large proportion of the cost of administering the system of safe-

not be deemed an administrative expense. The Commission ultimately recommended the inclusion within the administrative budget of $250,000 "for a limited fellowship program which from the administrative point of view could be undertaken by the Agency during the course of 1958 if funds were to be made available." This was justified on the grounds that such expenses might be deemed as "other expenses, such as may for example be contemplated under Article XIV F of the Statute." PRECO Report, note 49 *supra*, pars. 170 and 171. This narrow definition of administrative expenses was emphasized during the *Hearings before the Senate Foreign Relations Committee*, note 9 *supra*, at 57 and 136.

[151] Statute, art. XIV, par. G. The provision that the members shall not be liable for loans was included on British initiative following a suggestion made by Yugoslavia. IAEA/CS/OR.31, p. 42. See also IAEA/CS/OR.32, p. 17 and pp. 60-61 for the British and U.S.S.R. positions in this matter. The amendment is contained in Conference Room Paper No. 12/Rev. 1. The Soviet Union opposed any borrowing power for the Agency. The amendment proposed by the Soviet Union to delete par. G (IAEA/CS/Art. XIV/Amend. 4) was rejected by 49 votes to 9, with 14 abstentions. IAEA/CS/OR.36, p. 22.

[152] See Appendix I.

[153] Statute, art. XIV, par. G, last clause. This provision was included in the statute as a result of an amendment submitted by Egypt, Indonesia, and Syria. IAEA/CS/Art. XIV/Amend. 2, as revised by Conference Room Paper No. 10. The Soviet Union proposed an amendment to add a new par. E to art. XIV providing for financing of expenses under par. B, subpar. 2, to the extent that they concern the acquisition of Agency-owned materials, facilities, and equipment, by voluntary contributions. IAEA/CS/Art. XIV/Amend. 4. This amendment was rejected by 52 votes to 10, with 10 abstentions. IAEA/CS/OR.36, pp. 24-25.

guards.[154] Here again there are practical limitations upon the funds that can be raised through such charges. The greater the charges the greater the cost of production of electric power utilizing atomic fuel. If the charges imposed under Agency agreements are onerous, the result will be to delay substantially the time when atomic power will be competitive with conventional power. Furthermore, if the charges are greater under the Agency program than under bilateral programs, states will be discouraged in utilizing the Agency. On the other hand, there may be no other practical way to finance the safeguards system. One possible solution for this dilemma would be for states contributing fissionable and other materials to contribute those materials to the Agency at less than cost. There is nothing in the statute which would prevent such an indirect subsidy of the Agency.[155]

The Preparatory Commission recommended a first year budget of slightly in excess of four million dollars (excluding working capital fund of two million dollars).[156]

L. Amendment Procedures

Amendments to the statute come into effect when approved by the General Conference by a two-thirds majority and "by two-thirds of all the Members in accordance with their respective constitutional processes." [157]

[154] Statute, art. XIV, par. B, subpars. 1 (b) and 2.

[155] As stated previously, contributions of fissionable and other materials to the Agency will be made on terms agreed upon between the Agency and each individual state making the contribution. Statute, art. IX, pars. A and B. The agreement between the contributing state and the Agency might provide for furnishing the material at cost, at less than cost or at more than cost. There is nothing in the statute to require the Agency to pay uniform sums to the states making the contributions. For U.S. policy and legislation see note 169 *infra*, and text at that note. Chairman Strauss of the U.S. Atomic Energy Commission, in his statement to the International Conference on October 26, 1956 (IAEA/CS/OR.40, p. 2 *et seq.*), indicated that the United States contributions would be "on comparable terms" to the contributions made by other members. *Id.* at 7. It thus would be possible for the United States and other contributors to adjust the amount they charge to the Agency in such a manner that the cost of fissionable materials to recipient states including surcharges for operation of the safeguards system would be comparable to the cost of fissionable materials furnished under the bilateral programs. It should be noted that under the bilateral programs of the United States the net cost of fissionable materials to cooperating states is reduced through the amounts which the United States pays to such states for the plutonium by-product recovered when the fuel elements are chemically reprocessed in the United States. The Agency would not be in a position to make similar payments until the technology of utilizing plutonium for peaceful purposes is further advanced so as to allow the Agency to make profitable use of it.

[156] PRECO Report, note 49 *supra* at 39, pars. 174-187.

[157] Statute, art XVIII, par C

A member unwilling to accept an amendment to the statute may withdraw from the Agency at any time but must fulfill its contractual obligations to the Agency.[158] In theory, at least, this right to withdraw from the Agency protects a member against unacceptable amendments which would make basic changes in the rights and obligations of membership. In practice, however, if the Agency becomes a truly important source of assistance it might not be feasible for a state to withdraw. In all probability, agreements between the Agency and its members for the supply of special fissionable materials will result in obligations extending over a number of years.[159] It might be wise for a state furnishing fissionable materials to provide specifically in its agreement with the Agency for the termination of its obligation to furnish the materials in the event of its withdrawal from the Agency because of an amendment to which it was unwilling to agree. Likewise, the obligations of a state receiving assistance from the Agency will presumably extend for the life of the project and would make a withdrawal difficult. This raises the problem of the status of a power reactor constructed with assistance of the Agency if the state where the reactor is located withdraws from the Agency. Presumably the agreement between the Agency and the recipient state would cover this contingency. The statute provides that withdrawal by a member from the Agency shall not affect its contractual obligations entered into pursuant to the provisions governing Agency projects.

The United States Senate subjected its advice and consent to the "interpretation and understanding" that (1) any amendment to the statute shall be submitted to the Senate for its advice and consent, and (2) the United States will not remain a member of the Agency in the event of an amendment being adopted to which the Senate by a formal vote should refuse its advice and consent.[160] The act of Congress providing for the participation of the United States in the Agency made provision for "the prompt and orderly settlement of obligations and commitments to the Agency" and "orderly termination of United States participation in the Agency" if such a contingency should arise.[161]

[158] *Id.*, pars. D and E.

[159] For considerations concerning the duration of obligations of member states contributing materials, see text at note 107ff. *supra.*

[160] The "interpretation and understanding" originated in The Committee on Foreign Relations (Ex. Rep. 3 on Exec. I, 85th Cong., 1st. sess., at 17, June 14, 1957) and was adopted by the Senate, 103 Cong. Rec. 8463 *et seq.*, June 18, 1957.

[161] International Atomic Energy Agency Participation Act of 1957, P.L. 85-177, 85th Cong., 71 Stat. 455.

M. United States Cooperation with the Agency

The statute appears to conform to the concept of "an international arrangement" for an "international atomic pool" into which the President was "authorized" by the Congress to enter by the Atomic Energy Act of 1954.[162] The adherence of the United States to such an "arrangement" under the Act could have become effective either upon approval by the Congress or upon advice and consent of the Senate (as a treaty).[163] The Agency statute was submitted by the President to the Senate as a treaty, and, after approval by the Senate, was ratified on July 29, 1957.

The Executive Branch of the United States Government had concluded that under the conditions of the Act of 1954 United States cooperation with the Agency could and should be provided through the Atomic Energy Commission negotiating with the Agency periodic "agreements for cooperation" specifying amounts and terms of the contributions of fissionable materials for a given period.[164]

[162] Atomic Energy Act of 1954, 42 U.S.C.A. § 2154 (P.L. 703, § 124).

[163] *Id.*, §§ 2145 and 2014 (l) (P.L. 703, § 124, § 11 k). The statute provides for "ratification or acceptance" in accordance with "respective constitutional processes." Art. XXI, par. D. For discussion of § 2154 (P.L. 703, § 124) and generally of subchapter X (P.L. 702, c. 11) of the Atomic Energy Act of 1954 on International Activities, see Cole, "The Meaning of the New Atomic Law," Nucleonics, p. 12 (March 1955); Wit, "Some International Aspects of Atomic Power Development," 21 Law and Contem. Prob. 167-169 (1956). For a discussion of the provisions of the act concerning international activities generally see Ruebhausen, "New Atomic Problems," 9 N.Y. City Bar Assn. Rec. 368 (1954). See also University of Michigan Law School, Summer Institute, Workshops on Legal Problems of Atomic Energy 63-84 (1956).

[164] This general position was set forth to the Senate by the Secretary of State. *Hearings before the Senate Foreign Relations Committee,* note 9 *supra* at 6 and 7. Section 124 (P.L. 703, § 124) of the Atomic Energy Act of 1954, 42 U.S.C.A. § 2154, contemplates that the United States' cooperation with the "pool" will be "pursuant to an agreement for cooperation entered into in accordance with section 123." Section 123 (P.L. 703, § 123) provides for such an agreement with "any nation or regional defense organization." Since the Agency is not a "regional defense organization," the question may be asked whether under § 123 (P.L. 703, § 123) an agreement with the Agency is possible. This question clearly must be answered in the affirmative since in the absence of new legislation any other arrangement in the general context of the act and the Agency's statute would seem to be impracticable. It could perhaps be said that the giving of advice and consent by the Senate to the statute (or the approval by Congress of the Statute), since the statute provides for agreement between individual contributors (such as the United States) and the Agency, supersedes §§ 123 and 124 (P.L. 703, §§ 123, 124) to the extent that they are interpreted as precluding a bialteral agreement between the United States and the "international atomic pool." *Cf.* H.R. Rep. No. 2181, 83rd Cong. 2d Sess., "Separate Views on International Activities" and "Separate Views of Representative Holifield and Representative Price on H.R. 9757," reprinted in Atoms for Peace Manual, note 5 *supra* at 156-160, 161, 190-193.

The safeguards provisions of the Agency statute might be considered sufficient to enable the Agency to undertake in the agreement for cooperation the guarantees against diversion of materials to military purposes required in the Act. Upon completion of negotiations under this procedure the Commission would have to recommend approval of the agreement to the President. Before approving, the President would have to make "a determination in writing" that the agreement "will promote and will not constitute an unreasonable risk to the common defense and security." If it can be assumed that the participation of the Soviet Union and its satellites in the "international atomic pool" was contemplated by the Congress, such determination would be possible. Finally, before it came into effect, the proposed agreement—after approval by the President—would have to lie before the Joint Committee on Atomic Energy of the Congress for thirty days while Congress is in session.

The provisions of the Agency statute seemed compatible with the procedure required by the Atomic Energy Act interpreted in the above fashion. In fact, as pointed out earlier, the Agency statute itself envisaged notification by members of contributions made available "in conformity with its laws" and periodic agreements with contributors determining the terms of the contributions.[165]

These procedures required by the Atomic Energy Act proved to be rather cumbersome in connection with bilateral agreements. Unfortunately the Congress in the 1957 Act providing for the United States participation in the Agency appears to have complicated rather than simplified the procedures.[166]

Under Section 7 of the Participation Act, the Atomic Energy Act of 1954 was amended to provide that with the exception of the 5,000 kilograms containing uranium 235 already earmarked for the Agency,[167] "The Commission may distribute to the International Atomic Energy Agency or to any group of nations such amounts of special nuclear materials and for such periods of time *as are authorized by Congress.*" [168] This means that special legislation will be necessary for any further contribution to the Agency or for any contribution to other multilateral groups such as EURATOM. This requirement is far more burdensome than the procedures of the Atomic Energy Act of 1954.

[165] Statute, art. IX, par. C.
[166] P.L. 85-177, 85th Cong., 71 Stat. 453.
[167] Note 112 *supra.*
[168] Emphasis added. Sec. 7, P.L. 85-177, 85th Cong., 71 Stat. 455.

The same section of the Participation Act provided "unless hereafter otherwise authorized by law the Commission shall be compensated for special nuclear materials so distributed at no less than the Commission's published charges applicable to the domestic distribution of such material," with the exception of certain relatively small quantities of materials which might be made available for research purposes. This provision was included in the Act despite the unqualified assurances by the Executive Branch that full payment would be required for any materials made available to the Agency.[169]

It would seem desirable that the entire problem of United States cooperation not only with the Agency but also with certain regional arrangements such as EURATOM should be reviewed with a view to further amending the Atomic Energy Act of 1954 and the Participation Act of 1957 to permit greater flexibility in the relationships between the United States and these international groups, under general policy directives determined by the Congress.

Neither the Atomic Energy Act nor the Participation Act specify the form of the legal transaction (sale, lease, etc.) through which the United States fissionable material may be made available abroad.[170] The Atomic Energy Act of 1954 does provide that the title to all such materials *"within or under the jurisdiction of the United States"* shall be vested in the United States Government.[171] The United States bilateral agreements provide for either a lease or a sale of such materials to the cooperating government with the further provision in the case of sale that the title must remain vested in that government (and not passed to a private party under its jurisdiction) as long as private ownership of fissionable materials is not recognized in the United States.[172] The cooperating government is also required to agree that any material supplied by the United States will not be transferred

[169] During the hearings before the Senate Foreign Relations Committee the Secretary of State, the Chairman of the Atomic Energy Commission, and Ambassador Wadsworth, all stressed that the United States intended to receive full payment for the fissionable materials which it proposed to make available to the Agency and that the furnishing of these materials would not be on terms constituting in effect an indirect subsidy. For example, at the end of his testimony, Mr. Lewis Strauss, in response to a question, made the following statement: "They [countries receiving help from the Agency] will not get the donation out of the 5,000 kilograms we have been talking about because that is going to be cash on the barrelhead until Congress should determine differently." *Hearings before the Senate Foreign Relations Committee,* note 9 *supra* at 125.

[170] Section 54 of the Atomic Energy Act of 1954, 42 U.S.C.A. § 2074.

[171] *Id.*, § 52 and § 2h, 42 U.S.C.A. § 2072 and § 2012(h)

[172] The sale arrangement is used in "power bilaterals," *e.g.*, art. VII of the Agreement with Australia 102 Cong. Rec. 10412 at 10413 (June 29, 1956) The lease arrange-

"beyond the jurisdiction" of that government except as specified in the agreement itself.[173]

It seems unlikely that the legislation authorizing distribution of United States materials to the Agency will specify the form of the legal transaction. It is hoped that within the framework of the Atomic Energy Act and the Agency statute the Board of Governors will be able to work out with the Atomic Energy Commission a formula which would allow the Agency to make use of the United States contribution in the form most suitable to a given transaction keeping in mind, of course, that under the statute no member "shall have the right to require" that its contribution be "kept separately" or used for a designated purpose.[174] Neither the concept of a lease nor that of a sale may necessarily fit the actual arrangements desired.

N. Conclusions

The Agency as originally conceived had the twofold objective of making available the benefits of the peaceful uses of atomic energy on a worldwide basis and at the same time making a beginning in the direction of worldwide limitation of armaments through siphoning off to peaceful uses a portion of the materials available for nuclear weapons. For long periods of time during the negotiations the outlook for any tangible achievement toward either of these objectives was clouded. During the year immediately following the President's address to the United Nations, it appeared that the Soviet Union might not be a member and that the Agency might have limited membership largely confined to Western Europe and Latin America. Despite these fears it now appears that the Agency will have practically a worldwide membership.

The statute in its present form looks forward to a substantial contribution by the Agency to the peaceful development of atomic energy on a worldwide basis. However, largely because of the vast cost of the necessary facilities, for some years, its role is likely to be less significant

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ment is used in "research bilaterals," *e.g.*, art. IV of the Agreement with New Zealand. *Id.* at 10403.

The EURATOM plan contemplates that with certain qualifications EURATOM will have the option to purchase uncommitted quantities of source and fissionable material of the member states and will be the exclusive source of supply of such material for the members. Treaty establishing the European Atomic Energy Community, note 117 *supra*, arts. 52-76.

[173] Par. a(4) of § 123 (P.L. 703, § 123) of the Atomic Energy Act of 1954, 42 U.S.C.A. § 2153.

[174] Statute, art. IX, par. J.

than the role of national, bilateral, and multilateral regional programs.[175] The safeguards system developed by the Agency should as a minimum reduce the possibility of diversion of fissionable materials from peaceful to military uses and should assist in establishing uniform worldwide standards of health and safety. It could serve as a model for a control system if agreement were reached among the Great Powers that all future production of fissionable materials be utilized for peaceful purposes under adequate international control.[176]

In the eyes of the world, the success of the Agency is likely to be gauged by its progress toward establishment of power plants utilizing atomic fuel in the various areas of the world. The provisions in the statute regarding the powers, composition, and manner of selection of the Board of Governors can be justified to the world only if the Agency in the near future disposes of substantial quantities of fissionable materials for this purpose.

There are many hurdles in the path of rapid progress toward atomic power on a worldwide basis. Assuming as we may on the basis of the assurances given by the United States that the Agency will have a sufficient amount of fissionable materials to start operating, progress toward the goals of the Agency will, nevertheless, be slowed down by a shortage of trained technical personnel and a shortage of finances. The lack of available capital and personnel will affect not only the budget of the Agency but also national programs. Much skillful planning and action lie ahead to surmount these obstacles. The success of the undertaking depends also in large measure on securing for both the Agency staff and the Board of Governors individuals with the highest technical competence and the creative imagination necessary to visualize the Agency program and carry it out successfully. Finally, the Agency will play a significant role only if the participating states show sufficient imagination to see its potentialities and give it the necessary support.[177]

[175] *E.g.*, an Agency gaseous diffusion plant is an unlikely development for many years.

[176] See proposal of Canada, France, the United Kingdom and the United States, United Nations Disarmament Commission Document DC/113, Sept. 11, 1957, Annex 5.

[177] The experience in negotiating the statute of the Agency has created a useful precedent for preparing drafting international legislation under U.N. auspices. Rather than trying to draft a treaty in a committee of the General Assembly, it is preferable to organize a small but representative group such as the twelve-power group including those most vitally interested in the project. This group would then prepare the draft treaty and submit it to an international conference of all members with the understanding that it should not be changed except as a result of a demand by two-thirds of the members. During the negotiations, intermediate reports could well be made to the General Assembly which might discuss the progress and the chief issues without entering, however, into the drafting process.

Chapter II

SOVIET RUSSIA'S ROLE IN INTERNATIONAL COOPERATION FOR PEACEFUL USE OF ATOMIC ENERGY

HORACE W. DEWEY *

A. Introduction

The U.S.S.R. Council of Ministers announced on June 30, 1954, that the world's first industrial power station using atomic energy had begun producing electrical current for industry and agriculture in the Soviet Union.[1] Development of atomic energy for peaceful purposes was emphasized in the Soviet Union Communist Party's directives on the Sixth Five-Year Plan [2] and soon after the publication of these important directives the Council of Ministers issued a decree establishing a new body, the Chief Administration for Use of Atomic Energy, to direct atomic research, develop atomic reactors for electric power installations, and "further cooperation in the peaceful utilization of atomic energy between the U.S.S.R. and other nations." [3] By mid-1957 a report prepared for the United States Congress by staff experts of a subcommittee of the Joint Economic Committee predicted a possible Soviet victory over the United States in the "first round" of the atomic-energy "kilowatt race." [4] While kilowatts provide only one measure of progress, the consistency and magnitude of the Soviet effort in the whole area of peaceful utilization of atomic energy cannot be denied.

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[1] Pravda, July 1, 1954, p. 1.

[2] Pravda, Feb. 26, 1956, pp. 2-7. These directives specified five areas in which the use of atomic energy for peaceful purposes was to be "considerably expanded": electric power, transportation, agriculture and industry, medicine, and scientific research. Since then the Soviet press has been full of reports on new atomic power plants (one with a capacity of 420,000 kw.), an atomic-powered icebreaker (the *Lenin*), new nuclear research institutes, etc.

[3] Pravda, April 19, 1956, p. 3.

[4] N.Y. Times, July 11, 1957, p. 2. The Soviets feel that the victory is already theirs. A. N. Nesmeyanov, President of the U.S.S.R. Academy of Sciences, declared in late 1955 that the Soviet Union had attained full supremacy in the field of atomic energy. Pravda, Dec. 31, 1955, p. 2. In his report to the Jubilee Session of the U.S.S.R. Supreme Soviet on Nov. 6, 1957, Khrushchev said, "I shall limit myself to reminding you that our country leads the world in the peaceful uses of atomic energy . . ." (New Times, No. 46 (Nov. 14), Supplement, p. 12 (1957).)

The Soviet Union undoubtedly is facing a host of legal problems relating to the peaceful uses of atomic energy: problems in administrative law, torts, patents, and insurance law. Other areas, such as labor law and trade union legislation, may likewise be affected by atomic energy developments in the U.S.S.R. Although discussions of such problems have been published by the dozen in American periodicals, the Soviet Union has not yet seen fit to publish any legal materials on these subjects. The paucity of information on Soviet domestic legal problems connected with peaceful uses of atomic energy would lead one to believe that such information is considered secret because it affects state security. If this is the case, the reason may perhaps be found in the oft-repeated Soviet view that atomic energy's peaceful uses are inextricably interwoven with its military uses and that complete exchange of information and data on atomic energy cannot be expected between nations until nuclear weapons have been outlawed.

Liability for radiation injuries is one example of the kinds of legal problems which have not received attention in available Soviet materials.[5] Presumably, the imposition of liability is governed by Article 404 of the Soviet Civil Code which reads:

> Individuals and enterprises whose activities involve increased hazard for persons coming into contact with them, such as railways, tramways, industrial establishments, dealers in inflammable materials, keepers of wild animals, persons erecting buildings, and other structures, and the like, shall be liable for the injury caused by the source of increased hazard, if they do not prove that the injury was the result of an irresistible force or occurred through the intent or gross negligence of the person injured.
>
> Note: The period within which actions based on this section may be filed against governmental agencies shall be limited to two years and shall be computed from the day of the injury.
>
> The period shall be suspended, aside from the general grounds for the suspension and extension of periods of limitations (Sections 48 and 49) from the day that the injured person or, in the event of his death, persons theretofore supported by him, apply to the proper agency of social insurance, until the

[5] Several such incidents have been reported in Great Britain, Canada, and the United States in the last year. That Soviet scientists and doctors, if not lawyers, have been concerned with such cases is seen from such titles as *Two Cases of Acute Radiation Sickness in Man* and *Labor Hygiene in Conditions of Ionizing Radiations*—titles of Soviet papers delivered at Geneva in 1955. Atomic Industrial Forum, Inc., World Development of Atomic Energy 156-160 (1955).

day when the pension is either awarded or refused (as amended December 27, 1926, R.S.F.S.R. Laws 1927, text 3).[6]

Is an atomic installation "an enterprise whose activity involves increased hazard" in the terms of the code? It seems likely to be so considered, in view of Soviet judicial practice, which has been to extend the increased hazard concept to automobiles, sea and river vessels with motors, various types of production in which mechanical motors are used, loading operations, chemical factories, and the like.[7] A commentator on Soviet civil law has explained that the term "sources of increased hazard" refers to properties of things or of natural forces which, at the present level of technological development, are not completely subject to human control and, as a result, create a likelihood of harm to human life and health, as well as to property.[8]

Assuming the doctrine of increased hazard is involved, when is a radiation injury the result of an "irresistible force," relieving the defendant of liability? The most common examples of "irresistible force" are such external forces as floods or earthquakes which act on the source of increased hazard and cause it to manifest its dangerous properties. But Soviet law also recognizes as an "irresistible force" one "which cannot be prevented by a given person but by a given society in general."[9] Another question is: What is the effect of the plaintiff's status? Soviet materials indicate that a defendant enterprise might not be held "responsible without fault" for injuries to an employee despite the seemingly unequivocal language of the code.[10] Still other questions are: What type of conduct manifests the necessary "intent" or "gross negligence," *i.e.,* contributory negligence, to relieve from liability? Are there any exceptions to the two year period within which tort suits must be brought? In view of the delayed effect of some radiation injuries, the two year period is not realistic. What will be the nature of the damages? The customary damages in cases of injuries caused by a "source of increased hazard" amount to the difference between the injured plaintiff's social insurance benefits and his wages at the time of injury.[11] But would such a scale of damages be considered adequate in the case of radiation injuries? What damages are awarded

[6] Grazhdanskii Kodeks R.S.F.S.R. 71 (1954). The English text may be found in II Gsovski, Soviet Civil Law 208-209 (1948).

[7] II Bratus (ed), Sovetskoe Grazhdanskoe Pravo 309 (1951).

[8] *Ibid.*

[9] I Gsovski, *supra* note 6 at 508 and sources therein cited.

[10] See case cited in Hazard, Law and Social Change in the U.S.S.R. 237 (1953).

[11] *Id.* at 236.

if the plaintiff is uninsured—for example, a minor? This problem has arisen in other cases involving injuries from "sources of increased hazard," and Soviet courts have handled it in various ways.[12] Who must bear the economic loss if the "source of increased hazard" was being operated by some one other than the "holder" or "owner" (Russian *vladelets*) at the time of injury, as, for example, under a contract? Soviet law would presumably hold both the "holder" and the contracting party responsible to the injured person.[13] The "holder," however, apparently has rights of recovery against his own agent, if the latter is proved to have been negligent, to the extent permitted by labor legislation. The agent may, in addition, be held criminally liable if his actions displayed "signs of socially-dangerous activity." [14]

These are only a few of the legal questions that may demand solution in connection with the peaceful uses of atomic energy in the Soviet Union. Any answers can only be conjectural until such time as Soviet "atomic law" is made available to legal scholars throughout the world.

In contrast to the area of domestic Soviet "atomic law," in the area of international cooperation for peaceful uses of atomic energy the Soviets have published several documents and commentaries.[15] Therefore this paper will be limited to a survey of three forms which Soviet activity has taken in the international sphere that have been discussed in Soviet sources: the Soviet-sponsored Joint Nuclear Research Institute, the U.S.S.R.'s relations to the International Atomic Energy Agency, and bilateral agreements which the Soviet Union has concluded with a number of states both inside and outside the Communist bloc.

B. The Joint Nuclear Research Institute

Soviet jurists contend that there are two basic types of organization for possible cooperation between European states in the peaceful use of atomic energy. One of these types—bitterly assailed by the U.S.S.R.—is the "closed grouping of several states on the basis of existing military blocs in Europe," as primarily exemplified by EURATOM. The other —Soviet-approved—type is the "intergovernmental regional organiza-

[12] *Id.* at 240-41.

[13] Bratus, *supra* note 7 at 310.

[14] *Ibid.*

[15] This paper is based primarily on Soviet sources. Considerations of time and space have not permitted extensive use of East European materials. The English titles of dozens of articles dealing with international cooperation in peaceful uses of atomic energy which have been published in East European countries may be found in the Library of Congress' East European Accession List, published monthly.

tion open to participation by all interested European states." The latter method of international cooperation, according to Soviet legal writers, has been outlined in the Soviet government's proposals for all-European cooperation in peaceful utilization of atomic energy. They add, in this context, that a "model multilateral agreement for peaceful utilization of atomic energy by means of an organized international scientific research center for study in the field of nuclear physics and peaceful uses of atomic energy may be seen in the Charter of the Joint Nuclear Research Institute, founded on March 26, 1956, on the Soviet Union's initiative." [16]

On that date delegates from eleven Communist states signed an agreement making their respective countries "equal members" of an organization called the Joint Nuclear Research Institute (*ob'edinennyi institut iadernykh issledovanii*).[17] The Soviet press at the time paraphrased certain passages of the agreement, emphasizing that the new institute was to be devoted exclusively to the peaceful utilization of atomic energy.

The full text of the Agreement to establish the Joint Nuclear Research Institute, published on July 11, 1956, specified that the Institute's activities would be conducted in accordance with a separate Charter, which was to be prepared by the Institute's management and approved by the governments of the member states. This Charter was officially adopted, along with a Personnel Statute, at a conference of member states held on September 23, 1956, at Dubna, near Moscow. The Institute itself is located at Dubna.

[16] Malinin, "Pravovye formy mezhdunarodnogo sotrudnichestva v oblasti mirnogo ispol'zovaniya atomnoi energii," Sovetskoe Gosudarstvo I Pravo, No. 7 (July) 122-27 (1957). For texts of the Soviet government's proposals, see Appendix B, Item 3. Malinin's mention of the Joint Nuclear Research Institute in connection with the Soviet proposals for an intergovernmental regional organization open to participation by all European states, as opposed to "closed military groupings," is misleading. For one thing, the Joint Nuclear Research Institute itself resembles one of the "closed groupings of several states on the basis of existing military blocs" so vigorously condemned by Soviet writers, inasmuch as its membership thus far consists exclusively of Communist states which have concluded military alliances with the U.S.S.R. Another Soviet writer also mentions the Joint Nuclear Research Institute as a model of "regional atomic cooperation," whose equipment is much more modern and complete than that of the European Organization for Nuclear Research (C.E.R.N.), organized in 1953 and "just getting started" (Larin, Mezhdunarodnoe Agenstvo Po Atomnoi Energii 10-12 (1957)). Like Malinin, Larin cites the two Soviet proposals for all-European cooperation in peaceful use of atomic energy.

[17] Pravda, Mar. 15, 1956, p. 3. The document signed at that time will be called the Agreement in this paper, as distinguished from the Charter.

The texts of the Agreement [18] and the Charter,[19] which is doubtless regarded as subordinate to the Agreement and an implementation of it, and a considerable body of secondary sources dealing with the Joint Nuclear Research Institute are now available, and problems relating to membership in the organization, its functions, facilities, structure, basic operational procedures, and its relation to other international atomic research organizations have become quite clear.

According to the Agreement, the Joint Nuclear Research Institute is to be "an international scientific-research organization" with the "rights of a juridical person." [20] The Charter also defines the Institute as a legal entity and adds that it shall possess the capacity and status necessary to achieve its aims and functions "according to the laws of the country wherein it is situated" [21]—in other words, the laws of the Soviet Union.

These generally-worded provisions, restated in more specific terms, would appear to mean that the Institute, in addition to managing and disposing of its property according to the terms of its Charter, may, in its own name, make contracts and enter into other formal negotiations and relationships with such Soviet organizations as the Chief Administration for Use of Atomic Energy [22] or the All-Union Ministry of Medium Machine Building (to which the Chief Administration for Use of Atomic Energy is supposedly subordinated),[23] as well as with other Soviet organizations engaged in supplying the Institute with materials or designing and constructing new equipment for it.[24] The provisions

[18] The text of the Agreement is reproduced as Appendix B, Item I.

[19] The text of the Charter is reproduced as Appendix B, Item 2.

[20] Article 2.

[21] Article 3.

[22] The Soviet Council of Ministers' decree setting up this body was published in Pravda, Apr. 19, 1956, p. 3. Its functions include "furthering cooperation in the peaceful uses of atomic energy between the U.S.S.R. and other nations." V. S. Emelianov was appointed its Director in September, 1957; Izvestiya, Sept. 8, 1957, p. 6.

[23] E. P. Slavskii, the former Director of the Chief Administration for Use of Atomic Energy, succeeded Mikhail Pervukhin as Minister of Medium-Machine Building. The All-Union Ministry of Medium-Machine Building is believed to be in charge of over-all atomic energy development. For the report of Slavskii's promotion and Western hypotheses regarding the role of the Ministry of Medium-Machine Building, see the N.Y. Times, July 25, 1957, p. 1.

[24] See the Soviet legal provisions pertaining to "legal entities" in Article 13 of the Soviet Civil Code. A detailed study of Soviet legal entities may be found in Bratus, Yudidicheskie Litsa v Sovetskom Grazhdanskom Prave 124 and 140-152 (1947). A scholar of Soviet law in this country has declared that Soviet legal entities are in fact "sham entities and their mutual contracts are sham contracts." (I Gsovski, Soviet Civil Law 392 (1948).)

would also appear to give the Institute the capacity, in case of disputes with these organizations, to sue or be sued in Soviet courts and tribunals—for example in the *Gosarbitrazh* (State Arbitration System) which handles hundreds of disputes between Soviet enterprises yearly.[25] Both the Agreement [26] and the Charter [27] further stipulate that the Institute may deal with other national and international scientific-research organizations and other organizations in the development of nuclear physics and the exploration of new possibilities for peaceful uses of atomic energy. The Institute's relations to organizations of this type will be examined in another context, later in this chapter.

A comparison of the Institute's Charter with the basic documents of certain other international organizations devoted to peaceful utilization of atomic energy reveals some similarities, but there are also fundamental differences.

The Charter of the Joint Nuclear Research Institute specifies that the "Institute will concern itself exclusively with the development of peaceful uses of atomic energy to benefit all mankind" and authorizes five closely-related functions: (1) coordination of atomic research among member-states; (2) exchange of experience and research results among member-states; (3) communication with national and international organizations devoted to the peaceful use of atomic energy; (4) training (on all levels) of member-state personnel; and (5) announcement of results of the Institute's work in publications, reports to members, or in conferences.[28]

Such aims and functions, as far as they go, coincide largely with those of the International Atomic Energy Agency and EURATOM (both frequently contrasted with the Joint Nuclear Research Institute by Soviet writers) and, most of all, the European Organization for Nuclear Research (about which the Soviets have had much less to say).[29] However, the basic documents of these organizations (especially

[25] A study in the English language on the Soviet arbitration system has been made by Yaresh, Arbitration in the Soviet Union (1954). This work discusses the types of conflicts handled by *Gosarbitrazh* and the scope of its activities. The role of *Gosarbitrazh* in handling disputes between the Institute and other organizations, at least those within the Soviet Union, is made the more likely by the absence in the Charter of any specific machinery to handle such litigation.

[26] Article 2.

[27] Article 4.

[28] *Ibid.*

[29] Compare the aims and functions of the Joint Nuclear Research Institute with those of the European Organization for Nuclear Research (C.E.R.N.) as stated in Atoms for Peace Manual, 549 ff. One notes other similarities between the Joint Nuclear Research Institute and C.E.R.N.: both originally had eleven members, then added a

of the International Atomic Energy Agency and of EURATOM) are far more detailed than the Joint Nuclear Research Institute's Agreement and Charter, and contain considerably more implementing provisions. The Institute's Charter, for example, fails to prescribe any machinery for handling disputes among member-states [80] and is silent on the subject of formal contracts or "project agreements" between the Institute and organizations in member-states, although as a "legal entity" it theoretically has the capacity to conclude such agreements. There is no mention in the Charter of guaranteeing the "sovereignty" of member-states or of making Institute assistance independent of "political, economic and military considerations"—conditions which the Soviet delegates insisted on including in the Statute of the International Atomic Energy Agency. Nowhere in the Joint Nuclear Research Institute's Charter will one find any clauses giving the Institute powers of inspection and control—functions so strongly opposed by the U.S.S.R. in the final draft of the International Atomic Energy Agency Statute. Moreover, no health and safety standards are prescribed.

The Joint Nuclear Research Institute is, as its name would indicate, primarily a *research* organization and an educational or training center, encouraging the "comprehensive development of creative capacities of the member-states' scientific-research cadres." [81] As such, it has a far more limited range of functions than those which the International Atomic Energy Agency and EURATOM are expected to perform.[82] Its functions do not include supplying fissionable materials or designing and equipping atomic installations. Because it is a collective research body, rather than an atomic "bank" or distributor of fissionable materials, there was doubtless less need to include in its Charter any clauses setting up safeguards against diversion of fissionable materials from

twelfth; the Institute has four laboratories, and C.E.R.N. has four basic "study groups" (but only one laboratory); the documents of both organizations carefully define the scale of payments each member-state must make to meet the costs of organizational activities (in the case of C.E.R.N., the scale of payments from Yugoslavia and Greece were eventually reduced to .35%); both organizations have "open" membership, at least in theory.

[80] The statute of the International Atomic Energy Agency, on the other hand, provides for such machinery in its Article XVII, and EURATOM has its own "court of justice"; see Section IV in Secretariat of the Interim Committee for the Common Market and EURATOM. Treaty establishing the European Atomic Energy Community (EURATOM) (Brussels, 1957) (hereinafter called the "EURATOM treaty").

[81] Lebedenko, "Ustav ob'edinnogo instituta yadernykh issledovanii," Sovetskoe Gosudarstvo I Pravo, No. 2 (Feb.), 117 (1957).

[82] For a description and analysis of International Atomic Energy Agency functions, see Bechhoefer and Stein, *supra*.

peaceful to military uses, although the Soviet Union has always insisted that atomic energy's peaceful and military uses are inseparably interrelated.

Could the danger of diversion—of materials or techniques—even arise in connection with the activities of the Joint Nuclear Research Institute? Would it be possible, for example, for a member-state such as China to use Institute materials, or techniques developed at the Institute, for military projects without the knowledge and approval of the U.S.S.R. and other Institute members? Such a development seems highly unlikely, at least in the case of materials. One might speak of two types of protection against diversion of this type. One of them could be called "external security"—the fact that the Institute and all its installations are physically located in the Soviet Union, eliminating such difficulties and problems as "infringement of sovereignty" which arise in connection with the enforcement of the inspection and control clauses contained in the International Atomic Energy Agency statute or the EURATOM treaty. The second type of protection might be termed "internal security," being afforded by the structure and operational procedures (which we shall presently examine) of the Institute itself. The requirement that all the Institute's undertakings be planned (or known to and approved) by the management, the Scientific Council, and the Finance Committee, as well as the *collective* character of these undertakings, would seem to rule out the possibility of serious diversions of materials by individual member-states for unauthorized military purposes. It would, of course, be virtually impossible to limit the application of *techniques* to the physical confines of the Institute.

The Soviet Union has provided impressive facilities for the Institute. These include four laboratories: a laboratory of nuclear physics, which has a synchrocyclotron with proton energy of 680 megelectron volts (formerly the Nuclear Problems Institute of the U.S.S.R. Academy of Sciences); a high-energy physics laboratory which has a proton synchrotron with proton energy of 10,000 megelectron volts (formerly the Electrophysics Laboratory of the U.S.S.R. Academy of Sciences); a theoretical physics laboratory, and an electron physics laboratory. Both the Agreement and the Charter provide for other experimental installations and laboratories.[33] Some of the world's top nuclear physicists—men like Topchiyev and Veksler of the U.S.S.R.—work for the Institute.

There were eleven original signatories of the Agreement to establish

[33] Article 4 of the Agreement; Article 28 of the Charter.

a Joint Nuclear Research Institute: Albania, Bulgaria, Hungary, East Germany, China, North Korea, Mongolia, Poland, Rumania, the U.S.S.R., and Czechoslovakia.[84] The original Agreement specified, in its third article, that any other states wishing to take full part in the Institute's work should declare their concurrence with the provisions of the Agreement and that they could become members of the Institute by the decision of a majority of the member-states. A somewhat different procedure, however, was followed in the case of the only new member to date, Viet Nam, which joined the Institute on September 20, 1956, upon the "invitation" of the member-states.[85]

Membership qualifications as set forth by the Charter [86] remain substantially the same as those in the Agreement. An additional clause declares that the amount of participation in the Institute's maintenance and construction costs allotted to newly-joined member-states shall be decided by the Institute's Finance Committee and approved by the governments of the member-states. The Charter's sixth article states that all members of the Institute shall participate equally in its scientific work and management.

Soviet writers on the Joint Nuclear Research Institute have made a great deal of this "open-doors-to-all" membership policy, while criticizing EURATOM as a "closed grouping" and condemning the "discriminatory" policy of the United States and others who have insisted that only members of the United Nations or its specialized agencies should be members of the International Atomic Energy Agency. Such a policy is held to be "illegal" and "in contradiction to the principle of universality and of truly extensive international cooperation in the peaceful use of atomic energy." [87]

A condition of membership in the Institute is the payment of a specified percentage of the Institute's expenditures for construction and maintenance. The share borne by Albania, Mongolia, and North Korea, on the one hand, is only 0.05 percent apiece; the Soviet Union, on the

[84] The order of listing is according to the Russian alphabet, as followed in all documents.

[85] Izvestiya, Sept. 21, 1956, p. 1.

[86] Article 5.

[87] Trud, Sept. 14, 1956, p. 3. The article goes on to denounce the exclusion of the German Democratic Republic, the Mongolian People's Republic, the Korean People's Democratic Republic and China from membership in the Agency. These states, it will be noted, were among those signing the original agreement to set up the Joint Nuclear Research Institute. See also New Times, No. 8 (Feb. 21), 11 12 (1957) and numerous sources cited in our chapter on the Soviet Union and the International Atomic Energy Agency.

other hand, pays 47.25 percent.[38] The Agreement declares that the share of a member-state's contribution cannot be a factor bearing on the degree of its participation in the Institute's scientific work or administration. "Unless this principle were observed," writes a Soviet jurist, "membership in the Institute would be impossible for many states, and 'open doors for all' would remain an empty declaration of policy." [39]

The Agreement's seventh article, and article 8 of the Charter, state that any member-state may withdraw from the Institute by having its plenipotentiary give the Institute's Director written notice of its intention to withdraw not later than three months before the end of the current fiscal year. This would necessitate a revision of the percentage shares of the remaining member-states in meeting Institute expenses—a procedure outlined in Article VI of the Agreement.

The Charter's seventh article creates a type of guest membership for scientists from non-member states, enabling them to work in the Institute. Scientists from non-member states are encouraged to visit the Institute and to participate in its activities, and we frequently read of such visits and participation in Institute activities by foreign scientists, including scientists from the United States.[40]

The present charter membership in the Joint Nuclear Research Institute is exclusively Communist. This membership fails, however, to include one important Communist state, Yugoslavia. Yugoslavia was not among the original signatories of the Agreement to organize a Joint Nuclear Research Institute, nor is there any record of its being "invited" to join the Institute, as in the case of Viet Nam. Detailed speculation on the reasons for Yugoslavia's non-membership could hardly be justified in this paper, although a number of possible explanations come to mind. First, Yugoslavia may have been deterred from joining by considerations of its relations with the West. Second, Marshal Tito may have been reluctant to rush into joining a potential atomic Cominform in view of Yugoslavia's banishment from the political Cominform in 1948. Third, Yugoslavia's membership as the only Communist state in the twelve-member European Organization for

[38] Article VI of the Agreement.

[39] Lebedenko, *supra* note 31 at 117. For a similar description of the "open doors" policy, see Kapryin, "V Dubne, pod Moskvoi," Pravda, Jan. 4, 1957, p. 4.

[40] Iordansky, "Atomgrad," New Times, No. 4 (Jan. 24) 25-27 (1957) and Pravda, July 6, 1957, p. 4. One British scientist who has apparently become a regular staff member of the Institute is Bruno Pontecorvo, who fled England and obtained Soviet citizenship several years ago. His picture appears with a group of Institute scientists in Pravda, Jan. 4, 1957, p. 4.

Nuclear Research (CERN) may have been held against it by some of the states in the twelve-member Joint Nuclear Research Institute. Until the spring of 1958, Yugoslavia's absence from the Institute membership rolls did not seem to make much difference. A bilateral agreement had been concluded with the Soviet Union, on what appeared to be highly advantageous terms, for "cooperation in the use of atomic energy for peaceful purposes." [41] A Yugoslav scientist who visited the Joint Nuclear Research Institute was most impressed by its facilities and regretted that, so far, the Soviet Union and Yugoslavia had not exchanged scientific personnel—professors and research students. The scientist stressed, however, that the Soviet-Yugoslav bilateral agreement was especially satisfactory because "both from a political and a scientific viewpoint" it constituted "an arrangement between equal parties." [42] The Communist-bloc attacks on Tito in 1958 would appear to lessen the likelihood of Yugoslavia's joining the Institute and may result in serious curtailment of over-all Soviet atomic aid to Yugoslavia.[43]

The Joint Nuclear Research Institute is headed administratively by a Director and two Deputy Directors, elected by a majority of the member-states (through their plenipotentiaries) from among scientists of those states. The Director is elected for a term of three years. A Soviet professor, D. I. Blokhintsev (corresponding member of the Ukrainian Academy of Sciences) is the present Director. Deputy Directors serve

[41] The general terms of this agreement were outlined in a Tass communique from Belgrade, dated Jan. 28, 1956. The actual text of the agreement has not yet been published.

[42] Juric, "Nuclear Research in Yugoslavia," New Times, No. 23 (May 31), 20-21 (1956). Yugoslav spokesmen have criticized the Soviet Union as well as Great Britain and the United States for keeping atomic data secret: "The Russians . . . kept silent about their work and only revealed their final results: the explosion of atomic and hydrogen bombs and the setting in operation of a nuclear power plant . . . In spite of all attempts of the big powers to keep [atomic information] to themselves, humanity will not be checked from progressing along its road." Popovic, "International Cooperation and Nuclear Energy," 6 Review of International Affiairs, No. 126-128 (July-Aug.) 28 (1955). Yugoslav scientists and statesmen have called for the banning of atomic tests and have accused the U.S.S.R. (as well as Britain and the U.S.) of endangering world health by conducting nuclear tests. See statement by Academician Pavle Savic to Borba, "Extremely Harmful Consequences of Nuclear Explosions for the Whole World," Information Service Yugoslavia (n.d.) and statement by Tito on May 15, 1957, Information Service Yugoslavia (n.d.).

[43] During the crisis of mid-1958, Poland appeared to be the most reluctant of the Communist-bloc states to criticize Yugoslavia, and some Poles were inclined to hold China (rather than the U.S.S.R.) primarily responsible for the attack on Tito. Interestingly enough, a Polish-Yugoslav agreement for cooperation in peaceful uses of atomic energy through 1959 was reported by the Polish press on May 31, 1958; N.Y. Times, June 2, 1958, p. 10.

two-year terms. The current Deputy Directors are Professor Vaclav Votruba (of Czechoslovakia) and Marian Danysz (of Poland). The three together form the "management" or "Board of Directors" (*direktsiia*) of the Institute. They formulate the all-important plans for Institute activities and present the budget. The Agreement and Charter make this Board responsible to the governments of the member-states and oblige it to submit regular reports to those governments.[44] The Board's role in amending the Charter will be discussed later.

The Director acts as the Institute's plenipotentiary in relations with appropriate institutions in the member-states on all questions pertaining to the Institute's work.[45] Professor Blokhintsev, for example, would represent the Institute in its dealings with the Polish Academy of Sciences on research projects of mutual interest. He also serves as chairman of the Scientific Council (*uchenyi soviet*), which considers and approves the Institute's scientific research programs, examines the results of completed programs (and also the results of individual studies), and considers "other questions concerning the scientific work of the Institute." [46] The Charter requires this body to meet not less than twice a year.

Acting in his dual capacity of management head and chairman of the Scientific Council, the Director obviously wields great power, both executive and administrative. The Charter also confers on him the right to hire and discharge employees according to the Personnel Statute (the text of which has not yet been made public), to establish or alter the wages of all employees within the official wage limits approved by the Financial Committee, and to initiate individual pay raises of up to fifty percent for highly-skilled workers.[47] The Director is the formal manager-in-chief of all the Institute's assets.[48] He also appoints the deputy, or "Administrative Director," who is in charge of construction and business affairs of the Institute.[49]

The policy-making importance and supervisory powers of the Scientific Council are clear from the above-outlined provisions of the

[44] Article V of the Agreement; Articles 20, 23, and 25 of the Charter.

[45] Article V of the Agreement; Article 21 of the Charter.

[46] Article 18 of the Charter. Member-states' representation in this body is more "equal" (three scientists from each state) than in the corresponding organs of the International Atomic Energy Agency or EURATOM; see Article 118 of the EURATOM treaty and Article VI of the Agency statute. Each member-state of C.E.R.N. has one vote in the Council; Atoms for Peace Manual 550.

[47] Article 27 of the Charter.

[48] Article 26 of the Charter.

[49] Articles 33-35 of the Charter.

Charter. The relative brevity of this Charter and its paucity of detail means that most of the Institute's activities are determined by the Scientific Council. Minutes of the Scientific Council's first session give some additional information on the Institute's program and provide insight into procedures within the Council itself. These procedures display unmistakably Soviet characteristics. We learn, for example, that a five-year plan for further Institute development was approved in the first session of the Council. Elections for laboratory directors' posts were also held. First, the list of candidates was presented by the Board of Directors, and after this list was "discussed," three Soviet scientists were "chosen by secret ballot." Two of these laboratory directors (Veksler and Dzhelepov) immediately delivered addresses, apparently well-prepared, which furnished thorough and detailed "explanations" of the tasks to be undertaken by their respective laboratories. The Institute Director "suggested" a number of basic plans for constructing or acquiring new installations and equipment and for training specialists from member-states, after which a "lively discussion" took place. During this discussion "many questions were clarified, remarks studied, and certain legislative enactments were adjusted." There were "some differences of opinion," but the session closed with the "unanimous conclusions" which one has come to expect in Soviet organizational procedures.[50]

To what degree is the Institute's Board dependent upon the Finance Committee? The Charter's twenty-first article declares that the Board of Directors shall be guided exclusively by the decisions of the Scientific Council and the Finance Committee. While the Director presides over the former, he would appear to have no formal influence over the activities of the latter. The Finance Committee is made up of representatives of all member-states (one representative from each state), appointed directly by the governments of these states. The chairmanship of this body rotates among its members. It meets at least once a year, and its decisions are made by a majority of not less than two-thirds of the votes cast by its members. Its approval is formally required for a wide range of expenditures,[51] and the Charter states that the Finance

[50] Votruba, "The First Session of the Joint Nuclear Research Institute's Scientific Council," 2 Atomnaya Energiya, No. 1, 72-74 (1957) (each issue of this periodical is translated into English by Consultants Bureau, New York). Another reference to the single plan governing all Institute research may be found in Karnaukh, "Foreign Scientists in Dubna—International Center of Nuclear Research," 2 Atomnaya Energiya, No. 4, 482 (1957).

[51] Article 10 of the Charter.

Committee shall "generally control all financial affairs of the Institute." Thus the budget which the Board of Directors prepares must be submitted to it,[52] and the Committee determines the amount of money (in Soviet currency) to be expended by the Institute for "equipment, instruments and technical scientific literature or periodicals from states not belonging to the Institute." [53] It is the Finance Committee's function to establish "the manner of computing the value of equipment, materials and instruments supplied by the member-states, as well as the value of individual work accomplished according to Institute laws." [54]

Yet it probably would be erroneous to regard the Finance Committee as holding the purse strings and seeking to curtail, or otherwise actively interfere with, the plans of the executive. Since the members of the Joint Nuclear Research Institute are all states firmly committed to "planned economy," it seems likely that the Finance Committee's chief function is to work out practical financial arrangements in order that the plans of the Director and the Scientific Council may be carried out as effectively as possible. Its role is probably not to challenge any plans on their merits, beyond deciding on their economic feasibility. That the Committee operates largely in a "rubber stamp" manner seems clear from the aforementioned report on the Scientific Council's first session. The minutes note simply that "after the Scientific Council had finished its work, the first meeting of the Finance Committee took place; the Committee confirmed the tentative budget presented by the Institute's Directors for 1956-57 and thus guaranteed the completion of plans for the development of the Institute and of scientific-research problems approved by the Scientific Council." [55] Nevertheless, the Institute appears to follow strict accounting procedures. Each state's percentage share in the Institute's expenditures is credited with the value of equipment and materials which it delivers in accordance with orders placed by the Institute. Credit is also given for the value of research done by individual scientists working on Institute assignments and for sums which are withheld or deducted from members' salaries in form of taxes by the states of which they are citizens.[56]

We have already described the four laboratories which are attached to the Institute. Each laboratory has its own director, whose appointment by the Board (from among scientists of member-states) must, accord-

[52] Article 12 of the Charter.
[53] Article 13 of the Charter.
[54] *Ibid.*
[55] Votruba, *supra* note 50 at 72.
[56] Lebedenko, *supra* note 31 at 117.

ing to the Charter's twenty-ninth article, be approved by the Scientific Council. Apparently the "secret ballot" procedure described earlier applies to the selection of four directors from a larger list of candidates, or represents a failure to observe the exact procedure provided for by the Charter. In this writer's opinion it makes little difference which method is followed; the laboratory directors appear in any event to be selected by the Board. Each laboratory, under its director, is charged with preparing programs for the scientific research work assigned to it and with examining the results of this work as well as of studies made by individual scientists in the laboratory. The laboratories each have their own Scientific Council, which must be approved by the Institute's Scientific Council, and each laboratory contains a number of departments and "sections" (*sektory*) which may be altered by the Institute Board. The laboratories have the right to confer learned degrees, including the degree of "doctor" of physico-mathematical sciences, upon students at the Institute. Each laboratory may also consider "other questions concerning the scientific work of the laboratory." [57]

The Charter declares that all members of the Institute staff are employees or associates (*sotrudniki*) of the international scientific organization and are obliged to carry out its purposes and tasks.[58] A Soviet jurist speaks of some members being "dispatched" or "ordered" (*komandirovannye*) by their governments to work at the Institute for periods of not less than a year, while others have a considerably shorter tour of duty.[59] The rights and obligations of staff members are regulated in detail by a Personnel Statute (*polozhenie o personale*) which is appended to the Charter. (This statute is mentioned in the thirty-eighth article of the Charter, but its text has not yet been made public.) Its norms are said to correspond to the "basic principles of labor legislation" of the various member-states.[60] The Charter specifies that Institute personnel shall be "subject to the laws of the country in which the Institute is located"—*i.e.*, the laws of the U.S.S.R.[61]

Are the member-states all equal participants in the Institute's scientific research activities? Legally, yes. At least, the Charter's sixth article says that they are. Do member-states enjoy equality in determining and administering Institute policy? Here the legal answer is less clear. A Soviet jurist has hailed the "democratic nature" (*demo-*

[57] Articles 28 and 42 of the Charter.

[58] Article 36. Compare with Article VII of the International Atomic Energy Agency statute.

[59] Lebedenko, *supra* note 31 at 118.

[60] *Ibid.*

[61] Article 38.

kratichnost') of the Charter provisions.[62] These provisions make the Institute's Board of Directors responsible for Institute activities to the collective governments of the member-states and require the Board to submit periodic reports to these governments.[63] In its twenty-second article the Charter also makes clear that the Institute's Board shall not undertake to carry out the instructions of any *individual* member-state, but shall be guided exclusively by decisions of the Scientific Council and the Financial Committee, in which all member-states enjoy equal representation. We have already noted that a member-state's percentage share in the Institute's expenditures and maintenance is supposed to have no bearing on that state's degree of participation in Institute research or activities. Thus, on the surface at least, member-states are equals when it comes to administering the Institute and shaping its policies, as well as participating in its research activities.

Yet the Charter contains other passages whose legal effect would appear to increase the Soviet Union's influence over the Institute to the point of giving the Institute a Soviet character rather than an international one. We have already noted that the Joint Nuclear Research Institute is a Soviet "legal entity" whose rights—and obligations—are determined by Soviet law. This is in contrast to EURATOM whose legal personality is subject to separate definition under the respective municipal laws of the member-states.[64] We have likewise noted that, while the Personnel Statute's regulations allegedly conform to the "basic principles" of labor legislation in member-states, the Institute's staff is specifically made subject to Soviet law. There is no passage in the Institute's Charter dealing with privileges or immunities of personnel, as is to be found in the fifteenth article of the International Atomic Energy Agency statute. Problems of conflicts of laws, in which jurisdiction and disposal of cases involving Institute personnel would be at issue, could hardly arise under the Institute Charter's provisions. The member-states' property rights in Institute installations have never been defined, but the Charter acknowledges the Soviet Union's reversionary rights in these installations in the event of the Institute's dissolution, with the other member-states to receive monetary reimbursement proportionate to the amount of their participation and monetary contributions. The installations include "all Institute equipment and all . . . buildings." [65]

[62] Lebedenko, *supra* note 31 at 117.
[63] Article 22.
[64] *Cf.* Articles 184 and 185 of the EURATOM treaty.
[65] Article 40.

Although the Charter makes no mention of it, we must assume that the ultimate source of authority over matters affecting the Joint Nuclear Research Institute is the Communist Party of the U.S.S.R.[66] Whatever the Joint Nuclear Research Institute may have in common with other international organizations devoted to peaceful uses of atomic energy, this political feature of subordination to a single national political party—the Soviet Union's Communist Party—sets the Joint Nuclear Research Institute apart.

There are other considerations which lead one to doubt that the U.S.S.R. has only one vote in twelve in shaping Institute policy and controlling its administration. Without the guiding impetus and tremendous material contributions of the Soviet Union, the Institute could never have become the impressive organization that it is today. It might well continue to function effectively if one or more of the other member-states withdrew, but what would become of the Institute if the U.S.S.R. chose to exercise its right of withdrawal? It is difficult to imagine the success of any Institute project if that project met the opposition of the Soviet Union. Questions of formal status aside, the U.S.S.R. remains the scientific and economic "big brother" to the other members. Representatives of the smaller states are the first to recognize this fact. Professor Andrzej Soltan, Director of the Polish Academy of Sciences' Nuclear Research Institute, has hailed the creation of the Joint Nuclear Research Institute as "above all a manifestation of international scientific cooperation . . . a great step forwards in the development of atomic nuclear physics research, which permits scientists of small countries to achieve work which they could not carry out by themselves. We will use not only the experience of the Soviet scientists, but also their equipment." [67] Lajos Janosi, a member of the Hungarian Academy of Sciences, concedes that "such a small state as Hungary would not be in a position to construct and equip such an institution by its own means. And it would not be expedient, anyway. The problem has been resolved

[66] The Soviet Communist Party's complete power over all national organizations within the U.S.S.R. is unquestioned. Does the Joint Nuclear Research Institute's status as an "international organization" make a difference here? We believe not. It is an international organization of Communist states run by Communist parties, among whom the Soviet Communist Party continues to play the directing role. The Soviet Union's dominant position in international affairs between Communist states (with the much-publicized exception of Yugoslavia) appears unaltered at this date. Even without considering the Charter provisions which favor the Soviet Union, we see no reason to expect any of the other Institute member-states to object to, or in any way challenge, the factual domination of that body by the U.S.S.R. and the Soviet Communist Party.

[67] Izvestiya, April 4, 1956, p. 3.

correctly: the Institute was set up in a large country which has the necessary equipment at its disposal, while other lands are given the opportunity to participate in its work and to benefit by common experience." [68]

The Institute's Charter sets up a simple procedure for amendment of its provisions. Proposals for amending the Charter may be submitted by Institute members to the Board of Directors. The Board, in turn, has the right to introduce amendment proposals on its own initiative. In either case, the amendments take force when adopted by a majority of the member-states.[69]

The Charter provides for the liquidation of the Joint Nuclear Research Institute, but tells us only that this may be done "by agreement of the member-state's governments." [70]

The Institute's relations to other organizations and programs for peaceful utilization of atomic energy were highlighted by a visit which Sterling Cole, Director-General of the International Atomic Energy Agency, paid to the Joint Nuclear Research Institute in the spring of 1958.[71] The Institute Charter's fourth article provides that one of its purposes shall be to maintain communication between national and international scientific research organizations for the peaceful use of atomic energy, and in the future some cooperation between the International Atomic Energy Agency and the Joint Nuclear Research Institute may be realized. For example, the Institute would appear to be the logical institution to which students and specialists from Agency member-states would come for training under the Soviet program outlined in letters to Sterling Cole just before his trip to the U.S.S.R.[72]

The record shows a fundamental difference, however, in the Joint Nuclear Research Institute's relations with the various organizations devoted to the peaceful use of atomic energy. It is hardly surprising that the Institute cooperates most closely with organizations in the Soviet bloc. Its Charter specifies that it shall coordinate the theoretical and experimental research of member-state scientists,[73] and the Agreement's second article states that it shall cooperate in its work with the

[68] Pravda, Jan. 4, 1957, p. 4.

[69] Section XII of the Charter. We are not told whether the majority in question refers to a meeting of the Scientific Council or to some sort of general vote of members.

[70] Article 40.

[71] Pravda, April 11, 1958, p. 6; Izvestiya, April 11, 1958, p. 4; Izvestiya, April 12, 1958, p. 3; Pravda, April 15, 1958, p. 6.

[72] Pravda, April 4, 1958, p. 5.

[73] Article 4.

appropriate institutes and laboratories in the territories of member-states. The member-states, as we have seen, are placing great hopes in this arrangement. The director of the Polish Academy of Sdiences' Nuclear Research Institute, for example, has declared that he is counting on the closest cooperation between the Institute and his organization.[74]

The Institute's relations with the U.S.S.R. Academy of Sciences are intimate. The Academy's Nuclear Problems Institute and Electrophysics Laboratory have become laboratories of the Joint Nuclear Research Institute, and the Academy's greatest scientists are working for the Institute. We have no information on the Institute's ties with the U.S.S.R. Ministry of Medium Machine Building or the Chief Administration for Use of Atomic Energy, but there can be little doubt that such ties are fully exploited. The lavish expressions of gratitude for Soviet assistance on the part of scientists of smaller states should not obscure the fact that the U.S.S.R. itself stands to benefit considerably from the results of the joint scientific research conducted by the Institute. According to a West German scholar, the Soviets expect valuable contributions from scientists of Poland, China, and Czechoslovakia in particular.[75] Further evidence of the advantages which the U.S.S.R. will enjoy by virtue of its Institute membership is seen, curiously enough, in a letter from a Rumanian scientist expressing thanks for Soviet assistance to his country. Commenting on the atomic energy program in the Soviet Union's own five-year plan, this Rumanian scientist adds that "in carrying out the scientific part of this program, a part will be played by the Joint Nuclear Research Institute, and Rumanian physicists are proud that they will be able to work at this Institute." [76]

With reference to non-Communist atomic organizations and agencies, however, the Institute's attitude assumes a political and diplomatic significance of a special type. The Institute's historical and political background reveal a pattern which must be considered quite apart from problems of research on peaceful uses of atomic energy. On the day following the announcement of the Agreement to organize the Joint Nu-

[74] Izvestiya, April 4, 1956, p. 3. See also Wspolpraca ze wszystkimi narodami, I Polska, No. 41, 6-7 (1958), which mentions bilateral agreements between Poland and Yugoslavia, and Poland and East Germany, in addition to Polish participation in the Joint Nuclear Research Institute.

[75] Huber, Internationale Ordnung Der Friedlichen Verwendung Der Atomenergie 51 (1956).

[76] Sanielevich, "Aid Accorded to Atomic Scientists Coming from People's Democracies," 2 Atomnaya Energiya, No. 1, 98-99 (1957).

clear Research Institute, the Soviet government came out with a bitter attack against EURATOM, a "narrow and closed group of West European states" whose American and West European sponsors "intend to bypass the Paris Agreement clauses which prohibit West Germany from producing and stockpiling atomic and hydrogen weapons." [77] Shortly after the full text of the Agreement to organize the Joint Nuclear Research Institute was published (on July 11, 1956), EURATOM was again denounced—this time in a statement by the Soviet government on general European cooperation in the peaceful uses of atomic energy.[78] Once again, the twin facts that EURATOM was a "closed grouping" and that West Germany was to be one of its members drew Soviet criticism. It was pointed out that several states within this "closed grouping" were also members of closed military blocs, and the fear was expressed that EURATOM's creation would in effect lead to the removal of any restrictions on the production of atomic energy in West Germany. "This," in the words of the statement, "would permit revenge-seeking West German circles to organize in their country production of atomic weapons, which would create a serious threat to the cause of peace in Europe." The statement went on to describe, by way of contrast, the "open" character of the Joint Nuclear Research Institute and the purely peaceful purposes for which it was being organized.

Any doubt that the Joint Nuclear Research Institute had been organized as the Communist bloc's answer to atomic research organizations sponsored by the West must have been dispelled when a Soviet jurist wrote early in 1957 that "C.E.R.N. is a closed organization which does not admit states of the Socialist camp into its membership. This has compelled a number of states to create their own international research organization. With this purpose in mind, a conference was held in Moscow, in March, 1956. . . ." [79]

On March 17, 1957, in a declaration concerning the plans to create EURATOM and a Common Market, the U.S.S.R. Ministry of Foreign Affairs warned:

> The entire activity of EURATOM and the "common market" will be subordinated to the aims of NATO, whose aggressive character is widely known. Under such conditions the fulfillment of plans to create EURATOM and the "common market" will inevitably lead to a further deepening of the division which splits Europe, to the increase of tensions in

[77] Izvestiya, March 28, 1956, p. 3.
[78] See Appendix B, Item 4.
[79] Lebedenko, *supra* note 31 at 116.

> Europe. It will greatly complicate the establishment of economic and political cooperation on an all-European basis; it will bring into being new difficulties in solving the problems of European security.[80]

The declaration cautioned those who believed that the creation of EURATOM would lessen their countries' economic dependence on the United States:

> On the contrary, their dependence on the U.S.A. will only increase, to the detriment of the national sovereignty of the countries participating in this grouping, since the United States—and nobody attempts to conceal this fact—will in reality control EURATOM, acting in the capacity of chief supplier of fissionable materials and of equipment for atomic production in the EURATOM countries.[81]

In place of EURATOM, the Soviet government proposed an all-European organization for peaceful utilization of atomic energy, "bearing in mind that this organization would be a regional division or department of the International Atomic Energy Agency." Just what advantages such a "regional division" of the International Atomic Energy Agency would offer over the Agency itself was not disclosed.

The International Atomic Energy Agency has suffered greatly by comparison with the Joint Nuclear Research Institute in the Soviet press. During the New York conference which began on September 20, 1956, for examination and confirmation of the International Atomic Energy Agency's statute, Soviet publications were filled with articles drawing distinctions between the Agency and the Communist-sponsored Joint Nuclear Research Institute.[82] These articles emphasized that membership in the Joint Nuclear Research Institute was open to all, even to non-Socialist states, but that membership in the International Atomic Energy Agency was denied, quite illegally, to such states as the German Democratic People's Republic, the Korean People's Democratic Republic, the Mongolian People's Republic, and China. All member-states in the Joint Nuclear Research Institute were said to enjoy full legal equality. The draft statute of the International Atomic Energy Agency was condemned for its failure to include any clearly-formulated provision that the sovereign rights of its member-

[80] See note 16, *supra*.

[81] *Ibid.*

[82] Some examples may be found in Trud, Sept. 14, 1956, p. 3; Izvestiya, Sept. 21, 1956, p. 1; Pravda, Sept. 27, 1956, p. 4 and Sept. 28, 1956, p. 6; Izvestiya, Sept. 29, 1956, p. 4.

states must be observed in all activities of the Agency. With respect to the Joint Nuclear Research Institute, the articles claimed that member-states have equal participation rights and equal use of the Institute's facilities, regardless of their financial share in meeting its expenses. The statute of the International Atomic Energy Agency was denounced as financially discriminatory, providing in essence that countries which obtain aid from the Agency should not only pay for this aid, but should also ensure that the Agency have the income which it needs to construct or acquire its own plants, laboratories, and other installations. The argument was advanced that the financial arrangements naturally discriminated against the smaller, or economically-undeveloped, countries. In addition, the articles charged that the capitalist countries producing atomic raw materials and fissionable materials in quantity were intent upon using the International Atomic Energy Agency as a marketing channel. Finally, the equipment and facilities of the Agency and of EURATOM were described as lagging far behind those donated by the Soviet Union to the Joint Nuclear Research Institute, the finest in the world, and a number of which were already in operation.

From comparisons of this sort, one must conclude that the Joint Nuclear Research Institute serves not only as an international research organization, but also as an instrument of Soviet diplomacy and propaganda.

C. The Soviet Union and the International Atomic Energy Agency

The Soviet position with regard to the International Atomic Energy Agency, since Moscow's first published reaction to President Eisenhower's proposal of December 8, 1953, deserves serious study. If we are to understand the Soviet approach to international cooperation in the peaceful uses of atomic energy, the Soviet role in the history of the International Atomic Energy Agency cannot be ignored.

Two closely-related propositions form the ostensible basis of Soviet policy in international cooperation for the use of atomic energy. Without a consideration of these two tenets any discussion of the subject is viewed by the U.S.S.R. as fruitless. Repeatedly raised and emphasized in all the channels of communication available within the Soviet Union, the propositions amount simply to this: (1) at present the peaceful uses of atomic energy are inextricably interwoven with its military uses; and (2) effective cooperation in peaceful use of atomic energy cannot be fully achieved until an international agree-

ment to prohibit the manufacture, storage, and use of nuclear weapons is reached. The author of a recent Soviet volume on the International Atomic Energy Agency warns that the basic efforts of all states will inevitably be concentrated on the military, rather than the peaceful, uses of atomic energy until atomic weapons have been outlawed.[83] Although American scientists and officials have repeatedly praised the *personal* goodwill and cooperative spirit of Soviet scientists at international congresses and other gatherings, Igor V. Kurchatov, director of the Soviet Academy of Sciences' Atomic Energy Institute has admitted that "full candor" in relations between Soviet and Western scientists cannot be expected until atomic and hydrogen weapons have become a thing of the past.[84]

In the following pages the Soviet position with regard to the International Atomic Energy Agency, as presented to the reader of Soviet materials on the subject, is surveyed. It should be emphasized that the Soviet views reach an enormous public, both inside and outside the U.S.S.R.

A Soviet legal scholar has enumerated four basic juridical forms of organization for international cooperation in the peaceful uses of atomic energy. One of these forms is the bilateral agreement concluded directly between interested nations. Another is created through so-called intergovernmental "regional organizations." A third is the organization of international scientific-research centers based on multilateral agreements between states situated in various parts of the globe. The fourth form is the international organ created within the framework of the United Nations and (the Soviets insist on this) based upon the "principle of universality." [85]

What is the place of the International Atomic Energy Agency in this juridical scheme? In answering this question, the Soviet scholar has offered the following description of the Agency's relationship with the United Nations. First, the Agency was created within the framework of the United Nations, which ensures the proper observation and control of the Agency's work. Secondly, the United Nations Security Council and General Assembly have the right to demand reports from the Agency. They may criticize these reports, give the Agency in-

[83] Larin, *supra* note 16 at 46. Larin's book is especially important because it is the only Soviet monograph on the International Atomic Energy Agency to appear thus far. The book was edited by S. B. Krylov, the prominent Soviet specialist in international law.

[84] Pravda, Feb. 28, 1958, p. 3.

[85] Malinin, *supra* note 16 at 122.

structions resulting from their discussion of the reports, and may demand an accounting of the Agency's fulfillment of these instructions. Third, the Agency may not decide on questions falling under the exclusive jurisdiction of the Security Council. Therefore, any instructions of the Security Council which concern the ensuring of states' security are binding upon the Agency and its organs. These three characteristics of the Agency, taken together, show that the International Atomic Energy Agency's statute provides for a closer relation between the Agency and the United Nations than that which exists beween the United Nations and its specialized agencies. The specialized agencies, having been created by intergovernmental agreements, are in matter of fact outside the United Nations. Their activity is merely related to, or coordinated with, the activity of the United Nations.[86]

In contrast to the specialized agencies, the author reminds us, the Agency was placed in a definite relationship to the United Nations from the outset. This relationship was based, not on Article 63 of the United Nations Charter (which pertains to special agreements of the type used by the specialized agencies and the United Nations), but on the provisions of the Agency's own statute. The statute's sixteenth article, to be sure, requires an agreement between the Agency and the United Nations concerning Agency reports to the United Nations, and concerning the Agency's consideration of resolutions adopted by various United Nations organs on the subject of the Agency. But such agreements, as seen from the sixteenth article itself, merely pursue the practical aim of making more precise certain general provisions contained in the Agency statute.

Further distinctions between the International Atomic Energy Agency and United Nations specialized agencies can be found in the Agency's statute which define its relation to the United Nations and which emphasize that it was created within the framework of the United Nations.

At the same time, the author points out, the Agency cannot be regarded as an auxiliary organ of the Security Council (such as the United Nations Disarmament Commission), created in accordance with Article 29 of the United Nations Charter. Such organs are set up to ensure the performance by the Security Council of its immediate functions, which clearly cannot be turned over to a body like the International Atomic Energy Agency. Furthermore, such organs are created by the Security Council itself, whereas the Agency was created

[86] *Id.* at 126.

on an intergovernmental basis. Again, the organs created in accordance with Article 29 of the United Nations Charter are completely subordinated to and exclusively controlled by the Secuity Council, while the Security Council's control over the Agency is limited to guarding the security of states and maintaining international peace.

Thus the Soviet scholar concludes that the Agency, in its juridical position, differs both from a specialized agency and from an organ created in accordance with Article 29 of the United Nations Charter. In the author's opinion, the Agency is "a new international mechanism, created by intergovernmental agreement, albeit within the framework of the United Nations, and placed in direct relation to its chief organs—the Security Council and the General Assembly." [87]

Turning to the historical background of the International Atomic Energy Agency, the first step taken by the Soviet Union was to discount the United States' role in creating the Agency. President Eisenhower's proposal of December 8, 1953, to create an international agency for peaceful uses of atomic energy was (and still is) dismissed as a "face-saving measure," one designed to cover up the Americans' refusal to outlaw nuclear weapons. Furthermore, the Communists state that the President's proposal was much more limited in scope than claimed by the "bourgeois press" which had hailed it as an unprecedented step in the development of peaceful use of atomic energy. Actually (say Soviet spokesmen), Eisenhower's plan completely ignored the problem of removing the threat of atomic warfare. Providing merely that a small portion of atomic materials be set aside for peaceful purposes, the proposal tacitly assumed that the main mass of these materials would, as before, be directed toward the production of newer and more destructive nuclear weapons.[88] This, according to the Russians, was confirmed by American sources themselves; the United States' memorandum of January 11, 1954, and Secretary Dulles' informal paper to Molotov at Geneva on May 1, 1954, explained that the American proposal was merely a "first effort" on a "modest basis," naturally not conceived as a measure for bringing atomic weapons under control. Furthermore, it is argued that the United States was in no sense the initiator of international cooperation in peaceful uses of atomic energy. The claim is advanced that the Soviet Union had stood for such cooperation long before Eisenhower's proposal.[89]

[87] *Ibid.*

[88] See Larin, *supra* note 16 at 17.

[89] *Id.* at 18-19. See also the Soviet Aide-Memoire of April 27, 1954; Atoms for Peace Manual 269-274. The reader of such passages might well conclude that the

Before completion of the first draft of the International Atomic Energy Statute in July, 1955, the Soviet government presented a number of points which it declared should be basic principles of the new Agency. These points were contained in a pair of memoranda, the first issued on September 22, 1954 and the second on July 18, 1955.[90] The second (and more important) of these documents, in addition to certain broad and general suggestions (that the Agency should be created within the framework of the United Nations, and that it should encourage the exchange of scientific and technical information, establish research establishments, and maintain a number of specialists to assist states receiving help from the agency, etc.) contained some demands which proved to be sources of great discord in the subsequent history of the International Atomic Energy Agency. These demands included the principle that membership in the Agency should be open to *all* states, that there should be no privileged status for any state or group of states in the Agency, and that the Agency should never be used "for security purposes of any states."

These principles became issues almost immediately. The U.S.S.R. was not represented among the powers responsible for preparing the first draft of the International Atomic Energy Agency statute, and when it received this draft at the end of July, 1955, it criticized the document for three major reasons. First, no close ties were established between the Agency and the United Nations. Secondly, it was "undemocratic," in that it gave all power to the Board of Governors, leaving the

Soviet Union stood for an international agreement to prohibit nuclear weapons, but that the United States would hear of no such thing. The Soviet account fails to mention other highly pertinent passages in the American documents. Point 4 of the January 11 note, for example, states that "The United States is prepared to consider any proposal that the Soviet Union sees fit to make with reference to atomic, hydrogen and other weapons of destruction." Point 5 goes on: "However, the United States believes that the first effort should be to proceed on a modest basis which might engender the trust and confidence necessary for planning of larger scope." Atoms for Peace Manual 262. In the informal paper of May 1, 1954, Dulles declared (in point 3) that "the US cannot concur in the view of the Soviet Union that creation of an international agency to foster the use of atomic materials for peaceful purposes would not be useful in itself." In point 5 of the same paper, the American statesman repeated that "The US proposal of March 19 was, of course, not intended as a substitute for an effective system of control of atomic energy for military purposes. The US will continue, as heretofore, to seek means of achieving such control under reliable and adequate safeguards." Atoms for Peace Manual at 274. In contrast to the Soviets, Yugoslav spokesmen have freely recognized Eisenhower's initiative in international cooperation for peaceful uses of atomic energy; Damjanovic, "Toward an International Atomic Agency," VII Review of International Affairs, No. 156 (Oct. 1), 11 (1956).

[90] Atoms for Peace Manual 278-281 and Larin, *supra* note 16 at 21-22.

General Conference with merely consultative functions, and it limited membership in the Agency to states which were members of the United Nations or its specialized agencies. Thirdly, by failing to define the dimensions of the budget, the draft statute would impose uncertain financial obligations on Agency members.

In a memorandum devoted to the draft statute, dated October 1, 1955, the Soviet Union raised the following seven points. The first stressed the necessity for control provisions; since the Agency would be dealing with dangerous fissionable materials, and because the production of atomic energy for military and peaceful purposes was closely connected, it would be necessary to observe and control the activity of the Agency through some representative international organ such as the United Nations. Secondly, there must be no "privileged groups" in Agency membership. The statute must be based on recognition of the principle that no single country or group of countries be accorded a privileged position. In addition, the Agency's assistance was never to be made conditional on political, economic, or military considerations, or on any other considerations which were incompatible with the "sovereign rights" of states. Third, the statute's provisions dealing with the Agency's inspection and control powers must be in keeping with the "sovereign rights" of states receiving assistance from the Agency. Fourth, *any* state, regardless of whether or not it was a member of the United Nations or its specialized agencies, must have the right to be included among the founders of the International Atomic Energy Agency. Fifth, the first Board of Governors must include India, Indonesia, Egypt, and Rumania. Sixth, the statute must provide for a three-fourths majority vote in both the General Conference and the Board of Governors for approval of the budget and for establishing the scale of payments made by individual member-states. Seventh, the International Court of Justice was to have jurisdiction of cases involving the interpretation or application of the statute's provisions if the interested parties consented to its jurisdiction.[91]

By the time of the negotiations for creating the International Atomic Energy Agency in the fall of 1955, the Soviet position was clear to everyone. At the tenth session of the United Nations General Assembly, the Soviet delegate (Kuznetsov) repeated the demand that membership in the Agency be open to all. It was "unfair and unjust" that

[91] Larin, *supra* note 16 at 22-23. We shall presently see, in discussing Soviet bilateral agreements with states outside the Communist bloc, that the Soviet Union was soon to conclude agreements with Egypt and Indonesia, and was offering aid to India.

Communist China and the German Democratic Republic had been excluded from the Geneva conference that summer; no state should be barred from international cooperation in the peaceful uses of atomic energy. The inevitable appeal was made for an agreement prohibiting nuclear weapons. The Soviet delegation submitted a resolution that the General Assembly: (1) call upon all states to continue their efforts to reach such an agreement; (2) call for the creation of an international agency for peaceful uses of atomic energy within the framework of the United Nations; (3) call a conference of experts from various governments for joint consideration of problems relating to the drafting of a statute for the Agency; (4) recognize as desirable the periodic convocation of conferences on exchange of experience in the peaceful use of atomic energy in various fields (science, industry, agriculture, health, etc.), and authorizing the General Assembly to take steps for calling such a conference not later than 1957; and (5) decide on an international publication of works by scientists on problems of peaceful uses of atomic energy by 1956. The Soviet account would lead one to believe that all these suggestions originated with the Soviet delegation and adds that most of them were included in the final text of the resolution unanimously adopted by the General Assembly on December 3, 1955.[92]

According to the Soviet version, the Washington conference on drafting the International Atomic Energy Agency statute was subjected, from the outset, to tremendous pressure by the United States. The Americans gave all to understand that the U. S. policy toward the Agency would depend on the extent to which American wishes were followed.[93] The U.S.S.R., supported by Czechoslovakia, India, and others, posed as a defender of the United Nations against the American machinations. Upon the insistence of these powers, a provision was included in the statute requiring the Agency to present reports to the General Assembly and, in necessary cases, to the Security Council and other United Nations organs. The Agency was to examine the resolutions of these organs with respect to Agency activities, and was to submit reports on measures taken by it after consideration of these resolutions; "thus closer ties were set up between the Agency and the

[92] Larin, *supra* note 16 at 27.

[93] Larin, *supra* note 16 at 28-29. Once again, it is interesting to contrast the Soviet point of view with that of Yugoslav spokesmen who praised the "flexibility shown by the United States representatives towards the criticism of the attitude formulated in the original draft statute," which "made it possible to broaden the platform on which the Agency would be created." Damjanovic, *supra* note 89 at 12.

United Nations." [94] But these powers condemned the limitation of membership in the Agency to states which are members of the United Nations or its specialized agencies as "discrimination" contradicting the very concept of international cooperation in peaceful utilization of atomic energy. The U.S.S.R. and Czech delegates also attacked a provision in the draft statute which would have enabled the Agency's organs (the Board of Governors and the General Conference) to determine whether a given state would be capable of carrying out its obligations according to the United Nations Charter. They also argued that such powers belong to the United Nations' General Assembly and that the provision in question would lead to the "absurd result" that the Agency could pass on whether a particular state, already a member of the United Nations, could fulfill obligations contained in the United Nations Charter. According to Soviet reports, although the United States and other nations "stubbornly defended this provision," a new, changed formula was finally adopted.

The most controversial problem to arise at the conference concerned the composition of the Agency's Board of Governors. Here again, the Soviet delegation came out as a defender of "democracy" and "fair representation" against the alleged attempts of the Anglo-American bloc to subvert these principles. First, the Soviets proposed that the number of members on the Board be increased from sixteen to twenty-four. Secondly, procedures for election to the Board of Governors should be changed: nine member-states (including the five constant members of the United Nations Security Council) would be Board members by virtue of their advanced atomic technology and/or abundance of atomic resources. Fifteen other Board members would be selected by the General Conference according to geographical distribution (three members of American states, three from West Europe, two from East Europe, three from the Near East and Africa, and four from Southeast Asia and the Far East). These selections were to be made on the basis of two principles: (1) the guarantee of representation of members *receiving* benefits from the Agency, not contributing to it; and (2) "the offer of services, equipment, and information enabling the Agency to achieve its aims and fulfill its functions." The Soviet Union also demanded that Communist China be represented on the Board of Governors. Throughout the conference the U.S.S.R. maintained that the supreme organ of the International

[94] Larin, *supra* note 16 at 30.

Atomic Energy Agency should be its General Conference, with decisions binding upon the Board of Governors.[95]

The Soviet delegation recognized the danger that fissionable materials obtained from the Agency might be used for military purposes rather than peaceful ones, but insisted that there should only be as much control as was "really necessary," and that the "sovereignty" of member-states should always be "strictly observed." The statute should therefore provide that the Agency's activities never be made subject to conditions of economic, political, or military character—or in any way "incompatible with the sovereignty" of the recipient state. The United States-British insistence on strong inspection and control provisions, and their failure to accept the Soviet proposals for weakening these provisions, were denounced as "a refusal to accept the Soviet proposals to safeguard the sovereign rights of states making use of Agency assistance." [96]

In budgetary matters the U.S.S.R. sought to guarantee the fulfillment of the Agency's "true function"—assistance of underdeveloped countries in practical application of atomic energy for peaceful purposes. The U.S.S.R. suggested that all decisions on financial questions be made by a three-fourths majority vote, rather than two-thirds as provided in the original draft of the statute. It also proposed that the maximum contribution of any single state not exceed fifteen percent. It recommended that the Agency provide nuclear materials to underdeveloped countries at especially low prices, and in some cases entirely free. The Western powers were censured for rejecting this proposal, and for insisting that the Agency be given the right to acquire or construct atomic plants, laboratories, and other equipment. According to Soviet spokesmen, this would require enormous expenses, which would of necessity fall upon Agency members, even when they considered such construction and acquisition unnecessary.[97]

Representatives of states attending the New York conference which opened on September 20, 1956, to draft a statute for the International Atomic Energy Agency were strongly reminded of the Soviet stand on most of the points raised earlier. Bulganin dispatched a telegram to the conference, repeating that only with prohibition of atomic and

[95] *Id.* at 31-32. In this instance the Soviet view (on the relation of the Board of Governors to the General Conference) is supported by Yugoslavia. Arnejc, "Conference for the International Atomic Agency," 7 Review of International Affairs, No. 155 (Sept.), 9 (1956).

[96] Larin, *supra* note 16 at 33.

[97] *Id.* at 37.

hydrogen weapons could the most favorable conditions exist for peaceful use of atomic energy. Other familiar problems emerged in the course of discussions: the participation of the Chinese People's Republic and other Communist states in the Agency, the Agency's general tasks and aims, membership policy, composition and powers of the Board of Governors, and the Agency's inspection and control functions. There was little new in what the Soviet delegates said, but some fresh arguments were presented in support of their position.

On the question of Communist China's participation the Soviets have pointed out that such "states" as Monaco and the Vatican were invited to attend the conference, but the "great Asiatic power, the Chinese People's Republic"; yet China's contribution could be a valuable one. Outstanding Chinese scientists were said to be devoting themselves to problems of peaceful utilization of atomic energy. The Soviets also claimed that considerable deposits of fissionable materials have been discovered in China and that the Chinese government is giving a high priority to atomic research. China has a twelve-year plan in science and technology which envisages the achievement by 1967 of a level in atomic energy research equal to that of the most advanced countries. The Soviet Union's position is that the Chinese People's Republic must sooner or later be admitted into the Agency and that the present "short-sighted and discriminatory policy" can only harm the Agency, undermining its influence and authority.

At the conference G. N. Zarubin, the Soviet delegate, declared that the tasks and aims of the Agency must not be confined to serving the interests of a narrow group of highly-developed industrial powers; cooperation in peaceful uses of atomic energy can only be effective under conditions of equality of all participating states, with strict observance of their sovereignty and the principles of the United Nations. "In its foreign policy, the U.S.S.R. always adheres strictly to the principles of equality and observance of the sovereign rights of all people, great and small, highly-developed or backward," declared Zarubin (hardly a mouth before the tragic events which were to take place in Hungary that year), and he again emphasized that international cooperation in the peaceful uses of atomic energy could not be truly effective or complete until an international agreement was reached outlawing atomic and hydrogen weapons and until these weapons were removed from the arsenals of all states.[98]

The American-British insistence on strong inspection and control

[98] *Id.* at 45-47.

provisions was interpreted by the Russian representative as an effort to acquire control of the atomic industry in other lands. Paragraph D of the statute's third article was seen as "making sovereignty dependent upon carrying out the provisions of the Agency statute," [99] constituting a violation of the United Nations Charter itself.[100] The Soviets insisted that a danger lies in the fact that whether or not the statute and agreements made in accordance with its provisions have been observed is a question of interpretation. The interpretation may differ widely, according to who is doing the interpreting, and what considerations guide the interpretation. One delegate from the Soviet Union claimed that "there will always be those who are ready to accuse a state of failing to comply with the provisions of the statute or the agreements in order to use this as a pretext to interfere in the internal affairs of that state." According to the Soviet view, there are other means which are quite adequate for bringing pressures to bear on states guilty of violating statute provisions or otherwise failing to carry out their obligations. It was pointed out in this connection that the Agency statute provides sanctions, including withdrawal of Agency assistance from offending states, and expulsion of these states from the Agency.

Raising the question of Agency membership anew, the U.S.S.R. protested the exclusion of "certain states whose sociopolitical structure does not please the Western powers: the German Democratic Republic, the Mongolian People's Republic, the Korean Popular Democratic Republic and the Democratic Republic of Viet Nam." Claiming that the United States could offer no justification for its discriminatory policy, the U.S.S.R. advanced two arguments against the American position. One was that the wording of the statute's fourth article dealing with membership contradicted the second and third articles. The second article spoke of the Agency's efforts to attain a broader and more rapid use of atomic energy for peace, health and welfare throughout the *whole world;* the third article envisaged the Agency's contributions to scientific research in atomic energy, and practical application of atomic energy for peaceful purposes, *over the entire earth.* Such provisions made the Agency's aims and tasks clear to the Soviets: the Agency must be a body open to *all states* desiring to make a contribution to, or to benefit from international atomic cooperation. In other words, the Agency must possess a truly universal character, embracing all states without exception. In the opinion of the U.S.S.R. the dis-

[99] *Id.* at 47.

[100] The Charter provision in question is point 7 of Article 2.

criminatory membership terms contained in the fourth article clearly contradicted such a universal character. The second Soviet argument was based on alleged inconsistencies in the American position. The Soviet representatives stated that originally the United States had no discriminatory policy. It was pointed out that the United States memorandum of March 19, 1954, in which basic principles for a treaty establishing the International Atomic Energy Agency were proposed, declared that "all states signing the treaty" would be Agency members.[101] Furthermore, they alluded to the statement of Secretary Dulles, at the plenary session of the United Nations General Assembly on September 23, 1954, emphasizing the fact that the United States had no intention of excluding any states whatever from participation.[102] It was claimed that it was only in the spring of 1956, at the Washington conference, that the United States "came out against its own idea."

In discussions concerning the composition and powers of the Board of Governors, the U.S.S.R. upheld the view that the General Conference should be the general policy-making body. The Western insistence that the Board of Governors have sufficient powers to make frequent decisions on important matters, without constantly being compelled to turn to the General Conference, was attacked on two grounds. First, it abrogated the principle of the "sovereign equality of all the Agency's members"—the principle that all interested countries should participate in deciding fundamental problems of Agency activity. Secondly, the Western position was *not* based on considerations of expediency in the sense of making rapid, effectual decisions. This, to be sure, was the argument of certain Western powers, but in the Soviet view the real objective was to occupy a dominant position on the Board of Governors and to make the Board independent of the General Conference, where "the distribution of forces might sometimes be unfavorable to the Western powers." [103]

[101] The text of this memorandum may be found in Atoms for Peace Manual 266-269.

[102] *Id.* at 283-285. Secretary Dulles' words were that "I would like to make perfectly clear that our planning excludes no nation from participation in this great venture. As our proposals take shape all nations interested in participation and willing to take on the responsibilities of membership will be welcome to join with us in the planning and execution of this program." The Secretary of State apparently had the U.S.S.R. itself specifically in mind when he made these remarks, for he points out earlier in the address that "to date the Soviet government has shown no willingness to participate in the implementation of President Eisenhower's plan except on this completely unacceptable condition [a prior agreement outlawing nuclear weapons]. Yesterday when it was made known that I would speak on this topic today, the Soviet Union broke a five months' silence by affirming its readiness to talk further. But the note still gave no indication that the USSR had receded from its negative position."

[103] Larin, *supra* note 16 at 55-57.

The Soviet arguments proved somewhat successful on the point because the U.S.S.R. and other opponents of the Western (particularly American) position were able to secure a number of amendments at the New York conference which broadened the powers of the General Conference to a limited extent.[104]

The Agency's inspection and control functions were the most severely criticized by representatives of the Soviet Union who raised a series of objections and consistently used these provisions for attacking the United States. The inspection and control provisions contained in Article XII, first of all, conformed to the terms in the bilateral agreements which the United States had concluded with other countries for assistance in peaceful uses of atomic energy. The terms of inspection and control in these bilateral agreements were not merely denounced as harsh by the Soviets, but they were described as "violations of sovereignty." [105] The United States, however, insisted upon retention of these provisions in the International Atomic Energy Statute. In essence, the American position at conferences for drafting the statute was characterized by the Soviets as follows: "If you wish the United States to make its contribution, do not change these provisions." [106]

What were the motives underlying the American insistence on rigid inspection and control provisions? According to the Soviet view, the United States and "certain other Western powers" hope to occupy a dominant position in the Agency, and once the Agency has acquired broad powers of inspection and control, the Western bloc will be able to use these powers for its own ends: to control the development of atomic industry in lands obtaining assistance from the Agency. The Soviets charged that the Western bloc further was seeking to place under Agency control all bilateral agreements for cooperation in peaceful use of atomic energy without exception, and thus to extend its influence and control to the atomic industries of all lands of the earth. The United States was alleged to be desirous of using the Agency's control powers to hinder free development of atomic energy in other lands, because such development would mean the undermining of American influence there. Furthermore, Soviet representatives stated that the United States was attempting to transform the Agency into an "international policeman," thereby contradicting the entire concept of

[104] *Id.* at 57.

[105] The correspondence between the U.S. and the U.S.S.R. on the question of inspectors and other controls was published in a special supplement to the Soviet periodical New Times, No. 42 (Oct. 11) (1956).

[106] Larin, *supra* note 16 at 60.

international cooperation in atomic energy development on the basis of equality and respect of the sovereign rights of states.[107]

Soviet spokesmen did not deny the necessity of certain specific security measures in the handling of fissionable materials. They claimed, however, that the control mechanism which the United States suggested was worthless. American claims that strict measures were necessary in the interests of peace and security were denoted as "false and hypocritical." The Soviet delegates stated that if the Western powers were sincerely interested in such aims, they would support the Soviet proposal for prohibiting the production, storage, and testing of nuclear weapons and rid humanity of the threat of atomic war. The Soviet view was that only when such prohibition has been effected will strict international control be fully justified; thereafter international control could be extended to all states and could be successfully directed toward the use of nuclear energy for exclusively peaceful purposes if all existing supplies of nuclear weapons were destroyed.

The Soviets argued that the Agency statute provided no controls over the United States, Britain, the U.S.S.R., or other states whose atomic energy development is highly developed because these powers will not be seeking help from the Agency; on the contrary, they will be rendering assistance, through the Agency, to other states. Furthermore, they stated that the Agency can have no control, regardless of strict provisions in its statute, over states possessing adequate technical and material resources for carrying on their own program in peaceful utilization of atomic energy without help from the Agency. If such states were to undertake the costs involved, they would be able to produce nuclear weapons on their own. According to the Soviet view, those nations which are sufficiently developed technologically to carry out their own atomic programs could make use of the Agency's assistance and still manage to evade control by the Agency.[108]

The Soviets concluded with the following line of argument. Those states to whom the control provisions would apply are precisely the states least likely to produce atomic weapons in the first place; namely, the weakly-developed backward states whose need for Agency assistance is the greatest. We are thus confronted with a paradox: those states having no atomic installations or dangerous fissionable materials, and who need help from the Agency, are expected to submit to inspection and control at any time and any place. They can literally take no step

[107] *Id.* at 61.

[108] *Id.* at 63; the author does not elucidate.

in the development of their atomic industry without the Agency's knowledge and permission. On the other hand, such states as the United States, which possess huge supplies of dangerous fissionable materials and are constantly manufacturing atomic and hydrogen bombs, remain completely outside the sphere of Agency control.[109]

In view of their conclusion regarding this paradoxical situation, and because no general agreement has been reached outlawing nuclear weapons, the Soviet Union felt that the promise of recipient states not to use Agency-furnished fissionable materials for military purposes, along with the statute's requirements for accounting and reports, should prove sufficient safeguards. At the New York conference, however, the "unnecessary" inspection and control clauses were adopted. The Soviet proposals, made to "protect the sovereignty of states," found some reflection, however, in the Agency statute to the extent that the Agency cannot make its aid contingent upon political, economic, military, or other conditions which are incompatible with the Agency's rules, and that the Agency's activities with respect of fulfillment of control functions must be agreed upon between the Agency and the recipient states.[110]

Despite its dissatisfaction with many provisions of the International Atomic Energy statute, the Soviet Union was the first great power to ratify the statute, "thereby demonstrating once again its desire for broad international cooperation in promoting peaceful uses of atomic energy." [111] However, the same familiar issues were immediately raised by the Soviet Union at the general conference of the International Atomic Energy Agency in October, 1957. In a telegram to the chairman of the first session, K. Voroshilov (Chairman of the U.S.S.R. Supreme Soviet Presidium) declared that the Soviet Union attached great significance to the new international organization and had taken an active part in its creation, seeking to "ensure for it the most democratic character possible, and to ensure the broad participation and equal treatment of all countries participating in its work." He reminded the conference delegates that the U.S.S.R. had been the first great power to ratify the Agency's statute. He repeated the plea for an international agreement prohibiting atomic and hydrogen weapons and stressed that the Soviet Union was ready to conclude such an agreement. "How-

[109] *Id.* at 64.

[110] Article III.

[111] Larin, "Atoms for Peace and Progress," New Times, No. 8 (Feb. 21) 11 (1957). For decree of U.S.S.R. Supreme Soviet Presidium, ratifying the statute, and dated Feb. 9, 1957, see Vedomosti Verkhovnogo Soveta SSSR, Mar. 8, 1957, at 163.

ever, the Soviet Union's proposals to prohibit atomic and hydrogen weapons have unfortunately not met with support from the Western powers." [112] The U.S.S.R. and Czechoslovakia renewed their efforts to admit Communist China into the Agency,[113] and the Soviet embassy in Washington dispatched a note to the U. S. State Department insisting that the "Kuomintang (Nationalist China) has no right to represent China in the International Atomic Energy Agency. The Soviet Union again reaffirms its position and declares that it does not recognize the legality either of the Kuomintang's signature on the statute nor the Kuomintang's ratification of this Statute, since it does not represent China." [114]

So far, according to Soviet sources, the tone of the general conference had been "normal" and "business-like." But suddenly an attempt was made to "poison the atmosphere and bring back the cold war spirit," when the United States delegation, "for no apparent reason," introduced a resolution questioning the authority of the delegation representing the Hungarian People's Republic. "Of course, the American delegate was unable to provide any reasonable explanation of this provocatory resolution." The Soviets also expressed strong disapproval of the American insistence on procedures "which have become standard for the United Nations and other international organs" because these procedures blocked a proposal to exclude Nationalist China and prevent the admission of Communist China into the Agency. In general, the United States opposed Soviet proposals, which flowed from "the principle of the Agency's universality" (the apparent exception from this "universality" was Nationalist China), and the Soviet "efforts to create a healthy setting for the Agency's practical activity." The Soviet Union's spirit of cooperation and good will was claimed to have been shown in the appointment of the Agency's General Director. Although the U.S.S.R. would have preferred a representative of a "neutral state" for this post, the U. S. A. "stubbornly insisted" that Sterling Cole be named director, and the Soviet delegation "refrained from objecting" to Cole's candidacy.[115]

The "bourgeois press" made a great deal of the American offer "to supply Uranium 235 on a commercial basis." Some Western newspapers went so far as to proclaim the Agency an "enterprise subsidized

[112] The text of this telegram was published in Pravda, Oct. 2, 1957, p. 2.
[113] N.Y. Times, Oct. 3, 1957, p. 4.
[114] Pravda, Oct. 4, 1957, p. 5.
[115] Izvestiya, Oct. 10, 1957, p. 4.

by America," but all these "fantasies died a quick death" on October 10, 1957, when V. S. Emelianov, the Soviet representative, gave a speech outlining the U.S.S.R.'s aid program. This program included placing fifty kilograms of enriched uranium at the disposal of the Agency.[116] While recognizing the importance of supplying the Agency with an adequate amount of fissionable material, the U.S.S.R. claimed that the more urgent problem was how to utilize the material. The heart of the problem lay in training national cadres of scientists and specialists in underdeveloped countries. Thus a particularly strong impression was created when the Soviet delegate spoke of the Soviet Union's readiness to offer Agency member-states assistance in training scientific cadres in the technology necessary for manufacturing heat-generating elements for reactors. The U.S.S.R. was ready to take fifty or one hundred students from member-states to study in Soviet institutes of higher learning and to grant fifty scholarships to students from underdeveloped countries. It was moreover prepared to train specialists from member-states in the use of radioactive isotopes in science, industry, medicine, and agriculture. It would also be willing to design the atomic power and experimental projects and installations which were to be built by the Agency in prospecting for uranium and in mining uranium deposits. The Soviet account also stated that the American, British and French delegates made a "general statement that they were prepared to share their own atomic knowledge and experience with the Agency. Unfortunately, they did not specify any concrete form in which this aid might be rendered." [117]

The specter of American domination was raised again at this time. Far from having any desire to help underdeveloped countries in the peaceful use of atomic energy, the United States (according to the Soviet account) is interested only in using the Agency to control the work which scientists of other states are doing in the field. "These

[116] Izvestiya, Oct. 18, 1957, p. 4. This report fails to mention Sterling Cole's expressed hope that the Soviet Union would increase its contribution to the Agency's stocks of fissionable material. The Soviet contribution was only a hundredth of the pledge made by President Eisenhower; N.Y. Times, Oct. 17, 1957, p. 11. Here again the Yugoslav position is worth noting. With reference to Eisenhower's promise of 5,000 kilograms of uranium 235, a Yugoslav writer notes that this offer "has enabled the Agency to take steps for atomic research and for the realization of energy programs without delay." Arnejc, "Positive Prospects," 7 Review of International Affairs, No. 158 (Nov.) 9 (1956).

[117] Izvestiya, Oct. 18, 1957, p. 4. Another statement that the U.S.S.R. regards the Agency's chief aim to be in creating "national cadres of specialists and local production bases in underdeveloped lands" may be found in a short article by Podkliuchnikov, Pravda, Oct, 1957, p. 4.

motives, in particular, explain why the American delegation spent its whole effort in getting Sterling Cole, former chairman of the U. S. Congress' joint committee for atomic energy, appointed as the Director-General of the Agency." It was no accident that the United States had "no concrete proposals for rendering aid to underdeveloped countries through the International Atomic Energy Agency." The "ruling circles of the United States" want the Agency to be their subservient organ so that the United States may control every step of the Agency's members.[118]

In April, 1958 Sterling Cole received three letters from L. M. Zamyatin, U.S.S.R. Deputy Permanent Representative to the International Atomic Energy Agency. The first of the letters contained the information that the Soviet Union would appoint twenty to thirty advisers and consultants for temporary aid to Agency member-states and that the Soviet government would bear all expenses connected with the assignments of these specialists, who were to be sent by the Agency to various countries to assist in setting up national scientific and technical programs for the peaceful use of atomic energy. The other letters stated that the U.S.S.R. was prepared to accept forty to forty-five students in the academic year of 1958-59 for a period of from five to six years of instruction in basic atomic specialties. The Soviet government would assume the maintenance and tuition costs for twenty-five of these students. In addition, the Soviet Union would be willing to accept fifty scientists and specialists from Agency member-states for three-to-six-months "refresher courses" with the Soviet government bearing the expenses of twenty of these specialists.[119]

Such have been the views, as presented to the reader of Soviet publications, of the International Atomic Energy Agency, some of the provisions of its statute, and the role played by various states in the Agency. These published views appear to bear out a remark made by John Foster Dulles (in the early stages of negotiations for creating the Agency) that "negotiations publicly conducted with the Soviet Union tend to become propaganda contests." [120] American readers will quickly recognize the extent to which the United States' role in the Agency has been distorted and may be puzzled by certain inconsistencies in the Communists' own position. The active Soviet role in international cooperation for peaceful uses of atomic energy is stressed, and one is

[118] Podkliuchnikov, *supra* note 117.
[119] Pravda, April 4, 1958, p. 5.
[120] Atoms for Peace Manual 283.

repeatedly reminded that the U.S.S.R. was the first major power to ratify the Agency statute, despite the Soviet Union's originally negative attitude toward the project of such an Agency.[121] Voroshilov's telegram in 1957 described the U.S.S.R. as a "disinterested member" and claimed that the Soviet Union was striving for the greatest degree of international cooperation, employing a completely objective and harmonious approach to the Agency and its operations, yet almost in the next breath he expressed satisfaction that the Agency's headquarters were in a "neutral state" (Austria).[122] In bemoaning the election of an American rather than some "representative of a neutral state" to the post of Director-General, the Soviet press makes it clear that, come what may, America remains in the "enemy camp." [123]

There is more political expediency than logical consistency in the Soviet view on the Agency's relations to the United Nations. On one hand, the U.S.S.R. has always insisted that the Agency be within the framework of the United Nations and strictly accountable to it, and Soviet jurists have defined the Agency's ties to the United Nations as considerably closer than those of the specialized agencies to the United Nations.[124] On the other hand, the Soviets have denounced American insistence on following United Nations procedures [125] and have insisted that the statute's membership provisions are discriminatory and unacceptable because they exclude states not members of the United Nations. Whereas the U.S.S.R. at one time called for a strong control mechanism, with inspectors investigating atomic installations of recipient states,[126] it became satisfied with minimum safeguards, (excluding inspection or control within the recipient state), ostensibly because inspection and control provisions make no sense in the absence of an over-all prohibition of nuclear weapons and because such provisions would result in violations of the recipient states' sovereignty by the United States (not the U.S.S.R.).

Early in 1958 the United States proposed international inspection teams to implement a general agreement to outlaw nuclear weapons—the very type of agreement which the Soviets have constantly advocated. The American position was that no agreement to outlaw nu-

[121] *Supra* notes 89 and 102.

[122] *Supra* note 112.

[123] Izvestiya, Oct. 10, 1957, p. 4.

[124] *Supra* notes 86 and 87.

[125] *Supra* note 115.

[126] Dept. of State Press Release No. 527, Oct. 6, 1956, p. 23; see Bechhoefer and Stein, *supra* at note 77.

clear weapons could have meaning without concrete implementation of this type.[127] The initial Soviet response was disappointing,[128] but U. S. officials later saw hopes that an accord might be reached.[129] It remains to be seen whether the U.S.S.R. will agree to effective measures implementing a general agreement to ban nuclear weapons,[130] and how such an agreement will affect the Soviet attitude towards the International Atomic Energy Agency and other forms of international cooperation for peaceful use of atomic energy.

D. Bilateral Agreements on the Peaceful Use of Atomic Energy in the Communist Bloc

Primary sources for studying bilateral agreements pertaining to the peaceful use of atomic energy within the Communist bloc are meager. The Soviet press periodically reports such agreements between the U.S.S.R. and other states, and the Soviet government has published a number of "joint declarations" concerning its negotiations with other states for cooperation in peaceful utilization of atomic energy. Passing references are made to bilateral agreements between other Communist states,[131] but so far the actual texts of bilateral agreements in the Communist bloc have not been made public. The testimony of former citizens of the Communist states who have defected to the West has provided some additional information not found in Communist-bloc publications, but it is apt to be heavily biased and must be read with caution.

According to some reports, the U.S.S.R. has been furnishing radioactive isotopes to Communist-bloc states since 1951 and was approached by China with a request for assistance in constructing atomic laboratories in March, 1954.[132] It was not until January, 1955, however,

[127] The text of Eisenhower's arms inspection proposal was published in the N.Y. Times, April 8, 1958, p. 10. For concrete data on the proposed inspection teams, see N.Y. Times, April 16, 1958, p. 9.

[128] The text of Khrushchev's reply was published in Pravda and Izvestiya, April 24, 1958, p. 2.

[129] N.Y. Times, May 12, 1958, p. 1; June 3, 1958, p. 1 and June 10, 1958, p. 1.

[130] It has been suggested that the Soviet Union would enjoy important strategic advantages if all nations stopped testing nuclear weapons without guarantees of real world-wide disarmament; Kissinger, "Missiles and the Western Alliance," 36 Foreign Affairs, No. 3 (April) 383-401 (1958) and Sulzberger, "Nuclear Tests and Soviet Strategy," N.Y. Times, April 9, 1958, p. 32.

[131] See, for example, Wspolpraca ze wszystskimi narodami, I Polska, No. 41, 6-7 (1958) and N.Y. Times, June 2, 1958, p. 10, for references to bilateral agreements between Poland and Yugoslavia and Poland and East Germany.

[132] Huber, *supra* note 75 at 41.

that the Soviet Union embarked on a vast program of extending scientific, technical, and industrial aid to other states for the establishment of "experimental scientific centers to develop atomic energy for peaceful purposes." In the original announcement of this program,[133] the Soviet government promised five states—China, Poland, Czechoslovakia, Rumania, and East Germany—that it would aid them in designing and supplying equipment for the construction of "experimental atomic piles," with a capacity of up to five thousand kilowatts, and for the construction of accelerators of elementary particles.[134] The U.S.S.R. was to furnish these five countries with necessary quantities of fissionable materials for their atomic piles and scientific research work. Means of extending the number of countries to be aided were considered. Recipient states were to supply "appropriate raw materials" to the U.S.S.R. in return for Soviet aid.

This program was inaugurated very rapidly. At the beginning of March, 1955 a Czech government committee for research and use of atomic energy for peaceful purposes met to discuss problems of carrying out the Soviet proposals.[135] By early June bilateral agreements had been drafted and signed with the five states named in the original Council of Ministers announcement, and similar aid was promised to Hungary and Bulgaria in the near future.[136] Agreements to aid Hungary and Bulgaria were reported a week later.[137]

Although the texts of these bilateral agreements have not been published, their main features have been summarized in the Soviet press.[138] The Soviet Union was to supply the other states with experimental reactors and accelerators designed in the U.S.S.R. and to provide free scientific and technical documentation concerning them, as well as assigning Soviet specialists to aid in assembling and placing

[133] This announcement appeared on the front page of both Pravda and Izvestiya on Jan. 18, 1955, the day after its issuance by the Council of Ministers.

[134] Some revision in these figures was supplied in a report in Pravda, Aug. 29, 1955, which stated that Poland, Czechoslovakia, Rumania, Hungary and the German Democratic Republic would have reactors with a capacity of 2000 kilowatts and cyclotrons with up to 25 million electron volts of energy. China, on the other hand, was to acquire a similar cyclotron, but a reactor of 6500 kilowatts thermal capacity. A United Press dispatch from Tokyo on Mar. 7, 1958, announced the completiton of a 7000 kilowatt reactor "with Soviet assistance."

[135] Pravda, Mar. 12, 1955, p. 2.

[136] Pravda, April 30, 1955, p. 2.

[137] Pravda, June 15, 1955, p. 2.

[138] Pavda, April 30, 1955, p. 2. This issue summarized the agreements with China, Czechoslovakia, Poland, Rumania, and East Germany, stating that similar agreements would be concluded with Hungary and Bulgaria.

them in operation. The Soviet Union was to make available to these states the necessary amount of fissionable and other materials, and the U.S.S.R. was to deliver necessary amounts of radioactive isotopes until the experimental reactors went into operation. The agreements further declared that scientists and engineers from these states would receive training in the Soviet Union in nuclear physics, radiochemistry, use of isotopes, and reactor technology.

By mid-July of 1955, top-ranking scientists of Poland, Czechoslovakia, and East Germany were referring gratefully to the atomic "assistance agreements" between their states and the U.S.S.R., and it was reported that Poland and Czechoslovakia were reorganizing their over-all atomic energy programs (combining existing laboratories into single research institutes and establishing national committees to coordinate their research efforts) in order to take full advantage of Soviet aid.[139]

A Soviet-Yugoslav protocol on economic and scientific-technical cooperation was signed in Moscow on September 1, 1955. On January 28, 1956, a Soviet-Yugoslav Agreement on Cooperation in the Use of Atomic Energy for Peaceful Purposes was signed in Belgrade.[140] This agreement provided for "general cooperation and experimental exchange in the field of atomic energy" and for Soviet scientific and technical aid in constructing a reactor for Yugoslavia. The type of reactor was to be based on the Yugoslav program and specifications. The Soviet Union promised to supply the equipment and nuclear fuel necessary to ensure the uninterrupted operation of the reactor. Prices for materials and nuclear fuel were to be set according to "prices in the world market." In addition to the agreement itself, supplementary protocols setting forth "technical and commercial details" were to be signed.[141]

[139] See New Times, No. 30 (July 21) 13-14 (1955).

[140] Pravda, Jan. 29, 1956, p. 6. According to Huber, this agreement would have been concluded in 1955, but Yugoslavia was bound under an agreement with the World Bank not to accept new credits until the end of 1955; Huber, *supra* note 75 at 53.

[141] Talks were held in Belgrade during practically the entire month of May, 1956, to "implement" the January agreement; Izvestiya, May 27, 1956, p. 3. The Soviet press reported early in 1957, in a very brief communique, that a new protocol to the agreement of Jan. 28, 1956, had been signed, providing for further cooperation between Soviet and Yugoslav organizations and scientific institutes in the field of nuclear physics research and use of atomic energy for peaceful purposes. In the words of the communique, "the negotiations took place in a spirit of mutual understanding and desire to cooperate further in this field"; Izvestiya, Feb. 13, 1957, p. 12. A United Press dispatch of April 30, 1958, quoted Tanjug, the official Yugoslav news agency, to the effect that Yugoslav scientists had successfully tested a nuclear reactor and that the reactor would go into

In 1956 the Joint Nuclear Research Institute was also organized. The Institute has figured prominently in some of the later "joint declarations" between the Soviet Union and individual Communist states. Four states which are members of the Institute (Albania,[142] North Korea, Viet Nam, and Mongolia) have not yet concluded bilateral agreements with the U.S.S.R. A possible explanation is that these states lack the necessary technical personnel.

An agreement between the Soviet Union and Egypt for cooperation in the peaceful use of atomic energy was signed in Cairo on July 12, 1956. Its terms appear to be very similar to those of the bilaterals concluded between the U.S.S.R. and states in the Communist bloc.[143]

Later in July a "statement of the results of negotiations between government delegations of the Soviet Union and the German Democratic Republic" reported a new bilateral agreement. The statement limited itself to a description of the benefits which East Germany was to enjoy under the agreement; no terms favorable to the U.S.S.R. (for example, shipment of East German uranium ore to the Soviet Union) were listed. The U.S.S.R. was to assist in designing an East German atomic power plant with a capacity of up to 100,000 kilowatts, and the Soviet government undertook to supply the German Democratic Republic with the necessary equipment and materials.[144]

In a general agreement between the U.S.S.R. and Indonesia, signed on September 15, 1956, the parties agreed, *inter alia,* to cooperate in

operation in early May, 1958. It remains to be seen what effect the ideological conflict between Yugoslavia and the U.S.S.R. which was resumed in 1958, will have on Soviet atomic assistance to Yugoslavia.

[142] The Joint Soviet-Albanian Declaration of April 17, 1957, contains a single sentence on the subject: "The parties have discussed cooperation in peaceful uses of atomic energy"; New Times No. 17 (April 25) 38 (1957).

[143] Pravda, July 15, 1956, p. 5.

[144] Pravda, July 18, 1956, p. 4. A joint statement over the signatures of Bulganin and Grotewohl in January, 1957, restricted itself to remarks on the desirability of a "general European organization for the peaceful application of atomic energy, which both parties ardently support," and concluding that "utilization of atomic energy for peaceful purposes would bring the European working people higher living standards." New Times, No. 3 (Jan. 17) 36 (1957). For a description of the administration of East Germany's atomic energy program, see Huber, *supra* note 75 at 44-46. Pravda for Mar. 15, 1957, p. 6, reported negotiations between Soviet and East German delegations on payments for the products of the Wismuth Aktiengesellschaft (a Soviet-controlled corporation which administers uranium mining in East Germany), but the report was couched in such general terms that it adds nothing to our knowledge of Soviet-East German relations in the atomic energy field. Construction on East Germany's first atomic power station started on October 8, 1957. New Times, No. 42 (Oct. 17) 32 (1957).

peaceful uses of atomic energy, particularly in the use of radioactive isotopes in medicine, science, and technology, and in the training of Indonesian specialists in the use of atomic energy.[145]

Shortly after the Polish unrest and the Hungarian uprising of late 1956, a series of "joint declarations" between the U.S.S.R. and other Communist states were published. Some analysts believe that the Soviet Union was induced by the events in Poland and Hungary to make concessions (including concessions in the field of atomic energy) which were reflected in these declarations.[146] The declarations were extremely broad in scope, and several of them touched upon the question of cooperation in peaceful uses of atomic energy. Those involving Czechoslovakia, Bulgaria, and Hungary deserve particular attention.

In the Joint Soviet-Czechoslovak Declaration of January 29, 1957, the two governments agreed that the Czechoslovak Republic would continue to supply uranium ore to the Soviet Union. The declaration emphasized that Czech uranium ore was being sold to the U.S.S.R. at a "fair and mutually-advantageous price which makes possible the continued development of mining and refining of this raw material." The Soviet Union undertook to provide Czechoslovakia with the necessary assistance for the construction of an atomic power plant and a nuclear physics institute. It promised close cooperation with Czechoslovakia in problems of peaceful application of atomic energy. The declaration concluded with references to the two countries' active part in the work of the Joint Nuclear Research Institute.[147] It contained one other important statement which will be discussed later in a different context.

[145] Izvestiya, Sept. 18, 1956, p. 1. See N.Y. Times, Jan. 16, 1958, p. 53, for Indonesian plans to earmark special funds to finance the Soviet aid program.

[146] According to Soviet sources themselves, these bilateral talks were based on a Soviet government declaration issued on October 30, 1956, "On the Principles of Development and Further Strengthening of Friendship and Cooperation between the Soviet Union and Other Socialist States"; Pravda, July 14, 1957, p. 5.

[147] New Times, No. 6 (Feb. 7) 42 (1957). The Czech government committee for research and use of atomic energy for peaceful purposes met early in March, 1955, to discuss problems concerning the Soviet government's proposal to grant Czechoslovakia scientific, technical and production assistance in setting up scientific bases for developing research in nuclear physics and the peaceful use of atomic energy; Pravda, Mar. 12, 1955, p. 3. A national committee for the study of peaceful uses of atomic energy was established shortly afterwards, to "coordinate research effort," and it was hoped that the Soviet-built reactor and cyclotron would be in operation before the end of 1956; New Times, No. 30 (July 21) 14 (1955). (According to later reports, the first Czech atomic reactor started operations on Sept. 25, 1957: Pravda, Sept. 26, 1957, p. 3). According to a former member of the Ministry of Foreign Affairs in Prague, a Czech-Soviet treaty was concluded in 1945 (but kept secret until late in 1947) in which Czechoslovakia agreed to deliver its entire stock of uranium ore, and its

In respect to the declaration on negotiations between the governments of the U.S.S.R. and Bulgaria, it was announced that "together with the other Socialist countries, Bulgaria will take an active part in the work of the Joint Nuclear Research Institute, both in theoretical research and experimentation." It was further agreed that the Bulgarian People's Republic would continue to supply the Soviet Union with uranium ore "at a fair and mutually advantageous price that will enable the further development of the mining of uranium ore." [148]

Bulganin and Kadar signed a "Declaration of the Governments of the Soviet Union and Hungarian People's Republic" on March 28, 1957. This declaration listed four points of cooperation between the U.S.S.R. and Hungary in the peaceful utilization of atomic energy. First, both states would continue to participate in the work of the Joint Nuclear Research Institute. Second, the Soviet Union would continue to render Hungary economic and technical assistance in the geological survey of uranium deposits and to supply equipment and instruments. Third, the U.S.S.R. would aid Hungary in constructing atomic power plants and in obtaining fissionable material necessary for their operation. Fourth, after "reorganization of the mining of uranium ore," Hungary would sell the Soviet Union surplus ore "not required by her own economy" at a "fair and mutually advantageous price." [149]

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entire production thereof, to the Soviet Union. Mining and shipping of uranium were to be under Soviet direction. The terms of payment were left undefined, the treaty stating simply that Soviet payments would be based on "expenses incurred in mining the ore." Since vast quantities of ore were already on the surface, in pit heaps, these "expenses" amounted to very little. It would have been far more to Czechoslovakia's advantage to sell the ore at world market prices. The Czechs were obliged to supply capital for new investments, which were made on an enormous scale. The Soviet demands became so "cynical and ruthless," however, that finally the Czech Communist premier (Gottwald) had to dispatch an envoy to Moscow to try to negotiate more favorable terms. The Russians finally consented to appraise the pit heaps on the basis of the market price of uranium and to refund investments financed by Czechoslovakia. Kasparek, "Soviet Russia and Czechoslovakia's Uranium," 10 Russian Review, No. 4 (Oct.) 97-105 (1951).

[148] New Times, No. 9 (Feb. 28) 37 (1957). Bulgaria's copper, mica and important uranium mines are operated by *Gorubso,* a joint Soviet-Bulgarian corporation; Levitsky, "The Soviet Union and Satellite Uranium," IV Bulletin of the Institute for the Study of the U.S.S.R., No. 2 (Feb.) 39 (1957).

[149] New Times, No. 14 (Apr. 14) Supplement, p. 8 (1957). The formation of an "All-Hungarian Atomic Energy Committee" was reported in early 1956; Pravda, Jan. 22, 1956, p. 5. But all was apparently not well. The Hungarian scientist Lajos Janosi (the same Lajos Janosi whose enthusiastic approval of locating the Joint Nuclear Research Institute was cited earlier in this paper) reportedly complained in November, 1956, that the Soviet authorities had zealously guarded everything connected with uranium and had kept the Hungarian experts—including himself (he was

The Soviet Union's joint declarations with Poland and Rumania contained no clauses on cooperation in peaceful utilization of atomic energy although both those countries are known to possess uranium deposits. It has been reported that Gomulka brought up the question of Polish uranium mines when in Moscow in late 1956, and Poland may have received Soviet agreement on a similar arrangement to that which the U.S.S.R. has worked out with Czechoslovakia and East Germany.[150] But the Joint Statement on Soviet-Polish Talks, signed by Khrushchev, Bulganin, Gomulka, and Cyrankiewicz in Moscow on November 18, 1956, made no mention of atomic energy.[151] The Soviet press reported that a reactor was commissioned in Rumania in early August of 1957,[152] but little else is known about Rumanian-Soviet relations in this area. According to one source, Soviet geologists discovered important uranium deposits in Rumania several years ago and established a corporation (*Sovromquartz*) in charge of uranium mining and export. This same source cites a Soviet-Rumanian agreement of October 22, 1956, under which the Rumanians acquired the right to buy up the Soviet share in this corporation "under advantageous conditions." [153] G. Ionescu, an anti-communist Rumanian economist, claims that *Sovromquartz* was working exclusively on Soviet army requirements and not on peaceful uses of atomic energy.[154] Nothing pertaining to peaceful uses of atomic energy was to be found in the Statement on Soviet-Rumanian Negotiations signed by Bulganin and Stoica on December 3, 1956.[155]

Vice-Chairman of the "All-Hungarian Atomic Energy Committee")—completely in the dark; See Stolte, "Moscow's Current Hungarian Policy," IV Bulletin of the Institute for the Study of the U.S.S.R., No. 7 (July) 27 (1957) and sources therein cited. A former Soviet economist has summarized the role which the issue of Hungarian uranium-mine control played in that country's tragic uprising in 1956. He reports that the uranium mines had been controlled by the Soviet Union since the end of the second World War, in accordance with a secret treaty which gave the U.S.S.R. the exclusive rights to Hungarian uranium for twenty-five years without compensation. When the Hungarian revolt broke out, the revolutionaries demanded that the terms of the secret agreement be made public and that the mines be returned to Hungary Failing this, they threatened to seize the mines by force, and as the revolution progressed the mines were so badly damaged that Hungarian uranium production came to a standstill. In early 1957, Kadar announced that the Soviet-Hungarian uranium agreement would be 'reexamined"; Levitsky, *supra* note 148 at 40-41, and sources therein cited. The declaration we have quoted followed soon thereafter.

[150] Levitsky, *supra* note 148 at 40.

[151] New Times, No. 48 (Nov. 22) 37-40 (1956).

[152] New Times, No. 32 (Aug. 8) 5 (1957)

[153] Levitsky, *supra* note 148 at 40.

[154] See Cretzianu (ed.) Captive Rumania 93 (1956).

[155] New Times, No. 50 (Dec. 6) Documents, pp. 1-4 (1956).

An agreement for Soviet assistance to Poland in the peaceful uses of atomic energy was signed on January 22, 1958. The account of negotiations preceding the agreement discloses that both sides "discussed" a number of problems of technical assistance, including: the construction and equipping of a second experimental reactor in Poland; the design and construction of Poland's first atomic-powered electric plant; problems of uranium prospecting, mining and processing; the organization of Polish production of equipment and apparatus necessary for experimental work and equipment of nuclear physics and chemistry laboratories; further development of research and preparation of specialist cadres for peaceful utilization of atomic energy; and the organization of work in radiology. Technical assistance was to be carried out by: transmission of specialized literature and technical documents; delivery of special materials and equipment for nuclear physics and chemistry laboratories and also of equipment and apparatus which could not be produced by Polish industry; the assignment of Soviet specialists to Poland for advising and consulting; the training of Polish specialists in technology and production methods in the Soviet Union; education of Polish students in Soviet institutions of higher learning; and the assignment of teachers from Soviet institutions of higher learning to Poland for lecturing and consultation. The Soviet technical assistance to Poland was to be paid for according to the terms of a trade agreement which had been concluded earlier between the two countries.[156] The Polish delegation visited the Joint Nuclear Research Institute after the signing of the agreement, and V. Billig (the head of the Polish delegation) declared there that this new agreement, along with Polish participation in the Institute "in which the number of Polish associates is increasing," gave Poland a "firm basis for further successful solution of our problems in the field of peaceful utilization of atomic energy." [157]

As in other areas of international cooperation in the peaceful uses of atomic energy, Soviet writers have contrasted the activities of the U.S.S.R. and the Western powers in the field of atomic bilateral agreements. The American and British agreements with other lands have been denounced as "incompatible with the principles of sovereignty and

[156] Pravda, Jan. 23, 1958, p. 4. Poland's first nuclear reactor went into operation on June 14, 1958. It will be used in research work in medicine, physics, chemistry and biology and will produce isotopes of iodine, gold, coal and cobalt. Most of the equipment was purchased from the U.S.S.R., but Poles did most of the assembly work. The Poles report plans for another, larger nuclear plant which they hope to build themselves. N.Y. Times, June 16, 1958, p. 9.

[157] Pravda, Jan. 28, 1958, p. 6.

equality of states' rights"; the "ruling circles of imperialist states," writes one Soviet jurist, "seek to use such bilateral agreements to dictate their will to the other contracting parties, to seize sources of atomic raw-material and to interfere in the internal affairs of those states. The aid which the Soviet Union, on the other hand, is rendering through its bilateral agreements is in full harmony with the principles of the United Nations Charter, being based on complete equality of rights between states. It is not accompanied by any political, economic or military conditions whatsoever which would in any degree affect the independence of states." [158] The jurist also emphasized that although it had cost the U.S.S.R. vast sums to develop and construct atomic reactors and accelerators, the necessary scientific and technical documentation and experience was furnished other lands free of charge. The aided countries pay only the actual costs of making the equipment which is to be delivered to them.[159]

We are handicapped through our lack of the texts of the bilateral agreements. Although they are said to be "in full harmony with the principles of the United Nations," they have not yet been registered with the United Nations. It appears beyond question, however, that the agreements serve important political and diplomatic purposes. The timing of the U.S.S.R. Council of Ministers' first announcement on the atomic aid program, for example, is highly significant. This announcement, described earlier, was published on January 18, 1955, at the very moment when a United Nations consultative committee was meeting in New York to prepare for the International Conference on Peaceful Uses of Atomic Energy. On the day following the Council of Ministers' announcement, Pravda carried a front-page editorial contrasting the "two policies and two paths" followed by the Soviet Union and the West in using atomic energy. The editorial repeated some of the Soviet views on Eisenhower's proposal of December, 1953, which were discussed in connection with the International Atomic Energy Agency, and then added:

> It must be clear to everyone that two policies and two paths arose long ago concerning the use of atomic energy. The

[158] See Malinin, *supra* note 16 at 122-123, referring to U.S. treaties (with Turkey, South Korea and Latin American states) and the British treaty with Germany. A particularly violent attack on U.S. bilateral agreements with other states was made in connection with the U.S.-Swiss agreement of June 21, 1956. In an article appearing in Izvestiya, Sept. 4, 1956, p. 4, it was claimed that the terms of this treaty gave the United States the right to control the activity of all Swiss scientific institutes and enterprises which were to receive American supplies and information.

[159] Larin, *supra* note 16 at 8.

> Soviet Union is struggling consistently to free mankind forever from the danger of war and to pave the way for the most extensive peaceful use of atomic energy. In contrast to the American government, which prefers to make *verbal statements* on the peaceful use of atomic energy and *in practice* to prepare for atomic war, the Soviet government is furthering by concrete practical measures the use of atomic energy for peaceful purposes.

Subsequent events have made it difficult to agree with this important editorial. It seems more likely that the Soviet Union, far from feeling genuine contempt for America's "verbal statements" on the peaceful uses of atomic energy, had become alarmed at the progress of the American aid program and negotiations for creating the International Atomic Energy Agency. It may have felt impelled to launch its atomic aid program and to include as many states in this program as possible before the American aid program had progressed further and the International Atomic Energy Agency could start operations. Bilateral agreements with Communist states were quickly concluded. The Joint Nuclear Research Institute was created. Atomic aid treaties were made with the important "uncommitted" countries of Egypt and Indonesia. Libya and Sweden received Soviet offers of assistance. An offer was made to India, but that state concluded a treaty with Great Britain three weeks after the Soviet offer.[160] According to E. P. Slavskii, then Director of the Chief Atomic Administration of the U.S.S.R., an agreement could have been reached between the Soviet Union and Switzerland "had the latter referred this question to us." [161]

The political and diplomatic aspects of atomic energy negotiations and agreements were likewise apparent in the various "joint declarations" made in late 1956 and early 1957. Cooperation in peaceful use of atomic energy was merely one of many points covered in these declarations. All of them stressed the solidarity and "everlasting friendship" of states in the "socialist camp"; they uniformly condemned the United States and Western "warmongers" and went to great lengths to justify Soviet actions during the revolt in Hungary.

The U.S.S.R. has constantly emphasized the peaceful purposes of its atomic aid program. Some observers, however, might wonder whether the Soviet aid program has exclusively peaceful uses of atomic energy in mind. Two days after announcing the atomic aid program, the

[160] Huber, *supra* note 75 at 55-56.
[161] Pravda, Sept. 7, 1956, p. 2.

Soviet press explained why the U.S.S.R. had been engaged in producing atomic and hydrogen bombs:

> Although the Soviet Union has had to produce atomic and hydrogen weapons in order to defend the peaceful life and labor of its peoples, Soviet scientists and engineers have been working persistently and purposefully to utilize atomic energy for peaceful purposes.[162]

Some of the raw materials for these bombs doubtless comes to the U.S.S.R. from states with which it has concluded pacts for cooperation in the "peaceful" uses of atomic energy. In the words of the Joint Soviet-Czechoslovak declaration of January 29, 1957:

> The parties declare that the Czechoslovak uranium ore is being sold to the Soviet Union at a fair and mutually-advantageous price which makes possible the continued development of mining and refining of this raw material. *But it is not only a matter of economic advantage. The Czechoslovak people fully realize that in the hands of the Soviet Union nuclear energy is a powerful instrument of the peace and security of nations against the atomic threats and provocations of the international forces of aggression.*[163]

Such a declaration as this adds new significance to the Soviet program of atomic assistance to other countries, at least those countries which are loyal "satellites" within the Communist bloc. From the "joint declarations" on this program, and from the little that has been published concerning the bilateral agreements which implement it, one can say that it embraces frankly political and diplomatic aims, as well as economic and technological ones. The Joint Soviet-Czech declaration appears quite clearly to show that the Soviet aid program for "peaceful" use of atomic energy has important military objectives as well.

[162] Pravda, Jan. 19, 1955, p. 1.

[163] See *supra* note 147. Emphasis added.

Appendix A

ITEM 1

Brief Summary of Negotiations for the International Atomic Energy Agency

1. First Phase of Diplomatic Correspondence Between the United States and the Soviet Union

The first outline of a statute for an agency of the kind envisaged in President Eisenhower's proposal of December 8, 1953, was contained in a United States Department of State memorandum handed to Soviet Ambassador Zarubin on March 19, 1954. This memorandum is the first in a series of six documents representing the first phase of the correspondence between the United States and the Soviet Union, covering the period from March 19 to September 23, 1954. For the text of these documents see Atoms for Peace Manual, note 5 *supra* at 266-283; also U. N. General Assembly Off. Rec., 9th Session (1954), Annexes, Agenda Item 67, p. 4 (Doc. A/2738). The outline already contained many features of the Agency in its present form. In its reply the Soviet Union claimed that the United States memorandum evaded the problem of nuclear weapons and would tend to intensify the atomic armament race. Soviet Union Aide-Memoire of April 27, 1954, in Atoms for Peace Manual, note 5 *supra*, 269 at 271-272. Later on, however, the Soviet Union indicated its willingness to separate the issues of disarmament and peaceful uses of atomic energy. Soviet Union Aide-Memoire of September 22, 1954, *id.* at 278 *et seq.*

2. Negotiations of Eight States

Ambassador Morehead Patterson, U. S. representative in the original negotiating group consisting of Australia, Belgium, Canada, France, Portugal, the Union of South Africa, the United States, and the United Kingdom, describes the development that followed the discussion in the 9th General Assembly in the fall of 1954: "The United States prepared a first draft of the Statute taking into consideration suggestions received from other negotiating States and also from the United Nations General Assembly debates. This draft was then submitted to the negotiating States on March 29, 1955. During April and May the United States discussed this draft with all the negotiating States and also received further comments from interested agencies of the United States Government which had not participated in the original drafting.

"After a thorough discussion, it developed that there was sufficient

unanimity among all negotiating states so that substantially all of the suggested changes could be reconciled and incorporated into a new draft of the Statute. This new draft was transmitted to the Soviet Union on a confidential basis on July 29, 1955, and its comments were requested. It was distributed by the United States on behalf of the negotiating States, also on a confidential basis, to all eighty-four States Members of the United Nations or of the specialized agencies on August 22, 1955. Comments on the Statute were requested from all States." Report of Ambassador Morehead Patterson, 34 Dept. of State Bul. 5 at 6 (1956).

3. Discussion in the Ninth General Assembly

The question of the Agency came up for the first time for general international discussion in the 9th General Assembly. (See U. N. General Assembly Off. Rec., 9th Session (1954), Plenary Meetings, A/PV. 475, p. 17 at 25, A/PV. 478, p. 63 at 66, A/PV. 503, p. 339 at 339-349; First Committee, A/C. 1/SR. 707-725, pp. 289-387, Annexes, Agenda Item 67.) The debates there led to the unanimous adoption of a draft resolution which referred to ". . . negotiations . . . in progress . . . for the establishment of an International Atomic Energy Agency . . .," expressed the hope that ". . . the International Agency will be established without delay . . .," and suggested that ". . . once the Agency is established, it negotiate an appropriate form of agreement with the United Nations . . .," and that ". . . Members of the United Nations be informed as progress is achieved in the establishment of the Agency and that the views of members which have manifested their interest be fully considered. . . ." Resolution 810(IX), Document A/Resolution/230, in U. N. General Assembly Off. Rec., 9th Session (1954). Annexes, Agenda Item 67, pp. 24-25. For the report of the First Committee, see *id.* at 22-23.

4. Second Phase of Diplomatic Correspondence Between the United States and the Soviet Union

In the second series of notes (Department of State Press Release No. 527, Oct. 6, 1956, containing fifteen notes exchanged between Nov. 3, 1954 and Jan. 27, 1956) the Soviet Union demanded that the Agency be closely connected with the United Nations (in particular the Security Council) and that no member should have a "privileged position" within the Agency.

The United States, in a note of April 14, 1955 (*id.* at 8, 9), expressed its willingness to consider these comments and made clear that it kept the door open for the Soviet Union to join the negotiating group. It stated,

however, its intention in the meantime to carry on the negotiations regardless of Soviet participation. The United States furthermore submitted an agenda for a joint discussion by experts of both countries on safeguards against diversion of fissionable materials.

The U. S. S. R., on July 18, 1955 (*id.* at 11-13), declared its readiness to participate in the negotiations and agreed to deposit 50 kilograms of fissionable materials with the Agency as soon as agreement on the creation of the Agency has been reached. Again it referred to principles which it considered basic, among them the participation of *all* nations (obviously designed to bring in Red China) in the Agency with no privileged position for any state. The joint study of safeguards should take place after the completion of the scientific conference in Geneva scheduled for the summer of 1955.

In its answer of July 29, 1955 (*id.* at 14-15), the United States transmitted the draft statute worked out by the eight-power negotiating group (note 14 *supra*), which was identical with the draft distributed on August 22, 1955 to all members of the United Nations and of the specialized agencies, except for two minor changes. Later on the United States and U. S. S. R. agreed on the conference of experts on the safeguards to include experts from Canada, Czechoslovakia, France, and the United Kingdom. On Oct. 1, 1955 the Ministry of Foreign Affairs of the Soviet Union wrote to the American Embassy (*id.* at 22-24) that the eight-power draft could, with certain amendments, serve as a basis for drawing up the charter of an atomic energy agency. The permanent members of the Security Council should become permanent members of the Agency's Board of Governors. There should be a strong control mechanism, with inspectors investigating atomic installations of countries receiving aid under provisions which should give "due regard to the sovereign rights of the states." India, Indonesia, Egypt, and Rumania should be added to an increased first Board of Governors. A ¾ majority in the Board and the General Conference should be necessary for financial decisions. In conformity with the eight-power draft, these Soviet proposals now envisaged the Agency acting not only as a clearing house but also as a "bank" for fissionable materials. The International Court of Justice should not have compulsory jurisdiction over disputes arising from the application of the statute. After the discussion of the Agency in the 10th General Assembly (see *infra*), the exchange was continued in a United States note of Jan. 27, 1956 (*id.* at 25) suggesting further discussions at a twelve nation working group meeting scheduled for Feb. 27, 1956.

The remaining portion of the exchange between the United States and the U. S. S. R. is concerned with the problem of safeguards, in particular the possible extension of safeguards to existing international arrangements (see note 77 *supra*).

5. Discussion in the Tenth General Assembly

The main points of discussion in the 10th General Assembly of the United Nations were the relationship between the Agency on one hand and the United Nations and its specialized agencies on the other; fair representation of states, both in regard to the negotiations on the statute and in the mode of selection and voting of the Board of Governors; universality of membership; and the relationship of the Agency to regional or bilateral programs outside the Agency. See U. N. General Assembly Off. Rec., 10th Session (1955), First Committee, A/C. 1/SR. 757-772, pp. 5-93. A resolution was adopted unanimously [Resolution 912 (X) Document A/3116, in U. N. General Assembly Off. Rec., 10th Session, Supp. 19 (A/3116), pp. 4-5,] welcoming the intention of the nations sponsoring the draft statute of the Agency to invite all members of the United Nations and its specialized agencies to a conference on the final text of the statute; welcoming the invitations extended to Brazil, Czechoslovakia, India, and the U. S. S. R. to join the sponsors; recommending that the sponsors take into account the views expressed by the Agency during the debates in the United Nations and the comments made directly to the sponsors; recommending that measures be taken to establish the Agency without delay; and requesting that the Secretary General in consultation with his Advisory Committee study the question of the Agency's relationship to the United Nations and transmit the results of this study to the sponsors before the conference.

6. Negotiations of the Twelve States

A working group consisting of representatives of the original eight negotiating powers and of the representatives of Brazil, Czechoslovakia, India, and the U. S. S. R. met in Washington from Feb. 27 to April 18, 1956, for further discussion of the draft statute. The report of the working level meeting dated July 2, 1956, reads (in part): ". . . [T]he Group reviewed each article of the Statute, together with the proposed amendments, taking into account the comments advanced during the proceedings of the tenth regular session of the United Nations General Assembly as well as those of the thirty-nine States which submitted observations on the Statute in response to a request made by the initial Negotiating Group in August 1955 to all States Members of the United Nations and its Specialized Agencies. . . . At the final plenary session on April 18, 1956, the Negotiating Group approved, *ad referendum,* the revised text of the draft Statute. . . . While the Australian, Czechoslovak, Indian and Soviet Delegations reserved their positions on certain provisions of the Statute, . . . all delegations voted in favor of the Statute as a whole. . . . At the same session, the Group agreed that a conference should be convened at the United Nations Headquarters in New York in the latter part of September

1956 to discuss, approve and open for signature the Statute of the International Atomic Energy Agency. . . . The Group also unanimously approved the Agenda and Rules of Procedure for the Conference." Report of the Working Level Meeting on the Draft Statute of the International Atomic Energy Agency, Doc. 31, Washington, D. C., July 2, 1956, pp. 1, 2.

ITEM 2

(Footnote 19)

Article V, par. D, subpar. 2 of the twelve-power draft mentioned as one of the functions of the General Conference "to *admit* new Members in accordance with Article IV." This was changed in art. V, par. E, subpar. 2 of the final text to read "to *approve* states for membership in accordance with Article IV." (Emphasis added.) The change was perhaps motivated by the desire to make it clear beyond any doubt that a *favorable* recommendation by the Board is necessary for the admission of a new member. The drafters may have had in mind the advisory proceedings before the International Court of Justice on the question whether a favorable recommendation from the Security Council is required for admission of a state to the United Nations by the General Assembly. The Court answered this question in the affirmative. Advisory Opinion of the International Court of Justice of March 3, 1950, in I. C. J. Reports of Judgments, Advisory Opinions and Orders, 1950, p. 4 at 10.

In approving states for membership under this paragraph the Board of Governors and the General Conference make the determination "that the State is able and willing to carry out the obligations of membership in the agency." Statute, art. IV, par. B. In making this determination "due consideration" is to be given to the state's ability and willingness to act in accordance with the purposes and principles of the Charter of the United Nations. The eight-power draft would have had the Board of Governors and the General Conference each make two determinations: first, that the state was in a position to carry out the obligations of the Agency, and second, that the state was able and willing to carry out the obligations contained in the Charter of the United Nations. This would have excluded Switzerland which considers that it is not in a position to undertake the obligations required by the Charter of the United Nations.

ITEM 3

(Footnote 30)

The powers of the General Conference were a much debated item in the International Conference on the statute of the Agency. Apart from the additional powers already mentioned, the International Conference provided

for the authority of the General Conference to approve the appointment by the Board of the Agency's chief executive, the Director General. See art. V, par. E., subpar. 10 and art. VII, par. A. This originated in an Indonesian-Pakistanian amendment. IAEA/CS/Art. V/Amend. 8. The amendment was adopted by 77 votes to 1, with 1 abstention. IAEA/CS/OR. 22, p. 43.

Already before the discussions in the International Conference, the powers of the General Conference had been controversial matter. The smaller nations, not being represented on the Board of Governors, wanted to accord more authority to the General Conference. In response to the suggestions made to the negotiating parties, the twelve-power draft added a provision in art. V, par. E, subpar. 3 giving the General Conference the power to "propose matters for consideration by the Board and request from the Board reports on any matter relating to the functions of the Agency" (now art. V, par. F, subpar. 2 of the statute). Furthermore, the reference to the policy making power of the Board in art. VII, par. H of the eight-power draft no longer appears in the twelve-power draft and the statute. The powers of the General Conference other than those mentioned earlier are:

To elect the ten members of the Board mentioned in art. VI, par. A, subpar. 3 of the statute (art. V, par. E, subpar. 1);

To determine the place of its sessions (art. V, par. A);

To elect a President and other officers (art. V, par. C);

To adopt its rules of procedure (art. V, par. C);

To request the Director General to convene special sessions (art. V, par. A);

To approve states for membership upon recommendation by the Board (art. IV, par. B);

To suspend members (art. XIX);

To consider the Board's annual report (art. V, par. E, subpar. 4);

To approve or return to the Board reports to the United Nations (art. V, par. E, subpar. 6; art. III, par. B, subpars. 4 and 5);

To approve or return to the Board agreements between the Agency and the United Nations or other international agencies (art. V, par. E, subpar. 7; art. XVI, par. A);

To approve rules regarding (a) the exercise of borrowing powers by the Board (art. V, par. E, subpar. 8; art. XIV, par. G); (b) the acceptance of voluntary contributions to the Agency (art. V, par. E, subpar. 8; art. XIV, par. E); (c) the use of the general fund (art. V, par. E, 8; art. XIV, par. F);

To approve amendments of the statute (art. V, par. E, subpar. 9; art. XVIII, par. C(i)).

It seems that the enumeration in art. V is exclusive, *i.e.*, the Conference

has no other powers besides the ones specifically mentioned. A Polish amendment (IAEA/CS/Art. V/Amend. 1) to art. V proposed to insert at the beginning of the functions of the Conference a sentence reading "to determine the general policy of the Agency." This amendment, in effect a general clause granting additional powers to the Conference was rejected by 37 votes to 24, with 18 abstentions. IAEA/CS/OR. 22, p. 42.

The voting procedures of the Conference are laid down in art. V, par. C. Every member of the Agency has one vote. Except for decisions on financial questions (art. XIV, par. H), approval of amendments (art. XVIII, par. C(i)), and the suspension of privileges (art. XIX, par. B), which requires a $\frac{2}{3}$ majority, decisions are made by the majority of members present and voting, the majority of members constituting a quorum. Simple majority suffices for the determination of what additional questions are to be decided by a $\frac{2}{3}$ majority.

ITEM 4

(Footnote 38)

The eight-power draft, art. VII, par. A, subpars. 1 and 2, as well as the first outline of the statute, art. II, par. C, subpar. 1, third sentence [Atoms for Peace Manual, note 5 *supra*, 266 *et seq.*], envisaged actual contributions as a prerequisite for selection to the non-elective seats on the Board. This prerequisite was dropped in the twelve-power draft. In the International Conference on the statute, Denmark and Iran jointly submitted an amendment to art. VI, par. A, subpar. 1, which provided that in designating members of the Board under this sub-paragraph the contributions to the Agency should be taken into consideration. IAEA/CS/Art. VI/Amend. 2. In explaining this amendment the Danish representative said: "The main idea behind the Agency is that countries which are advanced and which are producing source material should give to other countries . . . their aid and their help. . . . [S]tress should be laid also on the contributions . . . because that is really the main point in the building up of this idea. . . . [N]o one in this room will suggest that any member elected on the basis of advanced technology and of production of source materials should be allowed to sit if that member were not willing to make contributions and was not actually making contributions." IAEA/CS/OR. 19, p. 27. The Philippine representative remarked: "[T]hat paragraph [*i. e.*, art. VI, par. A, subpar. 2] mentions 'producers. . . .' However, what good would that do as far as the Agency is concerned unless they make a contribution?" IAEA/CS/OR. 19, pp. 29-30. In arguing against the amendment, Mr. du Plessis (Union of South Africa) pointed to the difficulty of evaluating contributions and deciding what transactions were to be regarded as

contributions. IAEA/CS/OR. 20, p. 26 *et seq.* Subsequently, this amendment was withdrawn. See IAEA/CS/OR. 23, p. 3.

The composition of the Board in its present form is somewhat comparable to that of the Council of the Intergovernmental Maritime Consultative Organization. Art. 17, Convention of the IMCO. For the text of this convention, which is not yet in force, see 18 Dept. of State Bul. 499 *et seq.* (1948). There six members with the largest interest in the international seaborne trade and six with the largest interest in providing international shipping services are represented in this Council, together with 4 members elected by the Assembly of the IMCO. Other international organizations such as the International Bank for Reconstruction and Development and the International Monetary Fund have a system of weighted voting, based on actual contributions. See art. V, sec. 3 of the Articles of Agreement of the IBRD, and art. XII, sec. 5, of the Articles of Agreement of the IMF. Certain other organizations have all-elected executive bodies with one vote for each member, *e.g.*, the United Nations Food and Agricultural Organization, the United Nations Educational, Scientific and Cultural Organization, the World Health Organization, and the World Meteorological Organization.

ITEM 5

(Footnote 42)

See IAEA/CS/OR. 39, p. 61. The six states elected were Egypt, Indonesia, Pakistan, Japan, Argentina, and Peru. Apart from these six elected members, the Preparatory Commission was composed of representatives of Australia, Belgium, Brazil, Canada, Czechoslovakia, France, India, Portugal, Union of South Africa, the U. S. S. R., the United Kingdom, and the United States. The Commission came into existence with the opening of the statute for signature and continued till the first General Conference was convened and the first Board of Governors was selected. Statute, Annex I, par. A. The functions of this Commission were of a provisional nature. Apart from organizing itself and appointing its staff it was to make arrangements for the first session of the General Conference. This included the preparation of a provisional agenda and draft rules of procedure. The Commission was to designate members of the first Board in accordance with art. VI, pars. A and B; to make studies, reports and recommendations on various important problems for the first meetings of the Board and the Conference; and, finally, to enter into negotiations with the United Nations for a draft agreement on the relationship of the Agency to the United Nations and to make recommendations to the first sessions of the Conference and of the Board in regard to the relationship to other international organizations. Annex I, par. C, subpars. 1-7. The Report of the Preparatory Commission included detailed recommendations for an

initial Agency program. (G. C. 1/1, GOV/1, Report of the Preparatory Commission of the International Atomic Energy Agency (PRECO), New York, 1957).

ITEM 6

(Footnote 64)

The specific question of the Agency's relation to the specialized agencies for which the statute provides in art. XVI, par. A is dealt with in a memorandum by the executive heads of the specialized agencies presented to the International Conference (IAEA/CS/6, Sept. 24, 1956). In this memorandum attention was called to par. 9 of the United Nations, Doc. A/3122 (reproduced in IAEA/CS/5, Sept. 24, 1956), which calls for effective coordination between the activities of the Agency and those of the specialized agencies, with the aim of avoiding overlapping and duplication of activities. The annex to the memorandum contains comments by the International Labor Organization (ILO) and the World Health Organization (WHO), which seem to indicate a tendency not to relinquish much of the jurisdiction of these bodies to the Agency. Thus it was the opinion of the ILO that the protection of the health and safety of the workers cannot be the responsibility of an agency dealing solely with atomic energy. ILO felt that the present position, whereby the draft statute fails to make any explicit provision for cooperation with the ILO, but specifically authorizes the Agency "to establish or adopt standards of safety for protection of health and minimization of danger to life and property (including standards for labor conditions)," called for further consideration at the Conference. IAEA/CS/6/Annex. See also the statements of the representatives of various specialized agencies in the International Conference on October 4, 1956. IAEA/CS/OR. 16, p. 31 *et seq.*

Under art. III, par. A, subpar. 1, the Agency is given responsibilities in connection with "research on, and development and practical application of, atomic energy for peaceful uses throughout the world. . . ." The Food and Agricultural Organization includes among its functions "to stimulate and coordinate the use of radiation and radioisotopes in agricultural research and development, and to promote necessary investigations of the possible effects of radioactive materials on agriculture and food production." FAO is organizing an information service on the applications of atomic energy in agriculture and related fields. United Nations, Economic and Social Council, Doc. E/2931, Annex II, October 18, 1956, p. 7.

UNESCO authorized its Director General "to study and, if necessary, to propose measures of an international scope to facilitate the use of radioisotopes in research and industry." *Id.* at 9.

The International Bank for Reconstruction and Development states: "In carrying out its responsibilities, both to itself and to its members, in

respect of the foregoing the IBRD will, from time to time, undertake studies of general and specific power needs, and the relationship of atomic fuels to conventional energy resources." *Id.* at 19.

Under art. III, par. A, subpar. 3 the Agency is authorized "to foster the exchange of scientific and technical information on peaceful uses of atomic energy." Under par. A, subpar. 4 of this article the Agency is authorized "to encourage the exchange and training of scientists and experts in the fields of peaceful uses of atomic energy." UNESCO's program of work includes an item entitled "Training of Specialists." UNESCO proposes to convene an international conference "to organize a far-reaching exchange of information on the methods at present in use in various countries for training engineers, technicians, laboratory research workers and, in general, all the different scientific specialists who are concerned with the peaceful uses of atomic energy." *Id.* at 11. The conference will also recommend to UNESCO "action at the international level to secure the most efficient cooperation possible among the various countries; in particular, problems relating to exchange of teachers and students will have to be considered." *Id.* at 12.

Under art. III, par. A, subpar. 6 the Agency is given certain functions in developing standards of safety for protection of health and minimization of danger to life and property (including such standards for labor conditions), and to provide for the application of these standards to its own operations as well as to other operations coming under the jurisdiction of the Agency. The International Labor Organization states "the most immediate problems of concern to ILO is the protection of workers against ionizing radiations." *Id.* at 3. It is also planned to issue codes of practice dealing with the technical protective measures required in industrial and other undertakings. In addition, ILO will be able to provide advice and assistance to governments and industry in the training of specialized safety personnel and inspectors. *Id.* at 5. The World Health Organization has adopted a provisional program of work which includes training of specialists for health protection in atomic energy laboratories or plants, public health administrators and medical users of radioisotopes. The WHO also includes in its program the entire subject of the "health problems involved in the control of the location of reactors and in radioactive waste disposal from factories, laboratories and hospitals." *Id.* at 16 (emphasis omitted).

The World Meteorological Organization has an extensive program concerning collection and analysis of atmospheric radioactivity and its relation to health and safety. *Id.* at 22.

ITEM 7

(Footnote 76)

The history of the Soviet attitude toward the safeguards provisions is of considerable interest. The first outline of an International Atomic Energy Agency (see Appendix A above) in art. III, par. B, subpar. 3 included provisions for both health and safety standards and safeguards against diversion of fissionable materials. Mr. Molotov, in his reply of April 27, 1954 (in Atoms for Peace Manual, note 5 *supra*, 269 at 271) described very vividly the situation which makes safeguards a necessity in connection with any program for the peaceful uses of atomic energy. He said: "[T]he level of science and technique which has been reached at the present time makes it possible for the very application of atomic energy for peaceful purposes to be utilized for increasing the production of atomic weapons." Mr. Molotov's solution to that problem was the restatement of the Soviet line calling for the prohibition of atomic weapons without safeguards. In a memorandum handed to Ambassador Zarubin by Assistant Secretary of State Merchant on July 9, 1954, (*id.*, 274 at 276) the United States pointed out: "In reality, however, ways can be devised to safeguard against diversion of materials from power producing reactors. And there are forms of peaceful utilization in which no question of weapon grade material arises." On Sept. 22, 1954, the day before the opening of the General Assembly, Mr. Gromyko handed an Aide-Memoire to Ambassador Bohlen in Moscow (*id.*, 278 at 281) stating: "The Soviet Government is ready to examine in course of further negotiations the United States Government's views on this question (safeguards)."

In the 716th Session of the 9th General Assembly's First Committee on Nov. 15, 1954, Mr. Vyshinsky emphasized the necessity of control provisions by referring to President Eisenhower's plan contained in his speech before the General Assembly of Dec. 8, 1953: ". . . [*A*]*lthough the plan had contained no safeguards* to ensure that atomic energy would be used only for peaceful purposes . . . that did not mean that the Soviet Union considered it a bad one." [Emphasis added.] A/C. 1/SR. 716, p. 335 at 339.

The note of the Soviet Union of Oct. 1, 1955, to the American Embassy in Moscow called for an appropriate staff of inspectors to investigate atomic installations of the beneficiary states and to verify the use of materials and equipment received from the Agency, such observations and control to be accomplished "with due observation of sovereign rights of the above-mentioned states and within the framework of an agreement between a given state and the Agency." United States Dept. of State Press Release No. 527, Oct. 6, 1956, p. 23. See statement of the Soviet representative in the First Committee of the 10th General Assembly, Oct. 11, 1955, U. N. General

Assembly Off. Rec., 10th Session (1955), First Committee, A/C. 1/SR. 759, p. 13 at 14.

In its opening statement at the International Conference the Soviet Union representative, Mr. Zarubin, stated that ". . . the conditions for control and inspection, which are contemplated in the agreements between the United States and other countries and in the draft statute, do, in our opinion, infringe upon the sovereign rights of the recipient countries, and do therefore give rise to justified criticism on their part." IAEA/CS/OR. 3, p. 31. In the following discussion on Agency safeguards, Mr. Zarubin said: "The delegation of the Soviet Union had already declared that it considered that a sufficient safeguard would be to abide by the provision of the statute which makes recipient states assume their obligation not to use the assistance received for the production of nuclear weapons and to submit reports on the use to which the assistance given by the Agency has been put. The safeguards and controls which the draft statute provides would be significant only if these provisions found their place within the framework of a general prohibition of nuclear weapons and if these guarantees and safeguards extended to all States, both the States receiving the assistance of the Agency and those supplying it. The application of safeguards to recipient countries alone—that is, in the first place, to underdeveloped countries—falls short of the mark and imposes upon the recipient countries such conditions of control and inspection as violate their sovereignty and which would no doubt slow down the utilization of atomic energy for peaceful purposes in these countries." IAEA/CS/OR. 36, pp. 6, 7.

ITEM 8

(Footnote 89)

India made three reservations to art. XII of the twelve-power draft. Report of the Working Level Meetings, Annex IV, p. 3. First, the provisions of the twelve-power draft and also of the final statute require the agreement between the Agency and states receiving fissionable materials from the Agency to provide for certain Agency rights and responsibilities "to the extent relevant to the project or arrangement." The Indians would have added to this that the safeguards should be required only as specifically provided for in individual agreements between the Agency and the members thereof, thus permitting agreements with less safeguards than those prescribed in the statute. While there was considerable discussion on this subject India never submitted a specific amendment to the International Conference.

The second reservation concerned art. XII, par. A, subpar. 3 requiring the maintenance and production of operating records to assist in ensuring accountability for *source* and special fissionable materials used *or produced*

in the project or arrangement. The Indians would have amended the article to restrict accountability to *fissionable materials supplied.* This would have eliminated from accountability all of the source materials as well as plutonium or U-233, produced as by-products of the operation of the reactor. IAEA/CS/OR. 7, p. 48 *et seq.* France joined India in advocating the removal of source materials from accountability. IAEA/CS/OR. 24, p. 46 *et seq.* The third reservation (both the second and the third reservations are contained in amendment IAEA/CS/Art. XII/Amend. 5 sponsored by Ceylon, Egypt, India, and Indonesia) related to art. XII, par. A, subpar. 5, dealing with the chemical processing of fissionable materials and the disposition of plutonium and U-233 produced as a result of the reactor operations. The statute provided for complete Agency control over both the chemical processing of fuel elements and of the disposition of the fissionable materials produced in the reactor. This is one of the crucial points in reactor operations where diversion to war uses can most readily take place. India called for considerably less stringent control in connection with the by-product materials that would be produced from a reactor. Under this suggestion, states would be able to stockpile the plutonium and U-233 produced in reactors for use within the state for peaceful purposes and under Agency safeguards. Under present technology there are few peaceful uses for plutonium and for U-233. The result of the Indian suggestions would be that substantial stockpiles of materials unusable for peacetime purposes would accumulate in many parts of the world. The United States regarded this as a serious potential threat to the peace. India insisted that under the original wording of the statute, the Agency would be in a position to dictate in perpetuity what fissionable materials would be allotted to all states; it was entirely possible that the Board of Governors of the Agency on the basis of political or economic considerations unrelated to international safety would prevent states from acquiring the fissionable materials necessary for development of their economic welfare. IAEA/CS/OR. 28, p. 55 *et seq.*

ITEM 9

(Footnote 152)

Art. XIV in pars. B and E in effect reduces to a minimum the occasions when the Agency would be justified in utilizing its borrowing powers under art. XIV, par. G. Theoretically, all of the expenditures coming under the administrative budget (par. B, subpar. 1) will be apportioned among the members pursuant to par. D of art. XIV. All other expenditures will be met through a combination of revenue from a scale of charges (art. XIV, par. E) and voluntary contributions (donations). The Board of Governors is required to fix a scale of charges at least adequate (together with donations) to cover the operational expenditures described in par. B, subpar. 2.

Indeed, it is contemplated that there might be an excess of revenue which would go into the general fund (see par. F of art. XIV) and thus be available, for example, to meet a part of the cost of the safeguards system. On the other hand, the administrative expenses are likely to exceed the amounts that could be raised through apportionment among the members, especially if the administrative budget includes substantial sums for items such as the construction of safeguards facilities and storage costs for the "syphoned off" fissionable material not used for Agency projects. Statute, art. XIV, par. B, subpar. 1(b), last clause. Could the words "the costs of handling and storage of special fissionable material" in that clause be interpreted to include also the costs of *building* storage facilities for this material? Similarly, Agency facilities to be included in the operational budget under par. B, subpar. 2 may prove too expensive to be charged to the beneficiary members in accordance with art. XIV, par. E. It is these deficits which might be covered through borrowing. It seems probable that Agency borrowing would be directed primarily to that objective. Repayment of loans would come from the General Fund of the Agency resulting from an excess of revenues arising from the scale of charges and from donations. If loans are used for administrative expenses they could presumably be repaid by apportionment among members. Presumably, loans to construct facilities would be repaid over a period of years bearing some relationship to the life of the facilities.

The financing provisions were the subject of a lively discussion in the International Conference. The main point raised was the question as to who should be burdened with the financing of Agency facilities. See Mr. Zarubin (U. S. S. R.), IAEA/CS/OR. 31, p. 11; Mr. Wershof (Canada), *id.* at 16; Mr. Wadsworth (United States), *id.* at 26, and other statements in IAEA/CS/OR. 31 and 32.

ITEM 10

STATUTE OF THE INTERNATIONAL ATOMIC ENERGY AGENCY

ARTICLE I

Establishment of the Agency

The Parties hereto establish an International Atomic Energy Agency (hereinafter referred to as "the Agency") upon the terms and conditions hereinafter set forth.

ARTICLE II

Objectives

The Agency shall seek to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world. It

shall ensure, so far as it is able, that assistance provided by it or at its request or under its supervision or control is not used in such a way as to further any military purpose.

ARTICLE III

Functions

A. The Agency is authorized:

1. To encourage and assist research on, and development and practical application of, atomic energy for peaceful uses throughout the world; and, if requested to do so, to act as an intermediary for the purposes of securing the performance of services or the supplying of materials, equipment, or facilities by one member of the Agency for another; and to perform any operation or service useful in research on, or development or practical application of, atomic energy for peaceful purposes;

2. To make provision, in accordance with this Statute, for materials, services, equipment, and facilities to meet the needs of research on, and development and practical application of, atomic energy for peaceful purposes, including the production of electric power, with due consideration for the needs of the under-developed areas of the world;

3. To foster the exchange of scientific and technical information on peaceful uses of atomic energy;

4. To encourage the exchange and training of scientists and experts in the field of peaceful uses of atomic energy;

5. To establish and administer safeguards designed to ensure that special fissionable and other materials, services, equipment, facilities, and information made available by the Agency or at its request or under its supervision or control are not used in such a way as to further any military purpose; and to apply safeguards, at the request of the parties, to any bilateral or multilateral arrangement, or, at the request of a State, to any of that State's activities in the field of atomic energy;

6. To establish or adopt, in consultation and, where appropriate, in collaboration with the competent organs of the United Nations and with the specialized agencies concerned, standards of safety for protection of health and minimization of danger to life and property (including such standards for labour conditions), and to provide for the application of these standards to its own operations as well as to the operations making use of materials, services, equipment, facilities, and information made available by the Agency or at its request or under its control or supervision; and to provide for the application of these standards, at the request of the parties, to operations under any bilateral or multilateral arrangement, or, at the request of a State, to any of that State's activities in the field of atomic energy;

7. To acquire or establish any facilities, plant and equipment useful in

carrying out its authorized functions, whenever the facilities, plant, and equipment otherwise available to it in the area concerned are inadequate or available only on terms it deems unsatisfactory.

B. In carrying out its function, the Agency shall:

1. Conduct its activities in accordance with the purposes and principles of the United Nations to promote peace and international cooperation, and in conformity with policies of the United Nations furthering the establishment of safe-guarded world-wide disarmament and in conformity with any international agreements entered into pursuant to such policies;

2. Establish control over the use of special fissionable materials received by the Agency, in order to ensure that these materials are used only for peaceful purposes;

3. Allocate its resources in such a manner as to secure efficient utilization and the greatest possible general benefit in all areas of the world, bearing in mind the special needs of the under-developed areas of the world;

4. Submit reports on its activities annually to the General Assembly of the United Nations and, when appropriate, to the Security Council: if in connexion with the activities of the Agency there should arise questions that are within the competence of the Security Council, the Agency shall notify the Security Council, as the organ bearing the main responsibility for the maintenance of international peace and security, and may also take the measures open to it under this Statute, including those provided in paragraph C of article XII;

5. Submit reports to the Economic and Social Council and other organs of the United Nations on matters within the competence of these organs.

C. In carrying out its functions, the Agency shall not make assistance to members subject to any political, economic, military, or other conditions incompatible with the provisions of this Statute.

D. Subject to the provisions of this Statute and to the terms of agreements concluded between a State or a group of States and the Agency which shall be in accordance with the provisions of the Statute, the activities of the Agency shall be carried out with due observance of the sovereign rights of States.

ARTICLE IV

Membership

A. The initial members of the Agency shall be those States Members of the United Nations or of any of the specialized agencies which shall have signed this Statute within ninety days after it is opened for signature and shall have deposited an instrument of ratification.

B. Other members of the Agency shall be those States whether or not Members of the United Nations or of any of the specialized agencies, which deposit an instrument of acceptance of this Statute after their membership

has been approved by the General Conference upon the recommendation of the Board of Governors. In recommending and approving a State for membership, the Board of Governors and the General Conference shall determine that the State is able and willing to carry out the obligations of membership in the Agency, giving due consideration to its ability and willingness to act in accordance with the purposes and principles of the Charter of the United Nations.

C. The Agency is based on the principle of the sovereign equality of all its members, and all members, in order to ensure to all of them the rights and benefits resulting from membership, shall fulfil in good faith the obligations assumed by them in accordance with this Statute.

ARTICLE V

General Conference

A. A General Conference consisting of representatives of all members shall meet in regular annual session and in such special sessions as shall be convened by the Director General at the request of the Board of Governors or of a majority of members. The sessions shall take place at the headquarters of the Agency unless otherwise determined by the General Conference.

B. At such sessions, each member shall be represented by one delegate who may be accompanied by alternates and by advisers. The cost of attendance of any delegation shall be borne by the member concerned.

C. The General Conference shall elect a President and such other officers as may be required at the beginning of each session. They shall hold office for the duration of the session. The General Conference, subject to the provisions of this Statute, shall adopt its own rules of procedure. Each member shall have one vote. Decisions pursuant to paragraph H of article XIV, paragraph C of article XVIII and paragraph B of article XIX shall be made by a two-thirds majority of the members present and voting. Decisions on other questions, including the determination of additional questions or categories of questions to be decided by a two-thirds majority, shall be made by a majority of the members present and voting. A majority of members shall constitute a quorum.

D. The General Conference may discuss any questions or any matters within the scope of this Statute or relating to the powers and functions of any organs provided for in this Statute, and may make recommendations to the membership of the Agency or to the Board of Governors or to both on any such questions or matters.

E. The General Conference shall:

1. Elect members of the Board of Governors in accordance with article VI;

2. Approve States for membership in accordance with article IV;

3. Suspend a member from the privileges and rights of membership in accordance with article XIX;

4. Consider the annual report of the Board;

5. In accordance with article XIV, approve the budget of the Agency recommended by the Board or return it with recommendations as to its entirety or parts to the Board, for resubmission to the General Conference;

6. Approve reports to be submitted to the United Nations as required by the relationship agreement between the Agency and the United Nations, except reports referred to in paragraph C of article XII, or return them to the Board with its recommendations;

7. Approve any agreement or agreements between the Agency and the United Nations and other organizations as provided in article XVI or return such agreements with its recommendations to the Board, for resubmission to the General Conference;

8. Approve rules and limitations regarding the exercise of borrowing powers by the Board, in accordance with paragraph G of article XIV; approve rules regarding the acceptance of voluntary contributions to the Agency; and approve, in accordance with paragraph F of article XIV, the manner in which the general fund referred to in that paragraph may be used;

9. Approve amendments to this Statute in accordance with paragraph C of article XVIII;

10. Approve the appointment of the Director General in accordance with paragraph A of Article VII.

F. The General Conference shall have the authority:

1. To take decisions on any matter specifically referred to the General Conference for this purpose by the Board;

2. To propose matters for consideration by the Board and request from the Board reports on any matter relating to the functions of the Agency.

ARTICLE VI

Board of Governors

A. The Board of Governors shall be composed as follows:

1. The outgoing Board of Governors (or in the case of the first Board, the Preparatory Commission referred to in Annex I) shall designate for membership on the Board the five members most advanced in the technology of atomic energy including the production of source materials and the member most advanced in the technology of atomic energy including the production of source materials in each of the following areas not represented by the aforesaid five:

(1) North America

(2) Latin America

(3) Western Europe
(4) Eastern Europe
(5) Africa and the Middle East
(6) South Asia
(7) South East Asia and the Pacific.
(8) Far East.

2. The outgoing Board of Governors (or in the case of the first Board, the Preparatory Commission referred to in Annex I) shall designate for membership on the Board two members from among the following other producers of source materials: Belgium, Czechoslovakia, Poland, and Portugal; and shall also designate for membership on the Board one other member as a supplier of technical assistance. No member in this category in any one year will be eligible for redesignation in the same category for the following year.

3. The General Conference shall elect ten members to membership on the Board of Governors, with due regard to equitable representation on the Board as a whole of the members in the areas listed in sub-paragraph A-1 of this article, so that the Board shall at all times include in this category a representative of each of those areas except North America. Except for the five members chosen for a term of one year in accordance with paragraph D of this article, no member in this category in any one term of office will be eligible for re-election in the same category for the following term of office.

B. The designations provided for in subparagraphs A-1 and A-2 of this article shall take place not less than sixty days before each regular annual session of the General Conference. The elections provided for in sub-paragraph A-3 of this article shall take place at regular annual sessions of the General Conference.

C. Members represented on the Board of Governors in accordance with sub-paragraphs A-1 and A-2 of this article shall hold office from the end of the next regular annual session of the General Conference after their designation until the end of the following regular annual session of the General Conference.

D. Members represented on the Board of Governors in accordance with sub-paragraph A-3 of this article shall hold office from the end of the regular annual session of the General Conference at which they are elected until the end of the second regular annual session of the General Conference thereafter. In the election of these members for the first Board, however, five shall be chosen for a term of one year.

E. Each member of the Board of Governors shall have one vote. Decisions on the amount of the Agency's budget shall be made by a two-thirds majority of those present and voting, as provided in paragraph H of article XIV. Decisions on other questions, including the determination of addi-

tional questions or categories of questions to be decided by a two-thirds majority, shall be made by a majority of those present and voting. Two-thirds of all members of the Board shall constitute a quorum.

F. The Board of Governors shall have authority to carry out the functions of the Agency in accordance with this Statute, subject to its responsibilities to the General Conference as provided in this Statute.

G. The Board of Governors shall meet at such times as it may determine. The meetings shall take place at the headquarters of the Agency unless otherwise determined by the Board.

H. The Board of Governors shall elect a Chairman and other officers from among its members and, subject to the provisions of this Statute, shall adopt its own rules of procedure.

I. The Board of Governors may establish such committees as it deems advisable. The Board may appoint persons to represent it in its relations with other organizations.

J. The Board of Governors shall prepare an annual report to the General Conference concerning the affairs of the Agency and any projects approved by the Agency. The Board shall also prepare for submission to the General Conference such reports as the Agency is or may be required to make to the United Nations or to any other organization the work of which is related to that of the Agency. These reports, along with the annual reports, shall be submitted to members of the Agency at least one month before the regular annual session of the General Conference.

ARTICLE VII

Staff

A. The staff of the Agency shall be headed by a Director General. The Director General shall be appointed by the Board of Governors with the approval of the General Conference for a term of four years. He shall be the chief administrative officer of the Agency.

B. The Director General shall be responsible for the appointment, organization, and functioning of the staff and shall be under the authority of and subject to the control of the Board of Governors. He shall perform his duties in accordance with regulations adopted by the Board.

C. The staff shall include such qualified scientific and technical and other personnel as may be required to fulfil the objectives and functions of the Agency. The Agency shall be guided by the principle that its permanent staff shall be kept to a minimum.

D. The paramount consideration in the recruitment and employment of the staff and in the determination of the conditions of service shall be to secure employees of the highest standards of efficiency, technical competence, and integrity Subject to this consideration, due regard shall be paid

to the contributions of members to the Agency and to the importance of recruiting the staff on as wide a geographical basis as possible.

E. The terms and conditions on which the staff shall be appointed, remunerated, and dismissed shall be in accordance with regulations made by the Board of Governors, subject to the provisions of this Statute and to general rules approved by the General Conference on the recommendation of the Board.

F. In the performance of their duties, the Director General and the staff shall not seek or receive instructions from any source external to the Agency. They shall refrain from any action which might reflect on their position as officials of the Agency; subject to their responsibilities to the Agency, they shall not disclose any industrial secret or other confidential information coming to their knowledge by reason of their official duties for the Agency. Each member undertakes to respect the international character of the responsibilities of the Director General and the staff and shall not seek to influence them in the discharge of their duties.

G. In this article the term "staff" includes guards.

ARTICLE VIII

Exchange of information

A. Each member should make available such information as would, in the judgment of the member, be helpful to the Agency.

B. Each member shall make available to the Agency all scientific information developed as a result of assistance extended by the Agency pursuant to article XI.

C. The Agency shall assemble and make available in an accessible form the information made available to it under paragraphs A and B of this article. It shall take positive steps to encourage the exchange among its members of information relating to the nature and peaceful uses of atomic energy and shall serve as an intermediary among its members for this purpose.

ARTICLE IX

Supplying of materials

A. Members may make available to the Agency such quantities of special fissionable materials as they deem advisable and on such terms as shall be agreed with the Agency. The materials made available to the Agency may, at the discretion of the member making them available, be stored either by the member concerned or, with the agreement of the Agency, in the Agency's depots.

B. Members may also make available to the Agency source materials as defined in article XX and other materials. The Board of Governors

shall determine the quantities of such materials which the Agency will accept under agreements provided for in article XIII.

C. Each member shall notify the Agency of the quantities, form, and composition of special fissionable materials, source materials, and other materials which that member is prepared, in conformity with its laws, to make available immediately or during a period specified by the Board of Governors.

D. On request of the Agency a member shall, from the materials which it has made available, without delay deliver to another member or group of members such quantities of such materials as the Agency may specify, and shall without delay deliver to the Agency itself such quantities of such materials as are really necessary for operations and scientific research in the facilities of the Agency.

E. The quantities, form and composition of materials made available by any member may be changed at any time by the member with the approval of the Board of Governors.

F. An initial notification in accordance with paragraph C of this article shall be made within three months of the entry into force of this Statute with respect to the member concerned. In the absence of a contrary decision of the Board of Governors, the materials initially made available shall be for the period of the calendar year succeeding the year when this Statute takes effect with respect to the member concerned. Subsequent notifications shall likewise, in the absence of a contrary action by the Board, relate to the period of the calendar year following the notification and shall be made no later than the first day of November of each year.

G. The Agency shall specify the place and method of delivery and, where appropriate, the form and composition, of materials which it has requested a member to deliver from the amounts which that member has notified the Agency it is prepared to make available. The Agency shall also verify the quantities of materials delivered and shall report those quantities periodically to the members.

H. The Agency shall be responsible for storing and protecting materials in its possession. The Agency shall ensure that these materials shall be safeguarded against (1) hazards of the weather, (2) unauthorized removal or diversion, (3) damage or destruction, including sabotage, and (4) forcible seizure. In storing special fissionable materials in its possession, the Agency shall ensure the geographical distribution of these materials in such a way as not to allow concentration of large amounts of such materials in any one country or region of the world.

I. The Agency shall as soon as practicable establish or acquire such of the following as may be necessary:

1. Plant, equipment, and facilities for the receipt, storage, and issue of materials;

2. Physical safeguards;

3. Adequate health and safety measures;

4. Control laboratories for the analysis and verification of materials received;

5. Housing and administrative facilities for any staff required for the foregoing.

J. The materials made available pursuant to this article shall be used as determined by the Board of Governors in accordance with the provisions of this Statute. No member shall have the right to require that the materials it makes available to the Agency be kept separately by the Agency or to designate the specific project in which they must be used.

ARTICLE X

Services, equipment, and facilities

Members may make available to the Agency services, equipment, and facilities which may be of assistance in fulfilling the Agency's objectives and functions.

ARTICLE XI

Agency projects

A. Any member or group of members of the Agency desiring to set up any project for research on, or development or practical application of, atomic energy for peaceful purposes may request the assistance of the Agency in securing special fissionable and other materials, services, equipment, and facilities necessary for this purpose. Any such request shall be accompanied by an explanation of the purpose and extent of the project and shall be considered by the Board of Governors.

B. Upon request, the Agency may also assist any member or group of members to make arrangements to secure necessary financing from outside sources to carry out such projects. In extending this assistance, the Agency will not be required to provide any guarantees or to assume any financial responsibility for the project.

C. The Agency may arrange for the supplying of any materials, services, equipment, and facilities necessary for the project by one or more members or may itself undertake to provide any or all of these directly, taking into consideration the wishes of the member or members making the request.

D. For the purpose of considering the request, the Agency may send into the territory of the member or group of members making the request a person or persons qualified to examine the project. For this purpose the Agency may, with the approval of the member or group of members making the request, use members of its own staff or employ suitably qualified nationals of any member.

E. Before approving a project under this article, the Board of Governors shall give due consideration to:

1. The usefulness of the project, including its scientific and technical feasibility;

2. The adequacy of plans, funds, and technical personnel to assure the effective execution of the project;

3. The adequacy of proposed health and safety standards for handling and storing materials and for operating facilities;

4. The inability of the member or group of members making the request to secure the necessary finances, materials, facilities, equipment, and services;

5. The equitable distribution of materials and other resources available to the Agency;

6. The special needs of the under-developed areas of the world; and

7. Such other matters as may be relevant.

F. Upon approving a project, the Agency shall enter into an agreement with the member or group of members submitting the project, which agreement shall:

1. Provide for allocation to the project of any required special fissionable or other materials;

2. Provide for transfer of special fissionable materials from their then place of custody, whether the materials be in the custody of the Agency or of the member making them available for use in Agency projects, to the member or group of members submitting the project, under conditions which ensure the safety of any shipment required and meet applicable health and safety standards;

3. Set forth the terms and conditions, including charges, on which any materials, services, equipment, and facilities are to be provided by the Agency itself, and, if any such materials, services, equipment, and facilities are to be provided by a member, the terms and conditions as arranged for by the member or group of members submitting the project and the supplying member;

4. Include undertakings by the member or group of members submitting the project: (*a*) that the assistance provided shall not be used in such a way as to further any military purpose; and (*b*) that the project shall be subject to the safeguards provided for in article XII, the relevant safeguards being specified in the agreement;

5. Make appropriate provision regarding the rights and interests of the Agency and the member or members concerned in any inventions or discoveries or any patents therein, arising from the project;

6. Make appropriate provision regarding settlement of disputes;

7. Include such other provisions as may be appropriate.

G. The provisions of this article shall also apply where appropriate to a

request for materials, services, facilities, or equipment in connection with an existing project.

ARTICLE XII

Agency safeguards

A. With respect to any Agency project, or other arrangement where the Agency is requested by the parties concerned to apply safeguards, the Agency shall have the following rights and responsibilities to the extent relevant to the project or arrangement:

1. To examine the design of specialized equipment and facilities, including nuclear reactors, and to approve it only from the viewpoint of assuring that it will not further any military purpose, that it complies with applicable health and safety standards, and that it will permit effective application of the safeguards provided for in this article;

2. To require the observance of any health and safety measures prescribed by the Agency;

3. To require the maintenance and production of operating records to assist in ensuring accountability for source and special fissionable materials used or produced in the project or arrangement;

4. To call for and receive progress reports;

5. To approve the means to be used for the chemical processing of irradiated materials solely to ensure that this chemical processing will not lend itself to diversion of materials for military purposes and will comply with applicable health and safety standards; to require that special fissionable materials recovered or produced as a by-product be used for peaceful purposes under continuing Agency safeguards for research or in reactors, existing or under construction, specified by the member or members concerned; and to require deposit with the Agency of any excess of any special fissionable materials recovered or produced as a by-product over what is needed for the above-stated uses in order to prevent stockpiling of these materials, provided that thereafter at the request of the member or members concerned special fissionable materials so deposited with the Agency shall be returned promptly to the member or members concerned for use under the same provisions as stated above;

6. To send into the territory of the recipient State or States inspectors, designated by the Agency after consultation with the State or States concerned, who shall have access at all times to all places and data and to any person who by reason of his occupation deals with materials, equipment, or facilities which are required by this Statute to be safeguarded, as necessary to account for source and special fissionable materials supplied and fissionable products and to determine whether there is compliance with the undertaking against use in furtherance of any military purpose referred to in sub-paragraph F-4 of article XI, with the health and safety measures

referred to in subparagraph A-2 of this article, and with any other conditions prescribed in the agreement between the Agency and the State or States concerned. Inspectors designated by the Agency shall be accompanied by representatives of the authorities of the State concerned, if that State so requests, provided that the inspectors shall not thereby be delayed or otherwise impeded in the exercise of their functions;

7. In the event of non-compliance and failure by the recipient State or States to take requested corrective steps within a reasonable time, to suspend or terminate assistance and withdraw any materials and equipment made available by the Agency or a member in furtherance of the project.

B. The Agency shall, as necessary, establish a staff of inspectors. The staff of inspectors shall have the responsibility of examining all operations conducted by the Agency itself to determine whether the Agency is complying with the health and safety measures prescribed by it for application to projects subject to its approval, supervision or control, and whether the Agency is taking adequate measures to prevent the source and special fissionable materials in its custody or used or produced in its own operations from being used in furtherance of any military purpose. The Agency shall take remedial action forthwith to correct any non-compliance or failure to take adequate measures.

C. The staff of inspectors shall also have the responsibility of obtaining and verifying the accounting referred to in sub-paragraph A-6 of this article and of determining whether there is compliance with the undertaking referred to in sub-paragraph F-4 of article XI, with the measures referred to in sub-paragraph A-2 of this article, and with all other conditions of the project prescribed in the agreement between the Agency and the State or States concerned. The inspectors shall report any non-compliance to the Director General who shall thereupon transmit the report to the Board of Governors. The Board shall call upon the recipient State or States to remedy forthwith any non-compliance which it finds to have occurred. The Board shall report the non-compliance to all members and to the Security Council and General Assembly of the United Nations. In the event of failure of the recipient State or States to take fully corrective action within a reasonable time, the Board may take one or both of the following measures: direct curtailment or suspension of assistance being provided by the Agency or by a member, and call for the return of materials and equipment made available to the recipient member or group of members. The Agency may also, in accordance with article XIX, suspend any non-complying member from the exercise of the privileges and rights of membership.

ARTICLE XIII

Reimbursement of members

Unless otherwise agreed upon between the Board of Governors and the member furnishing to the Agency materials, services, equipment, or facili-

ties, the Board shall enter into an agreement with such member providing for reimbursement for the items furnished.

ARTICLE XIV

Finance

A. The Board of Governors shall submit to the General Conference the annual budget estimates for the expenses of the Agency. To facilitate the work of the Board in this regard, the Director General shall initially prepare the budget estimates. If the General Conference does not approve the estimates, it shall return them together with its recommendations to the Board. The Board shall then submit further estimates to the General Conference for its approval.

B. Expenditures of the Agency shall be classified under the following categories:

1. Administrative expenses: these shall include:

(*a*) Costs of the staff of the Agency other than the staff employed in connection with materials, services, equipment, and facilities referred to in sub-paragraph B-2 below; costs of meetings; and expenditures required for the preparation of Agency projects and for the distribution of information;

(*b*) Costs of implementing the safeguards referred to in article XII in relation to Agency projects or, under sub-paragraph A-5 of article III, in relation to any bilateral or multilateral arrangement, together with the costs of handling and storage of special fissionable material by the Agency other than the storage and handling charges referred to in paragraph E below;

2. Expenses, other than those included in sub-paragraph 1 of this paragraph, in connexion with any materials, facilities, plant, and equipment acquired or established by the Agency in carrying out its authorized functions, and the costs of materials, services, equipment, and facilities provided by it under agreements with one or more members.

C. In fixing the expenditures under sub-paragraph B-1 (*b*) above, the Board of Governors shall deduct such amounts as are recoverable under agreements regarding the application of safeguards between the Agency and parties to bilateral or multilateral arrangements.

D. The Board of Governors shall apportion the expenses referred to in sub-paragraph B-1 above, among members in accordance with a scale to be fixed by the General Conference. In fixing the scale the General Conference shall be guided by the principles adopted by the United Nations in assessing contributions of Member States to the regular budget of the United Nations.

E. The Board of Governors shall establish periodically a scale of charges, including reasonable uniform storage and handling charges, for materials, services, equipment, and facilities furnished to members by the Agency. The scale shall be designed to produce revenues for the Agency adequate to meet the expenses and costs referred to in sub-paragraph B-2 above, less

any voluntary contributions which the Board of Governors may, in accordance with paragraph F, apply for this purpose. The proceeds of such charges shall be placed in a separate fund which shall be used to pay members for any materials, services, equipment, or facilities furnished by them and to meet other expenses referred to in sub-paragraph B-2 above which may be incurred by the Agency itself.

F. Any excess of revenues referred to in paragraph E over the expenses and costs there referred to, and any voluntary contributions to the Agency, shall be placed in a general fund which may be used as the Board of Governors, with the approval of the General Conference, may determine.

G. Subject to rules and limitations approved by the General Conference, the Board of Governors shall have the authority to exercise borrowing powers on behalf of the Agency without, however, imposing on members of the Agency any liability in respect of loans entered into pursuant to this authority, and to accept voluntary contributions made to the Agency.

H. Decisions of the General Conference on financial questions and of the Board of Governors on the amount of the Agency's budget shall require a two-thirds majority of those present and voting.

Article XV

Privileges and immunities

A. The Agency shall enjoy in the territory of each member such legal capacity and such privileges and immunities as are necessary for the exercise of its functions.

B. Delegates of members together with their alternates and advisers, Governors appointed to the Board together with their alternates and advisers, and the Director General and the staff of the Agency, shall enjoy such privileges and immunities as are necessary in the independent exercise of their functions in connexion with the Agency.

C. The legal capacity, privileges, and immunities referred to in this article shall be defined in a separate agreement or agreements between the Agency, represented for this purpose by the Director General acting under instructions of the Board of Governors, and the members.

Article XVI

Relationship with other organizations

A. The Board of Governors, with the approval of the General Conference, is authorized to enter into an agreement or agreements establishing an appropriate relationship between the Agency and the United Nations and any other organizations the work of which is related to that of the Agency.

B. The agreement or agreements establishing the relationship of the Agency and the United Nations shall provide for:

1. Submission by the Agency of reports as provided for in subparagraphs B-4 and B-5 of article III;

2. Consideration by the Agency of resolutions relating to it adopted by the General Assembly or any of the Councils of the United Nations and the submission of reports, when requested, to the appropriate organ of the United Nations on the action taken by the Agency or by its members in accordance with this Statute as a result of such consideration.

ARTICLE XVII

Settlement of disputes

A. Any question or dispute concerning the interpretation or application of this Statute which is not settled by negotiation shall be referred to the International Court of Justice in conformity with the Statute of the Court, unless the parties concerned agree on another mode of settlement.

B. The General Conference and the Board of Governors are separately empowered, subject to authorization from the General Assembly of the United Nations, to request the International Court of Justice to give an advisory opinion on any legal question arising within the scope of the Agency's activities.

ARTICLE XVIII

Amendments and withdrawals

A. Amendments to this Statute may be proposed by any member. Certified copies of the text of any amendment proposed shall be prepared by the Director General and communicated by him to all members at least ninety days in advance of its consideration by the General Conference.

B. At the fifth annual session of the General Conference following the coming into force of this Statute, the question of a general review of the provisions of this Statute shall be placed on the agenda of that session. On approval by a majority of the members present and voting, the review will take place at the following General Conference. Thereafter, proposals on the question of a general review of this Statute may be submitted for decision by the General Conference under the same procedure.

C. Amendments shall come into force for all members when:

(i) Approved by the General Conference by a two-thirds majority of those present and voting after consideration of observations submitted by the Board of Governors on each proposed amendment, and

(ii) Accepted by two-thirds of all the members in accordance with their respective constitutional processes. Acceptance by a member shall be

effected by the deposit of an instrument of acceptance with the depositary Government referred to in paragraph C of article XXI.

D. At any time after five years from the date when this Statute shall take effect in accordance with paragraph E of article XXI or whenever a member is unwilling to accept an amendment to this Statute, it may withdraw from the Agency by notice in writing to that effect given to the depositary Government referred to in paragraph C of article XXI, which shall promptly inform the Board of Governors and all members.

E. Withdrawal by a member from the Agency shall not affect its contractual obligations entered into pursuant to article XI or its budgetary obligations for the year in which it withdraws.

ARTICLE XIX

Suspension of privileges

A. A member of the Agency which is in arrears in the payment of its financial contributions to the Agency shall have no vote in the Agency if the amount of its arrears equals or exceeds the amount of the contributions due from it for the preceding two years. The General Conference may, nevertheless, permit such a member to vote if it is satisfied that the failure to pay is due to conditions beyond the control of the member.

B. A member which has persistently violated the provisions of this Statute or of any agreement entered into by it pursuant to this Statute may be suspended from the exercise of the privileges and rights of membership by the General Conference acting by a two-thirds majority of the members present and voting upon recommendation by the Board of Governors.

ARTICLE XX

Definitions

As used in this Statute:

1. The term "special fissionable material" means plutonium-239; uranium-233; uranium enriched in the isotopes 235 or 233; any material containing one or more of the foregoing; and such other fissionable material as the Board of Governors shall from time to time determine; but the term "special fissionable material" does not include source material.

2. The term "uranium enriched in the isotopes 235 or 233" means uranium containing the isotopes 235 or 233 or both in an amount such that the abundance ratio of the sum of these isotopes to the isotope 238 is greater than the ratio of the isotope 235 to the isotope 238 occurring in nature.

3. The term "source material" means uranium containing the mixture of isotopes occurring in nature; uranium depleted in the isotope 235; thorium; any of the foregoing in the form of metal, alloy, chemical com-

pound, or concentrate; any other material containing one or more of the foregoing in such concentration as the Board of Governors shall from time to time determine; and such other material as the Board of Governors shall from time to time determine.

ARTICLE XXI

Signature, acceptance, and entry into force

A. This Statute shall be open for signature on 26 October 1956 by all States Members of the United Nations or of any of the specialized agencies and shall remain open for signature by those States for a period of ninety days.

B. The signatory States shall become parties to this Statute by deposit of an instrument of ratification.

C. Instruments of ratification by signatory States and instruments of acceptance by States whose membership has been approved under paragraph B of article IV of this Statute shall be deposited with the Government of the United States of America, hereby designated as depositary Government.

D. Ratification or acceptance of this Statute shall be effected by States in accordance with their respective constitutional process.

E. This Statute, apart from the Annex, shall come into force when eighteen States have deposited instruments of ratification in accordance with paragraph B of this article, provided that such eighteen States shall include at least three of the following States: Canada, France, The Union of Soviet Socialist Republics, the United Kingdom of Great Britain and Northern Ireland, and the United States of America. Instruments of ratification and instruments of acceptance deposited thereafter shall take effect on the date of their receipt.

F. The depositary Government shall promptly inform all States signatory to this Statute of the date of each deposit of ratification and the date of entry into force of the Statute. The depositary Government shall promptly inform all signatories and members of the dates on which States subsequently become parties thereto.

G. The Annex to this Statute shall come into force on the first day this Statute is open for signature.

ARTICLE XXII

Registration with the United Nations

A. This Statute shall be registered by the depositary Government pursuant to Article 102 of the Charter of the United Nations.

B. Agreements between the Agency and any member or members, agreements between the Agency and any other organization or organizations, and

agreements between members subject to approval of the Agency, shall be registered with the Agency. Such agreements shall be registered by the Agency with the United Nations if registration is required under Article 102 of the Charter of the United Nations.

ARTICLE XXIII

Authentic texts and certified copies

This Statute, done in the Chinese, English, French, Russian and Spanish languages, each being equally authentic, shall be deposited in the archives of the depositary Government. Duly certified copies of this Statute shall be transmitted by the depositary Government to the Governments of the other signatory States and to the Governments of States admitted to membership under paragraph B of article IV.

In witness whereof the undersigned, duly authorized, have signed this Statute.

DONE at the Headquarters of the United Nations, this twenty-sixth day of October, one thousand nine hundred and fifty-six.

ANNEX I

Preparatory Commission

A. A Preparatory Commission shall come into existence on the first day this Statute is open for signature. It shall be composed of one representative each of Australia, Belgium, Brazil, Canada, Czechoslovakia, France, India, Portugal, Union of South Africa, Union of Soviet Socialist Republics, United Kingdom of Great Britain and Northern Ireland, and United States of America, and one representative each of six other States to be chosen by the International Conference on the Statute of the International Atomic Energy Agency. The Preparatory Commission shall remain in existence until this Statute comes into force and thereafter until the General Conference has convened and a Board of Governors has been selected in accordance with article VI.

B. The expenses of the Preparatory Commission may be met by a loan provided by the United Nations and for this purpose the Preparatory Commision shall make the necessary arrangements with the appropriate authorities of the United Nations, including arrangements for repayment of the loan by the Agency. Should these funds be insufficient, the Preparatory Commission may accept advances from Governments. Such advances may be set off against the contributions of the Governments concerned to the Agency.

C. The Preparatory Commission shall:

1. Elect its own officers, adopt its own rules of procedure, meet as often as necessary, determine its own place of meeting and establish such committees as it deems necessary;

2. Appoint an executive secretary and staff as shall be necessary, who shall exercise such powers and perform such duties as the Commission may determine;

3. Make arrangements for the first session of the General Conference, including the preparation of a provisional agenda and draft rules of procedure, such session to be held as soon as possible after the entry into force of this Statute;

4. Make designations for membership on the first Board of Governors in accordance with sub-paragraphs A-1 and A-2 and paragraph B of article VI;

5. Make studies, reports, and recommendations for the first session of the General Conference and for the first meeting of the Board of Governors on subjects of concern to the Agency requiring immediate attention, including (*a*) the financing of the Agency; (*b*) the programmes and budget for the first year of the Agency; (*c*) technical problems relevant to advance planning of Agency operations; (*d*) the establishment of a permanent Agency staff; and (*e*) the location of the permanent headquarters of the Agency;

6. Make recommendations for the first meeting of the Board of Governors concerning the provisions of a headquarters agreement defining the status of the Agency and the rights and obligations which will exist in the relationship between the Agency and the host Government;

7. (*a*) Enter into negotiations with the United Nations with a view to the preparation of a draft agreement in accordance with article XVI of this Statute, such draft agreement to be submitted to the first session of the General Conference and to the first meetings of the Board of Governors; and (*b*) make recommendations to the first session of the General Conference and to the first meeting of the Board of Governors concerning the relationship of the Agency to other international organizations as contemplated in article XVI of this Statute.

Appendix B

ITEM 1 *

Agreement on the Establishment of a Joint Nuclear Research Institute

Article 1

To insure joint theoretical and experimental research into nuclear physics by scientists of the states signatories of the present agreement, an international scientific research organization known as the Joint Institute of Nuclear Research is hereby established.

Article 2

The Joint Institute of Nuclear Research shall conduct all its activities in accordance with a charter, the draft of which shall be prepared by the Institute's management and approved by the governments of the states members of the Institute. The Joint Institute of Nuclear Research shall have the rights of a juridical person. It may cooperate in its work with appropriate institutes and laboratories in the territories of the states members of the Institute. The Institute shall be located in Kalinin region, the USSR.

Article 3

The membership of the Joint Institute of Nuclear Research consists of the signatory states of the present agreement. Other states, wishing to take part in the work of the Joint Institute of Nuclear Research, shall declare their concurrence with the provisions of the present agreement and shall become members of the Institute by decision of the majority of the states members of the Institute.

Article 4

The Joint Institute of Nuclear Research shall comprise the following research organizations:

1—A laboratory of nuclear problems with a synchrocyclotron with proton energy of 680 megelectron volts (former Nuclear Problems Institute of the USSR Academy of Sciences).

2—A high energy physics laboratory with a proton synchrotron of a planned proton energy of 10,000 megelectron volts (former Electrophysics Laboratory of the USSR Academy of Sciences).

The aforementioned Nuclear Problems Institute and the Electrophysics

* The basic English text of this Agreement was published in a TASS press release dated July 11, 1956.

Laboratory of the USSR Academy of Sciences shall be delivered by the Government of the USSR to the Joint Institute of Nuclear Research with all equipment, principal, auxiliary and administrative installations and buildings, on the date the present agreement comes into force.

With a view to the further development of nuclear research the following installation shall be built at the Joint Institute:

1—A laboratory of theoretical physics with a calculating department and electronic computing machinery;

2—A laboratory of neutron physics with an experimental nuclear reactor with a high density of the neutron current;

3—A cyclotron for accelerating multicharged ions of various elements and for experiments with them as part of the nuclear problems laboratory;

4—Other experimental installations and laboratories.

Article 5

The Joint Institute of Nuclear Research shall be managed by a director and two deputies, elected by the majority of states members of the Institute from among scientists of these states. The director shall be elected for a term of three years, and deputy directors for two-year terms. The Institute director and his two deputies shall be elected in due manner by the plenipotentiaries of the states members of the Institute.

The Institute's director is a plenipotentiary person effecting relations with appropriate institutions in the states members of the Institute on all questions bearing on the latter's work. The management of the Joint Institute of Nuclear Research is responsible to the governments of the states members of the Institute for the Institute's work and shall report regularly to them.

A scientific council shall be established at the Institute to discuss and approve research plans, the results of their fulfillment, and other questions bearing on the Institute's scientific activities. The members of the scientific council shall be appointed by the states members of the Institute from among their scientists, each state appointing three persons. The director of the Joint Institute shall appoint a deputy in charge of construction and the business affairs of the Institute.

Article 6

Each state member of the Joint Institute of Nuclear Research shall make annual contributions for the maintenance of the Institute and the building of new research facilities, and shall participate in the material maintenance of the Institute.

The shares of the founder states in expenditures on the building and maintenance of the Institute are determined by the following scale: Albania—0.05 percent; Bulgaria—3.6 percent; Hungary—4 percent; Ger-

man Democratic Republic 6.75 percent; Poland—6.75 percent; Rumania—5.75 percent; USSR—47.25 percent; Czechoslovakia—5.75 percent.

In the case of new members joining the Institute or the withdrawal of any state from the Institute, the shares of the states in the expenditures on the building and maintenance of the Institute are subject to revision, and the new scale shall be submitted for the approval of the governments of the states members of the Institute. The share of the states members of the Institute shall have no bearing on the degree of participation of a member state in the Institute's scientific work and administration.

ARTICLE 7

A financial committee composed of representatives of all states members of the Institute shall be formed to prepare the budget and control the Institute's financial affairs. Each member state shall have one representative on the financial committee. The committee members shall be appointed by the governments of the states concerned. The chairmanship of the financial committee meetings shall rotate among the representatives of every state.

ARTICLE 8

Any state member of the Joint Institute of Nuclear Research has the right to withdraw from the Institute. Written notification of the withdrawal from the Institute shall be sent by the plenipotentiary of the government of the member state desiring to leave the Institute to the Institute's director not later than three months before the end of the current year.[1]

ARTICLE 9

The Joint Institute of Nuclear Research may be liquidated by agreement among the governments of all the states members of the Institute. In case of liquidation, all equipment, principal, auxiliary and administrative installations shall become the property of the USSR on whose territory the Institute is located. The other member states shall be compensated in accordance with their share in the capital expenditures of the Institute.

In case of the Institute's liquidation, the cash resources, with the exception of the part to be used to meet the Institute's obligations, shall be divided among the states members of the Institute at the time of the Insitute's disbandment proportionally to the actual cash contributions made by these states during their membership in the Institute.

ARTICLE 10

This agreement shall become effective on the date of its signature by all member states. For each country joining the Institute thereafter the

[1] The eighth article of the Institute's Charter states that "resignation from the Institute shall become official upon termination of that fiscal year in which the state declared its withdrawal from the Institute."

agreement shall become effective on the date of its admission to membership according to the procedure provided for in Article 3.

The present agreement was signed in Moscow on March 26, 1956. It was done in one copy, in Russian. Certified copies of the agreement shall be communicated by the Government of the USSR to all other signatories.

ITEM 2*

CHARTER OF THE JOINT NUCLEAR RESEARCH INSTITUTE

SECTION I

Creation and Location of the Institute

ARTICLE 1

The Joint Nuclear Research Institute, hereinafter referred to as the "Institute," shall be an international scientific-research organization, created by the Agreement for the organization of such an institute which was concluded among the following governments on the 26th of March, 1956:

The People's Republic of Albania, the People's Republic of Bulgaria, the Hungarian People's Republic, the German Democratic Republic, the Chinese People's Republic, the Korean Popular-Democratic Republic, the Mongolian People's Republic, the Polish People's Republic, the Rumanian People's Republic, the Union of Soviet Socialist Republics, and the Czechoslovakian Republic.

ARTICLE 2

The Institute shall be located in the Union of Soviet Socialist Republics, in the town of Dubna, Moscow district.

Mailing address: P.O. Box 79, Central Post Office, Moscow

ARTICLE 3

The Institute shall be a legal entity and, according to the laws of the country wherein it is situated, shall possess the capacity and status necessary to achieve its aims and functions.

The Institute shall have the right of free access to foreign publications.

The Institute shall have its own seal, an impression of which is affixed to this Charter.

* The Russian text of this Charter is to be found in 2 Atomnaya Energiya, No. 1, 76-82 (Russia 1957). An English text may be found in the English translation of this periodical (published by Consultant's Bureau, New York).

SECTION II

Aims and Functions of the Joint Nuclear Research Institute

ARTICLE 4

The purpose of the Joint Nuclear Research Institute is:

(1) to guarantee the coordination of theoretical and experimental research done by scientists of member-states in nuclear physics;

(2) to further the development of nuclear physics in the member-states by the exchange of experience and of theoretical and experimental research results;

(3) to maintain communication between the national and international scientific-research organizations and other organizations interested in the development of nuclear physics and in the exploration of new possibilities for the peaceful utilization of atomic energy;

(4) to help develop specialized skills of every description in the scientific-research personnel of the member-states.

The Institute will concern itself exclusively with the development of peaceful uses of atomic energy to benefit all mankind.

Results of scientific research done at the Institute shall be announced either by publication or at scientific conferences and meetings.

Reports on the work accomplished shall be sent to all member-states.

SECTION III

Membership in the Joint Nuclear Research Institute

ARTICLE 5

The members of the Joint Nuclear Research Institute are those states which signed the agreement concerning the organization of this Institute.

Other states, wishing to participate in the work of the Institute and concurring with the conditions of the Agreement concerning the organization of the Institute, shall become Institute members upon the decision of a majority of the member-states.

The amount of participation in the Institute's maintenance and construction expenses allotted newly-joined member-states shall be decided by the Finance Committee and approved by the governments of the member-states.

ARTICLE 6

All members of the Institute shall participate equally in the scientific work and management of the Institute.

ARTICLE 7

The Institute's Board of Directors, with regarding to the principle of cooperation, shall decide individually all questions regard the use of the Institute for work by non-member state scientists.

The Institute Board shall determine the size and form of compensation required for the use of Institute equipment and materials according to the agreement reached with the interested state, scientists, or scientific institution.

ARTICLE 8

Any Institute member-state can resign from membership.

Written notice of withdrawal from the Institute shall be submitted by the government of the state wishing to withdraw from the Institute to the Institute's Board no later than three months before the termination of the current fiscal year.

Resignation from the Institute shall become official upon termination of that fiscal year in which the state declared its withdrawal from the Institute. After reviewing the budget for the fiscal year in which the state announced its withdrawal from the Institute, the Finance Committee shall determine the amount of monetary reimbursement due the resigning state, according to the share of capital outlay for the Institute apportioned that state.

SECTION IV

Finance Committee and Budget

ARTICLE 9

A Finance Committee consisting of representatives from all member-states shall be set up to control the financial affairs of the Institute and to approve the budget.

Each member-state shall have one representative on the Finance Committee. Members of the Committee shall be appointed by the governments of the respective states.

The Finance Committee shall convene at least once a year. Representatives of each state in turn shall preside over the sessions.

The Finance Committee's resolutions shall require a two-thirds majority vote for adoption.

ARTICLE 10

The Finance Committee shall examine and approve:

a) the estimated costs of financing Institute scientific and economic works;

b) the departmental structure, personnel, and official pay rates for all categories of Institute workers;

c) amounts and terms of monetary payments toward Institute construction and maintenance from member-states, according to the proportionary scale provided in the Agreement of the member-states;

d) the plan for financing capital construction.

The Finance Committee shall generally control all financial affairs of the Institute.

Article 11

A budget for the Institute covering the period from January 1st to December 31st inclusive shall be drawn up each year.

Article 12

In the budget presented by the Board to the Finance Committee, provision shall be made for all Institute expenses, itemized as follows:

a) financing of scientific research and payment of Institute workers;

b) cost of developing scientific research and other Institute objectives;

c) money to reward and encourage Institute workers, for length of service, etc., and to give financial help to workers when and if needed;

d) other expenses incurred in the course of the Institute's activities.

Article 13

Each member-state shall produce on the dates specified monetary payments, according to the budget approved by the Finance Committee, toward the maintenance and development of the Institute and its objectives.

These payments shall be payable in the currency of the country wherein the Institute is situated.

In those cases where the Joint Nuclear Research Institute requires currency to purchase equipment, instruments, materials, technical scientific literature or periodicals from states not belonging to the Institute, member-states shall pay a portion of the sum allotted them by the Agreement in the currency of those states. The amount of the sum in this currency will be established by the Finance Committee.

The value of equipment, materials, and instruments supplied by member-states, as well as the value of individual work accomplished according to Institute laws may be computed as part of the allotted participation.

The manner of computation shall be established by the Finance Committee.

Article 14

The scale of allotted participation in the Institute development and maintenance costs shall be revised both upon the admittance of new member-states and upon the withdrawal of any state from membership, and a new scale shall be presented to the governments of the member-states for approval.

Article 15

During the fiscal year, the Institute may partially redistribute the monies itemized in the budget under the divisions of capital construction and exploratory work.

ARTICLE 16

At the end of each fiscal year, the Institute Board shall report to the Finance Committee on the budget balance according to its status at that time.

The Finance Committee shall specify the date on which the report is to be presented.

SECTION V

The Scientific Council of the Joint Nuclear Research Institute

ARTICLE 17

The Scientific Council of the Institute shall consist of three scientists from each member-state, to be appointed by their states.

The staff of the Scientific Council shall include the Director and Vice-Directors of the Institute (who are chosen according to article 20 of this statute), who shall have the right to vote.

Laboratory Directors, who have not been appointed members of the Scientific Council by their various governments, shall be included in the staff of the Scientific Council with the right of participating in the debates.

ARTICLE 18

The Scientific Council of the Institute shall:

a) consider and approve the Institute's scientific research programs;

b) examine the results of completed scientific research programs and also the results of individual studies;

c) consider other questions concerning the scientific work of the Institute.

The Scientific Council shall convene at least twice a year.

ARTICLE 19

The Institute Director shall be president of the Scientific Council.

The Scientific Council shall announce its own rules of procedure.

SECTION VI

Board of Directors of the Joint Nuclear Research Institute

ARTICLE 20

The Institute shall be headed by a Board of Directors consisting of an Institute Director and two Vice-Directors, to be elected from the scientists of the member-states by a majority of these states. The Director shall be elected for a three-year term, the Vice-Directors for a two-year term.

The Board of Directors shall be elected by the plenipotentiary representatives of the member-states.

ARTICLE 21

The Institute Director shall be a plenipotentiary officer, who shall maintain relations with the appropriate institutions of the member-states in all questions regarding the Institute's work.

The Institute may establish direct communication with scientists and scientific organizations of other countries.

The Institute Vice-Directors shall assist the Director in the management of the Institute, substitute for him in his absence, and shall have a responsibility equal to his for all activity of the Institute.

ARTICLE 22

The Institute Board is responsible to the Governments of the member-states for the activity of the Institute and shall report to them periodically.

Only decisions of the Finance Committee and the Scientific Council may direct the Institute Board in the management of the Institute; the Institute Board shall not obey any orders from individual member-states.

ARTICLE 23

On the appointed dates, the Institute Board shall present a yearly budget estimate and a report of the budget balance to the Finance Committee.

ARTICLE 24

The Institute Board shall direct the scientific work of the Institute according to the program for scientific research procedure approved by the Institute's Scientific Council, and shall direct the financial affairs according to the decisions of the Finance Committee.

The Institute Board shall have the right of partially altering the scientific research programs assigned to the various Institute Laboratories.

The Board must inform the Institute's Scientific Council of all such changes or modifications.

ARTICLE 25

Each year, the Institute Board shall present to the Institute's Scientific Council for review and approval drafts of summary programs for scientific research works, drafts of programs for the future development of the Institute, and a report of the Institute's scientific work.

ARTICLE 26

The Institute Director shall be manager in chief of Institute assets. He shall be in charge of all the Institute resources and property.

Article 27

The Institute Director shall have the right:

a) to hire and discharge employees according to the Institute's personnel statute;

b) to establish or alter within the official wage limits approved by the Finance Committee the wages of all employees, and to initiate individual pay raises for highly-skilled workers of up to 50% of the original wage within the limits of the sums estimated for this.

SECTION VII

Laboratories of the Joint Nuclear Research Institute

Article 28

The Institute staff shall include: a Nuclear Problems Laboratory, a High Energy Laboratory, a Neutron Physics Laboratory, and a Theoretical Physics Laboratory, each of which shall coordinate the research in their respective fields of nuclear physics.

The Institute Laboratories shall consist of scientific departments and sections.

Decision of the Institute's Scientific Council can change the number of Laboratories to fit the requirements of the work at hand, and decision of the Institute Board can change the number of departments and sections.

Article 29

Scientists from member-states will be chosen by the Institute Board to serve as Laboratory Directors and subsequently approved by the Scientific Council; their function shall be the management of the Laboratories.

The Laboratory Directors shall be responsible to the Institute Board for their actions and for the work of their Laboratories.

Article 30

The Laboratory Directors shall direct all scientific research work in their Laboratories according to the program approved by the Institute Scientific Council; their function shall be the management of the Laboratories.

The Laboratory Directors shall be responsible to the Institute Board for their actions and for the work of their Laboratories.

Through the Institute Board, Laboratory Directors may select personnel, hire and discharge Laboratory employees, determine and alter, within the approved pay-rate limits, wages paid Laboratory employees according to the extent and quality of each employee's work, and may declare bonuses or fines.

ARTICLE 31

A Scientific Council shall be set up in each Laboratory, the staff of which shall be approved by the Institute Scientific Council.

The Laboratory Director shall be the president of the Laboratory Scientific Council.

The Laboratory Scientific Council:

a) shall prepare programs for the scientific research work assigned the Laboratory;

b) shall examine results obtained by such scientific research work and by individual studies;

c) shall confer doctorates and bachelors degrees in the mathematico-physical and technical sciences;

d) shall consider other questions concerning the scientific work of the Laboratory.

ARTICLE 32

On specified dates, the Laboratory Directors shall present a draft program of the Laboratory's scientific research work, a report on the Laboratory's work, and requests for needed materials and equipment to the Institute Board.

SECTION VIII

Administrative-Economic Management of the Joint Nuclear Research Institute

ARTICLE 33

The Institute Director shall appoint one of his assistants as Administrative Director to manage the administrative-economic work and construction of the Institute.

ARTICLE 34

The Administrative Director shall direct the work of the departments within his jurisdiction, which departments provide the framework of the Institute. He shall have the right of hiring and discharging workers in these departments.

ARTICLE 35

The Administrative Director as proxy for the Institute Director shall manage the assets and shall be responsible for the correct expenditure of Institute funds as outlined in the budget approved by the Finance Committee.

The Administrative Director shall be subordinate to and responsible for his actions to the Institute Director.

SECTION IX

Concerning Personnel at the Joint Nuclear Research Institute

ARTICLE 36

All persons on the Institute staff shall be employees of the said international scientific organization and under obligation to further its aims and undertakings.

ARTICLE 37

Institute employees shall be recruited from member-state citizens.

The Institute's Board shall consider the proposed contingents from each member-state, and the Scientific Council shall approve them.

The question of scientific workers sent by member-states for short-term work at the Institute shall be decided by the Institute Board.

ARTICLE 38

The obligations and rights of Institute personnel shall be determined by a Code of Regulations for personnel of the Joint Nuclear Research Institute. Personnel of the Institute shall be subject to the laws of the country in which the Institute is located.

ARTICLE 39

The Institute Board may take university students or graduates who are citizens of member-states for practical study in the Institute's Laboratories. In such cases, the states shall stand the expenses incurred by their students or novices. The form and term of this practical study shall be determined by the Institute Board.

SECTION X

Liquidation of the Joint Nuclear Research Institute

ARTICLE 40

The Joint Nuclear Research Institute can be liquidated by agreement of the member-states' governments.

Upon liquidation, all Institute equipment and all principal, subsidiary and administrative buildings shall become the property of the Union of Soviet Socialist Republics, wherein the Institute is located. Other member-states shall receive monetary reimbursement proportionate to the amount of participation assigned each of these states in capital outlay for the Institute.

Upon liquidation all Institute monetary assets on hand, except those portions required to pay Institute obligations, shall be distributed among those states who are members of the Institute at the time of its liquidation,

in proportion to the amounts of monetary payments actually contributed by these states during their participation in the work of the Institute.

SECTION XI

Ratification of the Charter

ARTICLE 41

This Charter shall be ratified by the Council of Plenipotentiary Representatives of the member-states.

The ratified copy of the Charter shall be kept at the Institute.

SECTION XII

Amendments to the Charter

This Charter may be amended or changed.

Proposals to change the Charter shall be directed to the Institute Board. The Board shall also have the right to propose changes in the Charter. Upon the acceptance of such proposals by a majority of the member-states, the Institute Board shall consider those changes as part of the Charter.

This Charter for the Institute has been drawn up in the Russian language on the 23d of September, in the year 1956. Witnessed copies of this document shall be sent by the Institute Board to all Institute member-states.

In witness whereof the plenipotentiary representatives of the Institute member-states' governments have signed this document and certified it with the Institute's seal.

Authorized by the Government of the People's Republic of Albania ..... Prifmi, Mihal

Authorized by the Government of the People's Republic of Bulgaria ..... Gerasimov, Lyuben

Authorized by the Government of the Hungarian People's Republic ..... Kish, Arpad

Authorized by the Government of the Democratic Republic of Viet Nam ..... Chan Dai, Ngia

Authorized by the Government of the German Democratic Republic ..... Rambusch, Karl

Authorized by the Government of the Chinese People's Republic..... .....Wan Gan, Chan

Authorized by the Korean Popular-Democratic Republic..... ..... Kim Khen, Bon

Authorized by the Government of the Mongolian People's Republic... ..... Sodnom, Namsrain

Authorized by the Government of the Polish People's Republic..... ..... Billig, Wilhelm

Authorized by the Government of the Rumanian People's Republic... ..... Khulubei, Khoriya
Authorized by the Government of the Union of Soviet Socialist Republics.....Slavsky, Efim Pavlovich
Authorized by the Government of the Czechoslovakian Republic..... ..... Kozheshnik, Yaroslav

ITEM 3*

Soviet Government Statement on General European Cooperation in the Peaceful Use of Atomic Energy

On July 12, the USSR Foreign Affairs Ministry sent to the Governments of Austria, Albania, Belgium, Bulgaria, Great Britain, Hungary, the German Democratic Republic, Greece, Denmark, Iceland, Italy, Luxembourg, the Netherlands, Norway, Poland, Rumania, the Federal Republic of Germany, Finland, France, Czechoslovakia, Switzerland, Sweden, Yugoslavia, and to the Government of the United States, through their embassies and legations in Moscow, the text of the Soviet Government statement: "On general European cooperation in the peaceful uses of atomic energy."

The text of the aforementioned statement was simultaneously brought to the attention of the Government of the Chinese People's Republic, the People's Democratic Republic of Korea, the Mongolian People's Republic, and the Democratic Republic of Vietnam, through their embassies in Moscow.

Here is the text of the statement of the Soviet Government.

The great discoveries in the sphere of atomic energy have considerably expanded the opportunities for technical progress, development of power, industry, agriculture, transport, science, and culture, and for improving the welfare of the people. Further development in the field of atomic energy and its practical application in science and engineering call for an appropriate industrial and scientific-technical base, call for collective efforts of states in organizing production and utilizing atomic energy for peaceful aims.

At present, when the Cold War and mutual nonconfidence in relations between states, which hampered the development of general international cooperation are receding into the past, more favorable conditions are appearing for the efforts of scientists, engineers, and other atomic specialists to be directed not toward military uses of atomic energy, but toward its use for peaceful aims, for the benefit of mankind.

* The English text of this statement was published in a TASS press release dated July 13, 1956.

The Soviet Government considers that the attainment of an international agreement on the unconditional prohibition of atomic and hydrogen weapons and on their withdrawal from the armaments of the states would open wide prospects for the peaceful uses of atomic energy and make it possible to switch over the huge material-scientific-technical and other resources from the production of means of destruction to the creation of material benefits and spiritual values.

Working consistently for unconditional prohibition of atomic and hydrogen weapons and for the use of atomic energy for peaceful purposes, the Soviet Government is already taking the necessary steps for a general development of international cooperation in the field of the peaceful uses for atomic energy. Moreover, the Soviet Government bases itself on the fact that international cooperation in this field must completely exclude the use for military aims of atomic materials which are provided on the basis of corresponding agreements.

It goes without saying that cooperation in the field of peaceful uses of atomic energy can be effective only under conditions of equality of all the interested parties, in the presence of strict respect of national sovereignty of the states and noninterference in their internal affairs, in the strict observance of the high principles expressed in the U. N. Charter. Such cooperation can be fruitful only if it will not harm the security of any of the states, and the assistance granted is not conditioned by any kind of demands of a political or military nature.

The Soviet Union, as one of the states which is developing the production of atomic energy and which possesses atomic raw material, is actively taking part in the development of international cooperation in the cause of the use of atomic energy for peaceful purposes. The USSR, together with other states, is taking part in the measures for the creation of an international agency for the peaceful uses of atomic energy.

The Soviet Government considers that the possibilities for development of international cooperation in the field of application of atomic energy are far from exhausted. In particular, this refers to development of cooperation in this field on a regional basis.

At the present moment the attention of broad public circles is being more and more attracted to the question of the organization of cooperation in the field of peaceful uses of atomic energy between the European states. The development of such cooperation between the European countries would have contributed considerably to the strengthening of confidence among them and would have been in accord with the interests of general European security. In present conditions it is the European states, together with the United States, which have the most favorable prospects, including the existence of highly-developed industry, qualified manpower, well-trained scientific and engineering cadres, and the necessary reserves, for the devel-

opment of cooperation in the field of the peaceful uses of atomic energy between European countries, and to render corresponding assistance to other states.

Nevertheless, one must but note that lately in some of the Western European states definite attempts are being made to exploit the understandable aspirations of the peoples for development of international cooperation in the field of peaceful uses of atomic energy, for the creation in this field of a closed grouping of a few states—which will hamper the broad cooperation in this field on a general European basis. Such a grouping is envisaged by the plans for setting up the so-called Euratom, an atomic merger of six European countries—France, the Federal Republic of Germany, Italy, Belgium, Holland, and Luxembourg.

According to the plan for the establishment of Euratom, drawn up by a special inter-governmental committee of the aforementioned six states, a monopoly of rights is to be given to this organization for the possession of all the nuclear materials as well as the right to distribute these materials among states of the group. The authors of this plan propose to grant the executive organs of Euratom rights and authority which would enable this organization to control, in fact, the whole atomic industry, and, to a considerable extent, branches of national economy connected with it in the states participating in this merger. Thus, in substance, a supranational character has been contemplated for this organization.

One cannot fail to see that the creation of such an organization under circumstances in which several West European states are members of closed military blocs which oppose other European states would result in the fact that the activity of the Euratom would be subject to the military-strategic aims of these blocs. By the nature of the organization of Euratom, it naturally could not be expected to carry out its activity in the interest of those states which have no opportunity to develop the production of atomic energy in their countries.

This means that economically stronger states and, in fact, the corresponding large monopolies of these countries, will have an opportunity to use Euratom to impose conditions on other countries which are much weaker economically. Obviously, this could lead only to the increasing of distrust in relations between states and would create additional difficulties in the organization of a system of effective European security.

One must also take into consideration the fact that the creation of this organization, to which only a part of Germany will belong, would lead to an even greater consolidation of the division of Germany into two parts and would make more difficult the achievement of measures for the creation of a single peace-loving and democratic German state.

One must also note the circumstance that the creation of Euratom would, in fact, lead to the removal of any restrictions in the production of atomic

energy, which are now being contemplated in relation to West Germany. This would permit the revenge-seeking West German circles to organize in their country production of atomic weapons, which would create a serious threat to the cause of peace in Europe.

The Soviet Union has always stood and continues to stand for wide international cooperation in the peaceful use of atomic energy. It does not make a secret of its achievements in the peaceful application of atomic energy and willingly shares it with all countries. It is giving effective assistance to several countries in the development of research in the fields of nuclear physics and the uses of atomic energy for peaceful aims, in the construction of atomic reactors, training of specialists, and so forth.

To bring about the cooperation of scientists in various countries in theoretical and experimental research in the field of nuclear physics and to broaden the possibilities for the use of atomic energy for peaceful purposes, on the initiative of the Soviet Union a conference was convened in Moscow in March 1956 of representatives of eleven countries of Europe and Asia who concluded an agreement on setting up an international scientific research organization under the name of the Joint Institute of Nuclear Research. In accordance with the agreement, the Soviet Government has handed over to the Joint Institute of Nuclear Research, the Institute of Nuclear Problems and the Electro-Physical Laboratory with all their unique equipment.

It is clearly provided for in the agreement that other states, wishing in the future to take part in the work of the Institute, can state their agreement with the articles of the agreement, and, following a decision of the majority of the members of the Institute, become members of the latter, with equal rights. Thus, the Joint Institute of Nuclear Research, open to other countries for participation, is destined to become an important center of cooperation between scientists of different states.

Proceeding from the fact that exchange of knowledge and experience in the field of the peaceful utilization of atomic energy will be a powerful incentive for the further development of atomic science and will contribute to the elimination of suspicion and distrust in this field, the Soviet Union submitted in April 1956, for examination by the 11th session of the European Economic Commission, a proposal on creating, within the framework of this organization, a body to deal with questions of the utilization of atomic energy for peaceful purposes.

Introducing this proposal, the Soviet Government proceeded from the fact that some countries, especially small countries, do not have the ability to solve by themselves the complex questions connected with the peaceful utilization of atomic energy. Such questions as the training of scientific cadres, the creation of a material base for the development of scientific research work, the setting up and development of the production of atomic

energy for peaceful purposes are very complex matters which demand huge expenditures and the existence of a corresponding technical base. Without doubt, the broad cooperation of all European states in this field will speed up the development of the production of atomic energy for peaceful purposes and will to a large extent, contribute to raising the well-being of the peoples.

Attributing great importance to cooperation in the field of peaceful utilization of atomic energy, the Soviet Government holds that the time has come for convening a conference of the countries of Europe for the discussion of the question of setting up a general European regional body for the peaceful utilization of atomic energy. Such a body could be set up on an inter-government basis, with the participation of all the European states wishing to join. The United States could also participate in such a body.

In the opinion of the Soviet Government, such a conference could discuss the question of the rights and powers of the above-mentioned body, while bearing in mind that its competence should include such questions as, for instance, the study of the economic aspects of the peaceful utilization of atomic energy; study of the possibility of coordinating the utilization of raw material resources; the rendering of technical assistance; exchange of information; granting of technical and scientific consultation by states advanced in the atomic field, to other states; assistance through cadres; discussion of the question of maintaining permanent relations between the international and national organizations existing in Europe in the field of the utilization of atomic energy for peaceful purposes.

The conference could, of course, examine any other proposals of states regarding the extension of international cooperation in the field of peaceful utilization of atomic energy.

It goes without saying that a broad development of general European cooperation in the task of peaceful utilization of atomic energy by no means excludes bilateral agreements in this field. On the contrary, bilateral agreements, concluded on the basis of equality and without imposing on one of the parties any political, economic, military, or other demands incompatible with the principles of respect for the sovereignty and independence of states, will contribute to the unification of the efforts of the states and to cooperate between them in the field of utilization of atomic energy for peaceful purposes.

The Soviet Government expresses its conviction that the governments of all interested countries will respond with suitable attention to the appeal of the Soviet Union for uniting their efforts in this important field. It expresses its conviction that such cooperation of all European states would contribute to a large extent to reaching an agreement on banning the atomic and hydrogen weapons and eliminate them from the armaments of the

states—which, in its turn, would secure the utilization of all nuclear materials exclusively for peaceful purposes, for the progress of science and technology, for the use of the people.

ITEM 4

Declaration of the U.S.S.R. Ministry of Foreign Affairs on Plans to Create Euratom and a "Common Market" *

At the present time the governments of France, the German Federal Republic, Italy, Belgium, Holland and Luxemburg are preparing the creation in Western Europe of two new closed organizations, a "partnership" of the six named countries in atomic energy (the so-called "Euratom") and a "common market," within whose framework is planned the gradual abolition of customs duties in the economy of each of the countries, "free" movement of labor force and capital, and joint exploitation by the participating countries of French, Belgian and Dutch colonial domains.

In view of the fact that the plans to create Euratom and the "common market," which concern problems of economic cooperation and cooperation in the use of atomic energy (problems which are important ones for all European countries), envisage measures whose fulfillment will entail dangerous consequences for the peoples of Europe, the U.S.S.R. Ministry of Foreign Affairs has been authorized to make the following declaration.

The Soviet Union has constantly sought, and now seeks, the fullest development of international economic cooperation, including cooperation in the use of atomic energy for peaceful purposes, since such cooperation corresponds to the interests of all countries, strengthens confidence between peoples, and creates a solid basis for the peaceful co-existence of states.

The Soviet Union attaches special importance to the establishment of such cooperation in Europe on an all-European basis, inasmuch as it would contribute to overcoming the division of Europe into opposed military groupings, which (division) has been the result of the Western powers' policies, and would contribute to European peace.

The devolopment of peaceful production of atomic energy on a wide scale in European countries would open up favorable perspectives for the development of economy, science and culture, and for the increased well-being of the peoples. The use of the tremendous opportunities which peaceful utilization of atomic energy gives naturally requires a corresponding productive and scientific-technical base, and the united efforts of the states in organizing the broad industrial production of atomic energy. Therefore the Soviet government regards with understanding the aspira-

* Pravda, March 17, 1957, p. 3.

tions of various European states, especially those which do not have sufficient resources and technical experience at their disposal to carry out work in this field, to unite their efforts and opportunities for peaceful use of atomic energy and to make use of the scientific and technical experience which has been accumulated by other countries.

The Soviet government understands equally well the interest of European countries in establishing broad economic cooperation in all other fields. The broadening of economic cooperation between European countries would have a highly favorable effect on the development of these countries' economy, on increased employment, and on the improvement of the living standard of the population. It would exert a positive influence on the world economic situation as a whole. Economic cooperation on an all-European basis would assist in restoring traditional trade ties and scientific-technical ties which have been destroyed; it would help overcome artificial obstacles and limitations in the area of commercial and other economic relationships; it would bring European states closer to one another, and would increase the European peoples' sense of security and faith in the morrow.

However, the plans to create Euratom and the "common market" stand in clear contradiction to these aims. One's attention is drawn first of all to the fact that all the members of Euratom and the "common market" are members of the military grouping, NATO. It is obvious that the entire activity of Euratom and the "common market" will be subordinated to the aims of NATO, whose aggressive character is widely known.

Under such conditions the fulfillment of plans to create Euratom and the "common market" will inevitably lead to a further deepening of the division which splits Europe, to the increase of tension in Europe; it will greatly complicate the establishment of economic and political cooperation on an all-European basis; it will create new difficulties in solving the problems of European security.

New and serious obstacles will also arise in the path of restoring the national unity of the German people, since Western Germany will be still more deeply drawn into the system of closed military groupings of the Western powers which are opposed to other European states. In this connection it is necessary to note the understandable concern expressed by the Social Democratic Party through its leader Ollenhauer in his declaration of March 6th of this year, in which he pointed out a number of dangerous consequences for the German people in the plans to create Euratom and the "common market."

The affirmations of certain leading statesmen in the Western countries to the effect that Euratom and the "common market" will concern themselves exclusively with problems of peaceful cooperation among the participating countries represent nothing more than a concealment of the actual

plotting of their organizers and originators. One must not forget that certain United States circles which actively support the creation of Euratom are seeking the earliest possible restoration of German militarism and the equipment of the already-created West German army with all types of modern arms, including atomic arms. As is known, it was on the initiative of the United States that a decision was made on this question at a NATO Council session in December, 1956. The creation of Euratom will be a practical step in the fulfillment of these aggressive plans, so dangerous for all peoples.

There can be no doubt that revenge-seeking circles in Western Germany will miss no opportunity to use Euratom for accumulating atomic materials and raw materials in order more quickly to prepare for the production of their own atomic weapons. In this way, the creation of Euratom will clear the way for German militarism to prepare for new military adventures; in the middle of Europe there will again arise a dangerous center of unrest. In this connection, however, it must again be noted that the equipment of the West German army with nuclear weapons will be pregnant with dangerous consequences, above all for the population of West Germany itself, which may find itself the object of a retaliatory atomic blow.

Concerning the plans of the ruling circles of certain West European countries to use Euratom as a means of controlling the production of atomic energy in Western Germany, such plans have been shown by experience to be without foundation. It is well known that when the European Coal and Steel Union was created, the French government, seeking to ensure ratification of the agreement to create this Union by the French parliament, also declared that it would be possible by way of this Union to gain control over Western Germany's war-industry potential. Seeking the ratification of the Paris agreements, the French government asserted that these agreements would be a means of achieving military control over Western Germany. It is now clear to all that these calculations proved illusory. The creation of Euratom—regardless of others' wishes—will inevitably lead to the removal of all limitations in the field of atomic arms production in Western Germany, and this will create a direct threat to the people of France as well as to the peoples of other West European nations.

Equally without foundation are the plans of certain circles in France, Italy, and other West European states that the creation of Euratom will contribute to a lessening of these countries' economic dependence on the United States. On the contrary, their dependence on the U.S.A. will only increase, to the detriment of the national sovereignty of the countries participating in this grouping, since the United States—and nobody attempts to conceal this fact—will in reality control Euratom, acting in the capacity of chief supplier of fissionable materials and of equipment for atomic

production in Euratom countries. It is not by accident that influential circles in England have come out against England's joining Euratom, realizing full well the consequences which participation in it would have for England.

The plan to create a "common market" likewise represents a serious threat for the peoples of European countries. . . .

. . . Proceeding from these considerations, the Soviet Union has already put forth a number of suggestions aimed at establishing genuinely all-European cooperation:

1. In April, 1956, at the eleventh session of the European Economic Commission of the United Nations, the Soviet Union introduced a proposal to create, within the framework of this commission, an organ dealing with questions of utilizing atomic energy for peaceful purposes. This proposal is included in the agenda of the twelfth session of the United Nations' European Economic Commission, which opened on April 29th of this year.

2. In its declaration "On All-European Cooperation in Peaceful Utilization of Atomic Energy" of July 12, 1956, the Soviet government proposed that a conference of all the European countries be convened to discuss the question of creating an all-European organization on peaceful utilization of atomic energy, bearing in mind that this organization would be a regional division or department of the International Atomic Energy Agency. In the opinion of the Soviet government, such an organization could be founded on an inter-governmental basis, with participation in it by all interested European states, and also by the United States.

This regional organization for peaceful use of atomic energy, as suggested by the Soviet Union, would not be directed against any state or group of states and would not act counter to any national interests whatever.

Cooperation in the framework of an all-European regional organization on atomic energy would, beyond any doubt, be able to contribute to the progress of each of the European countries in the peaceful utilization of atomic energy and to the raising of the European peoples' living standards, not to mention the fact that it would be an important means of improving the situation in Europe generally.

The establishment of all-European cooperation in peaceful utilization of atomic energy would contribute in many respects to a solution of the most urgent modern-day problem: the prohibition of atomic and hydrogen weapons as weapons of mass destruction.

Guided by its desire to contribute to a positive solution of the problem of all-European cooperation in the peaceful utilization of atomic energy, the Soviet government proposes that certain supplementary problems be considered, including the following:

a) the creation of a scientific-research institute or institutes in atomic energy, on an all-European basis;

b) cooperation in creating enterprises for producing atomic energy for industrial and scientific-research purposes, including problems of ensuring a supply of raw materials for these enterprises.

It goes without saying that, when cooperation in peaceful utilization of atomic energy is made possible on an all-European basis, European countries will have the opportunity to take advantage of the Soviet Union's experience in this field. . . .

. . . The Soviet government is ready to consider any other proposals concerning principles and forms of all-European economic cooperation, as well as cooperation in the peaceful use of atomic energy.

The Soviet government believes that the proposals outlined above for all-European economic cooperation and cooperation in peaceful use of atomic energy may be considered at the twelfth session of the United Nations' European Economic Commission.

The Soviet government hopes that the governments of all interested lands will give due attention to the Soviet Union's proposal on the question of all-European economic cooperation and of cooperation in the field of peaceful use of atomic energy.