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## **Medical Utopias**

René J. Dubos

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# Medical Utopias

RENÉ J. DUBOS

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## MEDICAL UTOPIAS

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**M**EDICINE has been called the mother of sciences. In the minds of most medical men the "basic sciences" are identified with the physical, chemical, and biological theories and techniques used in the laboratory. And indeed, it is apparent that the laboratory has provided the most successful opportunities for the interplay between medicine and basic science during modern times. True enough, the study of psychoses has also revealed fascinating phenomena that throw light on other aspects of human nature, but few of these can as yet be studied in the laboratory. It is probably for this reason that the study of the mind does not rate high among "basic sciences."

The present subject occupies an even lower place in the pecking order of sciences. My thesis is that the study of disease has contributed much to the understanding of man as part of the social body, and therefore to the science of human ecology. An epigram published in the London *Spectator* shortly after the First World War defines succinctly some important aspects of medical sociology.

Science finds out ingenious ways to kill  
Strong men, and keep alive the weak and ill—  
That these a sickly progeny may breed  
Too poor to tax, too numerous to feed.

The problems of human ecology, so well summarized in this epigram, are too complex to be dealt with in a single article, and I shall limit my discussion to a very narrow aspect of the field. Perhaps the easiest way to define my topic is to present it—very crudely—in the form of two alternatives. Can we hope that the knowledge

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gained by the study of disease will greatly lighten the burden of medical care in the future? Or will new problems of disease endlessly arise and require ever increasing scientific and social efforts, making of medical Utopia a castle in the air that can exist only in the Erewhon of political Utopia?

It is my impression that the first alternative is the one most generally regarded as probable. In fact, it is clear that the lay and paramedical organizations established during the past fifty years to deal with problems of health are based on the optimistic assumption that, given enough time and financial resources, science can develop techniques to prevent or cure most diseases, and that only social and economic limitations will in the future stand in the way of ideal health. Anyone who has dealt with Congressional appropriation committees knows that the present flow of public money for medical research is based on the conviction that science will provide ways to eliminate disease. I wonder whether the attitude of fund-granting agencies would be as generous as now if they knew that it will continue to take all the running we can do to remain at the same place.

To state it bluntly, my personal view is that the burden of disease is not likely to decrease in the future, whatever the progress of medical research and whatever the skill of social organizations in applying new discoveries. While methods of control can and will be found for almost any given pathological state, I believe nevertheless that disease will remain a problem, and will merely change its manifestations according to social circumstances. Threats to health are inescapable accompaniments of life.

Health is an expression of fitness to the various factors of the total environment, and fitness is achieved through countless genotypic and phenotypic adaptations to these factors. Any change in the environment demands new adaptive reactions, and disease is the consequence of inadequacies in these adaptive responses. The more rapid and profound the environmental changes, the larger the num-

ber of individuals who cannot adapt to them rapidly enough to maintain an adequate state of fitness and who therefore develop some type of organic or psychotic disease. "It is changes that are chiefly responsible for diseases," wrote Hippocrates in Chapter XV of *Humours*, "especially the great changes, the violent alterations both in seasons and in other things." And he stated again in *Regimen in Acute Diseases*, "The chief causes of disease are the most violent changes in what concerns our constitutions and habits."

A perfect policy of public health could be conceived for colonies of social ants or bees, whose habits have become stabilized by instincts. Likewise, it would be possible to devise for a herd of cows an ideal system of husbandry with the proper combination of stables and pastures. But unless men become robots, their behavior and environment fully controllable and predictable, no formula can ever give them permanently the health and happiness symbolized by the contented cow. Free men will develop new urges, and these will give rise to new habits and new problems, which will require ever new solutions. New environmental factors are introduced by technological innovations, by the constant flux of tastes, habits, and mores, and by the profound disturbances that culture and ethics exert on the normal play of biological processes. It is because of this instability of the physical and social environment that the pattern of disease changes with each phase of civilization, and that medical research and medical services cannot be self-limiting. Science provides methods of control for the problems inherited from past generations, but it cannot prepare solutions for the specific problems of tomorrow because it does not know what these problems will be. Physicians and public health officials, like soldiers, are always equipped to fight the last war. Before proceeding further with this theme, however, it is only fair that I outline briefly the more optimistic attitude taken by many of the social philosophers and scientists in the course of history.

SOME of the thinkers of classical Greece certainly believed that reasonable men could achieve the millennium of health by the exercise of wisdom. Witness the cult of Hygeia, which symbolized the faith that men could enjoy *mens sana in corpore sano* if they lived according to reason. Carrying this doctrine to its logical conclusion, Plato wrote that the need for many hospitals and doctors was the earmark of a bad city; there would be little use for them in his ideal Republic. In Imperial Rome, Tiberius asserted in a similar vein that anyone who consulted a doctor after the age of thirty was a fool for not having yet learned to regulate his life properly without outside help. In contrast, medieval Christianity had little faith in the possibility of creating a medical Paradise on earth. But after the Renaissance, Thomas More and all utopists that followed him popularized imaginary states so well organized that their medical needs could be foreseen and provided for just as certainly as their political and economic problems. Describing the ideal society he imagined on the moon, Cyrano de Bergerac asserted, "In every house there is a Physionome supported by the state, who is approximately what would be called among you a doctor, except that he only treats healthy people."<sup>1</sup>

The French Encyclopedists believed that all health problems could be solved by science, and Condorcet envisaged an era free from disease, in which old age and death would be infinitely postponed. Echoing this faith, Benjamin Franklin wrote to Joseph Priestley that "all diseases may by sure means be prevented or cured, not excepting that of old age, and our lives lengthened at pleasure even beyond the antediluvian standard." Continuing the traditions of the Enlightenment, Rudolph Virchow preached in his journal *Medizinische Reform* that misery was the breeder of disease, and that the key to the general improvement of health would be found in the improvement of social conditions. In one form or another, projections of

Utopia have continued until our time. In James Hilton's *Lost Horizon*, the lamas living in Shangri-La, miles from corrupting influences, had mastered the secret of long life. In his book *My First Days in the White House*, Huey Long listed high on his program a plan to provide adequate medical care for the whole country—giving the job to the Mayo brothers!

Faith in the powers of man to eradicate disease had been greatly strengthened, of course, by the spectacular scientific achievements of the nineteenth century. In 1900 Hermann Biggs, then Commissioner of Health of New York State, adopted for his department the motto "Public Health is Purchasable. Within Natural Limitations Any Community Can Determine its Own Death Rate." In 1958 the same faith was repeatedly expressed on the occasion of the tenth anniversary of the World Health Organization. The authors of the WHO pamphlet *Ten Years of Health Progress* recognized, of course, that large problems remained to be solved, and that "as one disease is eradicated . . . others grow in importance," but Dr. Axel Hojer voiced their collective confidence that through the technique of scientific knowledge "man seems to have found out how to make his dreams of paradise on earth come true." And still more recently, Dr. M. G. Candau, Director-General of WHO, affirmed:

If the great advances gained in science and technology are put at the service of all the people of the world, our children will live in an age from which most of the diseases our grandparents and parents took for granted will be banished. It may no longer be Utopian to envisage a new chapter in the history of medicine.

Medical scientists may be skeptical of social Utopias designed on the basis of political theories, but they rarely doubt that mankind would soon achieve the millennium if their own theories derived from "basic sciences" were put into practice.

The widespread conviction that health is purchasable, not only in limited areas but also on a world scale, seems to be substantiated by



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the advances made during the past half-century in the fields of nutrition and infection. In reality, however, it has not yet been shown that these achievements justify the wide extrapolations made from them. Indeed, there is overwhelming historical evidence that the evolution of diseases is influenced by many determining factors that at present are not, and may never become, amenable to social or medical control. The changes that have spontaneously occurred in the prevalence of various diseases during the past few centuries should serve as warning that it is unwise to predict the future from the short perspective of the past decades.

Granted the lack of precise information, it is clear nevertheless that many diseases have undergone ebbs and flows in their prevalence and severity. Plague invaded the Latin world during the Justinian era. Leprosy was prevalent in Western Europe until the sixteenth century. Plague again reached catastrophic proportions during the Renaissance. Several outbreaks of the sweating sicknesses terrorized England during Tudor times. Syphilis spread like wildfire shortly after 1500. Smallpox was the scourge of the seventeenth and eighteenth centuries. Tuberculosis, scarlet fever, diphtheria, measles, took over when smallpox began to recede. Today virus infections occupy the focus of attention in our medical communities. And long before viruses had become scientifically fashionable, pandemics of influenza at times added a note of unpredictability to the pattern of infection.

Awareness that diseases come and go for mysterious reasons is not new. Malthus had sensed the phenomenon when he wrote in 1803, "For my part, I feel not the slightest doubt that, if the introduction of the cow pox should exterminate the small pox we shall find a very perceptible difference in the increased mortality of some other disease." More recently, the historical and geographic aspects of the problem were documented by August Hirsch in his monumental *Handbook of Geographical and Historical Pathology*.<sup>2</sup> The matter was interestingly discussed by Charles Anglada in *Etudes sur les maladies*

*éteintes et sur les maladies nouvelles*, and by Maurice Nicolle in his famous book *Naissance, Vie, et Mort des Maladies Infectieuses* showing that such events are often governed by forces independent of conscious human intervention. Most explicit perhaps was the statement made in 1873 by William Parr in his letter to the Registrar General:

The infectious diseases replace each other, and when one is rooted out it is apt to be replaced by others which ravage the human race indifferently whenever the conditions of health are wanting. They have this property in common with weeds and other forms of life, as one species recedes another advances.

I have selected infection to illustrate ebbs and flows in the prevalence of disease because of my greater familiarity with this field. But anyone with specialized knowledge could provide just as telling examples in other areas of medicine. With regard to nutrition, Lucretius was already aware of the problem when he wrote two thousand years ago, "In the old days lack of food gave languishing limbs to Lethe. On the contrary, today surfeit of things stifles us."

Coming now to our times, who could have dreamt a generation ago that hypervitaminoses would become a common form of nutritional disease in the Western world? That the cigaret industry and the use of x-rays would be held responsible for the increase in certain types of cancers? That the introduction of detergents and various synthetics would increase the incidence of allergies? That advances in chemotherapy and other therapeutic procedures would create a new staphylococcus pathology? That alcoholism would become widespread in the Western world? That patients with all forms of iatrogenic diseases would occupy such a large number of beds in the modern hospital?

We may take it for granted, I believe, that the pattern of disease will continue to change, and that as new types of pathology arise the solutions worked out for the problems of yesterday and of today will not be entirely applicable, if applicable at all, to the problems of

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tomorrow. For the sake of illustration, let me try to imagine a few of the problems that may be anticipated in the near future.

In the field of infectious diseases, we need not go far for examples because the future is already with us. While mortality from acute bacterial infections is at an all-time low, chronic disorders of complex and ill-defined microbial etiology loom larger and larger on the horizon. In England chronic bronchitis is at present the second in causes of death and the largest cause of disability. It claimed 37,000 lives in 1951, and accounted for the certified loss of 26.6 million working days among the insured population. Chronic bronchitis illustrates the fact that air pollution and many other factors associated with life in urbanized and industrialized areas can give to otherwise trivial infections of the respiratory tract certain pathological characters that make them impervious to drug treatment and other methods of therapy.

As to the part to be played by viruses in the future, it need only be mentioned that the development of modern sanitation has begun to bring about a progressive shift of childhood diseases into adult life—with consequences that we are only now beginning to recognize. Even with regard to uncomplicated bacterial infections, the time is probably approaching when many of the chemotherapeutic agents presently in use will lose their effectiveness. The case of the staphylococcus is in everybody's mind; recent reports from Poland, England, Japan, and Denmark reveal that the gonococcus is becoming resistant to penicillin; and there is no doubt in my mind that the indiscriminate use of isoniazid, particularly in the underdeveloped parts of the world, spells the end of convenient drug control of tuberculosis within a very few decades. New drugs will of course be discovered, but it is unlikely that discovery will keep pace with need. In this regard, it seems relevant to quote here the conclusion reached by S. W. Simmons in a recent critical review of "The Current Status of Insecticide Resistance":

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It is evident that the extermination of vectors with residual insecticides is probably not feasible. We appear to be in an endless cycle of synthesizing, at an ever increasing cost, more and more insecticides to which vectors become more and more resistant. Thus, it seems we cannot go on forever relying on insecticides. A more final and permanent solution to the vector-borne diseases problem might lie in ecologic control.<sup>3</sup>

In contrast to infectious diseases, the field of nutrition would at first appear to hold few surprises for the future. There is reason to believe that nutritionists have identified most if not all the growth factors required by man, and that they can devise formulae satisfactory for all ages of life and for the various occupations. But the application of this knowledge is proving more difficult than its acquisition. Both qualitatively and quantitatively, human requirements vary with the pattern of daily life; and habits as well as tastes change so fast that there is no time for orderly adjustments. Shakespeare made Nerissa say in *The Merchant of Venice*, "They are as sick that surfeit with too much as they that starve with nothing." Only now is it becoming a problem of general concern that what used to be a reasonable diet for a physically active man can be ill-balanced for the citizen wheel-borne in the modern world. Dietary habits that were adequate yesterday may come to constitute a national danger in the era of television and automation.

For the largest part of the world, of course, the real concern is not overnutrition, but rather shortage of food. And this is rapidly creating new problems of disease in poor countries where death rates have been cut by partial control of infection. Agricultural and industrial technology will no doubt provide new sources of carbohydrates, fats, proteins, amino acids, and vitamins in amounts sufficient to meet essential human needs. But it can be surmised also that the consumption of new kinds of food will bring in its train new types of medical problems. Nutritional disease can arise not only from qualitative or quantitative deficiencies, but also from toxic effects, which are often slow in manifesting themselves. For example, algae are much spoken

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of as economical synthesizers of foodstuffs, but there are several reports that the continued consumption of large amounts of algae by farm or laboratory animals has resulted in a hepatic toxicity of unknown mechanism. Other examples of hepatic toxicity that became apparent only after long-term use of certain new foodstuffs have been reported in a recent symposium on Human Requirements and their Fulfillment in Practice.<sup>4</sup> Scientific knowledge is not yet sufficient to replace the biological wisdom derived from the countless centuries during which mankind has engaged in the empirical trial of foodstuffs.

Many examples could be quoted to support the statement that technological advances carry with them threats to health revealed only by long experience, and often too late. These threats extend from mere inconveniences like allergies, to the delayed carcinogenic effects exerted by radiation and by the various types of synthetic substances with which modern man increasingly comes into contact. Most industrial processes pollute the air, the water, and the rest of the environment with countless new chemicals and thereby prepare for the future various pathological disorders of types as yet unsuspected. Even air-conditioning may turn out to have physiological and pathological consequences that have not yet been recognized.

Changes in social patterns also will contribute their share of unpredictability to the health problems of the future. As our population grows and our natural resources decrease proportionally, there will be need for ever increasing organization, regulation, and even regimentation in our lives. It is hard to believe that the physiological and psychic effects of this transformation of collective life will all be favorable to physical and mental health. There is already evidence that the boredom engendered by automation is creating new forms of psychosis, and it will become increasingly difficult for society to manage a proper balance between its intake of tranquilizers and of energizers.

More dramatic in its implications, because so intimately involved in our system of ethics, is the fact that the very medical and social advances of which we are so justifiably proud are likely to create difficult if not insoluble problems for the generations to come. Speaking of our "load of mutations," H. J. Muller has repeatedly emphasized that, as medical science becomes more effective in permitting the survival of biologically defective individuals, there will be an increase in the frequency of detrimental genes allowed to accumulate in our communities. If this trend continues, in Professor Muller's words:

Instead of people's time and energy being mainly spent in the struggle with external enemies of a primitive kind such as famine, climatic difficulties, and wild beasts, they would be devoted chiefly to the effort to live carefully, to spare and to prop up their own feeblenesses, to soothe their inner disharmonies and, in general, to doctor themselves as effectively as possible. For everyone would be an invalid, with his own special familial twists.<sup>5</sup>

In a recent essay on "The Control of Evolution in Man," Darlington expressed tersely the same thought:

Those who were saved as children return to the same hospital with their children to be saved. In consequence, each generation of a stable society will become more dependent on medical treatment for its ability to survive and reproduce.<sup>6</sup>

It is misleading, of course, to speak of biological defectives without regard to the environment in which the individual lives and functions. Medical techniques can make up for genetic and other deficiencies that would be lethal in the wilderness; by controlling the environment, and with the help of modern medical resources, man can live and function effectively in our world even though he is tuberculous, blind, diabetic, crippled, or psychopathic. But fitness bought at the cost of medical care has economic implications that have not yet been precisely determined. There is no doubt that a large percentage of individuals are now unable to pull their full

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weight in our communities, and we may assume that their numbers will continue to increase at an accelerated rate, precisely by reason of medical progress. Furthermore, it is also likely that the cost of medical care will continue to soar because each new discovery calls into use more specialized skills and expensive items. At the present time the cost of medical care in the United States amounts to more than 10 per cent of the national income. There is certainly a limit to the percentage of its resources that society can devote to the maintenance of its medical establishments; and a time may come when medical ethics will have to be reconsidered in the harsh light of economics.

The use of anticoagulents for the prevention of coronary thrombosis is a case in point. Although the value of this procedure has been established beyond doubt (see recent survey by the Medical Research Council in England), its application will be limited by its cost, for example by the labor involved in the determination of blood-clotting time. In other words, the medical justifications for the use of anticoagulents will need to be influenced by social criteria. Surgery for the repair of congenital heart defects provides another striking example, by reason of its exacting requirements in nursing care, hospital space, elaborate equipment, and technical skill. Finally, it must not be taken for granted that the power of science is limitless. After all, it is only during the past few decades that medical treatment has permitted the victims of genetic disabilities to survive and to reproduce on such a large scale. Should the trend continue, it is far from certain that therapy can keep pace with the problems that will have to be met to avoid biological extinction. Indeed, I would be surprised if the medical geneticist of the future did not rate the sociological aspects of his science as more important than its contribution to biochemistry.

THE POLITICAL Utopias devised by Plato, Thomas More, and their imitators have no chance of success because they are based on a static view of the world and of men. H. G. Wells defined the problem clearly in his book *A Modern Utopia*:

The Utopia of a modern dreamer must needs differ in one fundamental aspect from the Nowheres and Utopias men planned before Darwin quickened the thought of the world. Those were all perfect and static forces, a balance of happiness won for ever against the forces of unrest and disorder that inhere in things. But the Modern Utopia must be not static but kinetic, must shape not as a permanent state but as a hopeful stage.<sup>7</sup>

Similarly, it is impossible to acquire in advance all the specialized knowledge and techniques that will be required to deal with the diseases of the future. What may be worth asking, however, is whether medical science can help the individual and society to develop a greater ability to meet successfully the unpredictable problems of tomorrow. This is an ill-defined task for which there is hardly any background of knowledge. Traditionally, medicine is concerned with retarding death and also with preventing pain and minimizing effort. Its achievements in this field have added greatly to the duration, safety, and charm of individual existence. While scientific medicine has continued to emphasize the detailed study of particular diseases and specific remedies, it has placed less emphasis on the non-specific mechanisms by which the body and soul deal with the constant and multifarious threats to survival. The question is whether it is possible to increase the ability of the individual and of the social body to meet the stresses and strains of adversity. In this regard it may be worth considering that preoccupation with the avoidance of threats and dangers does not have the creative quality of goal-seeking. It is at best a negative attitude, one that does not contribute to growth, physical or mental. In our obsession with comfort and



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security, we have given little heed to the future, and this negligence may be fatal to society and indeed to the race.

Whatever the theories of physicians, laboratory scientists, and sociologists, it is of course society that must decide on the types of threats it is most anxious to avoid and on the kind of health it wants — whether it prizes security more than adventure, whether it is willing to jeopardize the future for the sake of present-day comfort. But this decision might be and should be influenced by knowledge derived from a study of the manner in which different ways of life can affect the future fate of the individual and of society. Although this knowledge does not yet exist, a few general remarks appear justified.

It is a matter of common experience that, while man's physical and mental resources cannot develop to the full under conditions of extreme adversity, nevertheless a certain amount of stress, strain, and risk seems essential to the full development of the individual. Normal healthy human beings have long known, and physiologists are beginning to rediscover, that too low a level of sensory stimulation may lead to psychotic disorders, and that man functions best when a sufficient number of his neurons are active. Analogous considerations seem to be valid for the lower levels of biological functions, and two recent studies illustrate that at least some of the mechanisms involved in training and in adaptability are not beyond experimental analysis.

It has been shown by Dr. Curt P. Richter and his associates that the domesticated laboratory rat differs from its wild ancestor, the Norway rat, in many anatomic and physiologic characters that can be measured by objective tests. As a result of selection and of life in the sheltered environment of the laboratory, the domesticated rat has lost most of the ability of its wild ancestor to provide for itself, to fight, and to resist fatigue as well as toxic substances and microbial diseases. The domesticated rat has become less aggressive in behavior but also less able to meet successfully the strains and stresses of life,

and therefore it could hardly survive competition in the free state. As a result of domestication, in Dr. Richter's words:

1) the adrenal glands, the organs most involved in reactions to stress and fatigue, and in providing protection from a number of diseases, have become smaller, less effective . . . 2) the thyroid—the organ that helps to regulate metabolism, has become less active . . . 3) the gonads, the organs responsible for sex activity and fertility, develop earlier, function with greater regularity, bring about a much greater fertility. . . . The finding of a smaller weight of the brain and a greater susceptibility to audiogenic and other types of fits, would indicate that the brain likewise has become less effective.<sup>8</sup>

While some of these changes may be phenotypic, it is probable that most of them are the expression of mutations selected by life in the laboratory. But whatever their mechanism, the effects of domestication on the wild rat are not without relevance to the future of mankind. Human societies made up of well-domesticated citizens, comfort-loving and submissive, may not be the ones most likely to survive.

The study of so-called germ-free animals has revealed other aspects of this problem. Animals born and raised in an environment free of detectable microorganisms can grow to a normal size and are capable of reproducing themselves for several generations, but they exhibit extraordinary susceptibility to infection, even to the most common types of microorganisms that would be innocuous for animals raised in a normal, exposed environment. Furthermore, germ-free animals produce only small amounts of lymphoid tissue, and their plasma is extremely low in gamma globulin—deficiencies that may be of little consequence in the protected environment of the germ-free chamber, but that become fatal under normal conditions of life.

These types of experimental situations illustrate the fact that a sheltered life alters in many ways the ability of the organism to cope with the stresses of life. "Let a man either avoid the occasion alto-

gether, or put himself often to it, that he may be little moved with it," Bacon wrote in his essay *Of Nature in Men*. While Bacon's aphorism is a picturesque statement of an important sociomedical problem, the solution that it offers hardly fits the modern world. Man cannot "put himself often to threats" the nature of which he cannot anticipate. But he can perhaps cultivate the biological mechanisms that will permit him to respond effectively when the time of danger comes.

THUS, a type of knowledge that bears on social philosophy is slowly emerging from preoccupations with medical problems. After a semi-facetious debate held in London on 17 November 1952, the Hunterian Society voted 59 to 47 "that the continued advance in medicine will produce more problems than it solves." In reality, most of the new problems continuously arising are not the products of medical advances, but manifestations of the fact that our society becomes more complex as it grows in size and age. We cannot escape these problems, but we should give more thought to the long-range effects of the solutions that we devise to meet them.

We must have the courage to discuss the wisdom of retaining individual longevity as the dominant criterion of social and medical ethics. We must be prepared to recognize that an excessive concern with security, with comfort, and with avoidance of pain and of effort, has dangerous economic and biological implications—that such concern may, in fact, amount to social and racial suicide. I realize that any attempt to deal with these problems will involve painful conflicts with personal interests and with religious and moral convictions. Yet we have to formulate the problems in a forthright manner if we are to find their solutions. Unless we discover methods for producing a higher level of adaptive power in the individual and for preventing genetic deterioration of the race, the likely alternative is that more

and more in the future we shall have to run frantically from one protective and palliative measure to another, trying to lengthen life at the cost of sacrificing its wholeness and many of its values.

Before closing, I must acknowledge that I have never taken care of the sick and am not a physician—a fact that has prevented me from apprehending with all their compelling force many of the human and practical aspects of medicine. Though fully aware of my lack of judgment arising from these deficiencies, I cannot refrain from quoting here a few lines from G. K. Chesterton, brought to my attention by a humane physician who is also a scientist:

The mistake of all that medical talk lies in the very fact that it connects the idea of health with the idea of care. What has health to do with care? Health has to do with carelessness. In special and abnormal cases it is necessary to have care. . . . If we are doctors we are speaking to exceptionally sick men, and they ought to be told to be careful. But when we are sociologists we are addressing the normal, we are addressing humanity. And humanity ought to be told to be recklessness itself. For all the fundamental functions of a healthy man emphatically ought not to be performed with precaution or for precaution.<sup>9</sup>

Chesterton was neither a scientist nor a physician, and as a sociologist he was prone to substitute brilliant paradox for logic and knowledge. Yet it seems to me that his flippant remarks help to quicken attention to an aspect of medicine that bids fair to become of increasing social importance in the future. Medical advances do not arise in a social vacuum. They are products of the sparks between the scientific knowledge of the time and the demands of the community. But what the community demands is determined to a large extent by publicity, apparent or hidden—in this case by the implied promises of medical science. We must beware lest we give the illusion that health will be a birthright for all in medical Utopia, or a state to be reached passively from effortless directives given by physicians or from drugs bought at the corner store. In the real world of the future,

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as in the past, health will depend on a creative way of life, on the manner in which men respond to the unpredictable challenges that continue to arise from an ever changing environment.

The study of specific pathological problems requires the use of laboratory techniques and contributes to the advancement of laboratory knowledge. But the field of medicine transcends this kind of knowledge because it deals with man as a spiritual being and also with the future of the human race. Medical science is concerned not only with the control of individual diseases, but also with the long-range effects of its products on the total performance and happiness of the individual, on the social problems of the community, and on the adaptive powers of the race. Unless medical scientists are willing to take a long-range view of the consequences of their activities, some day they may have to confess like Captain Ahab in *Moby Dick*, "All my means are sane . . . my object mad." They may come to know the anguish that atomic physicists experienced as they watched the tragic effects of their scientific triumphs. Because medicine is an aspect of social technology, its ethics and its goals are the products of the interplay between scientific understanding and human aspirations.

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