

1956

On Science and Philosophy

Harold D. Hantz

University of Arkansas, Fayetteville

Follow this and additional works at: <http://scholarworks.uark.edu/jaas>



Part of the [Philosophy of Science Commons](#)

Recommended Citation

Hantz, Harold D. (1956) "On Science and Philosophy," *Journal of the Arkansas Academy of Science*: Vol. 9 , Article 13.

Available at: <http://scholarworks.uark.edu/jaas/vol9/iss1/13>

This article is available for use under the Creative Commons license: Attribution-NoDerivatives 4.0 International (CC BY-ND 4.0). Users are able to read, download, copy, print, distribute, search, link to the full texts of these articles, or use them for any other lawful purpose, without asking prior permission from the publisher or the author.

This Article is brought to you for free and open access by ScholarWorks@UARK. It has been accepted for inclusion in Journal of the Arkansas Academy of Science by an authorized editor of ScholarWorks@UARK. For more information, please contact scholar@uark.edu, cmiddle@uark.edu.

ON SCIENCE AND PHILOSOPHY^{1/}

Harold D. Hantz
University of Arkansas

I am sure that some of you are thinking that only a philosopher would dare select a title so comprehensive, and even vague, as one "On Science and Philosophy." You are probably wondering whether or not there can be anything definite concerning a topic this broad. Like you, I hope that I shall have something more specific to say than the title might indicate. As a matter of fact, I had more specific titles, some fancy, some plain, but none quite appropriate. Finally I gave up on titles, trusting that if you were not driven away by the present one, you would be pleased to find any specificity whatsoever, and the title would then be forgotten, or at least forgiven.

My theme, then, is this: That the objectives of scientific inquiry in its best sense and of philosophic inquiry in its best sense are in many respects identical; that in the intellectual history of Western civilization the union of scientific and philosophic inquiry has often provided its most fruitful moments; and that separation of scientific inquiry and philosophic inquiry (a separation which in our day seems ever more acute) is perilous to both.

The initial step in exploring this theme consists in making as precise as possible the meaning of the expressions "scientific inquiry in its best sense" and "philosophic inquiry in its best sense." This step might be put somewhat more loosely as definitions of "science" and "philosophy." The step is

^{1/} A paper read at a general meeting of the Arkansas Academy of Science at the University of Arkansas, April 23, 1954.

ON SCIENCE AND PHILOSOPHY

not an easy one to take. "Why not?" you ask, "For surely every scientist knows what 'science' means and every philosopher knows, or should know, what 'philosophy' means." Let me illustrate what I mean by the difficulty of definition here, beginning with not even a definition of science in general, but one branch of science, physics. The definition is taken from a well-known textbook.(3) "Physics deals with the properties and phenomena of inanimate matter as affected by forces, and is especially concerned with the properties common to all kinds of matter and those changes of form and state which matter undergoes without being changed in kind, as well as such general phenomena as sound, heat, electricity, and magnetism." Now the definition may be technically sound, but it is pedagogically absurd. How many beginning students, for example, could do anything more than parrot the words? The student should find this definition meaningful at the close of the course, but hardly at the beginning. I cite this definition to point to a difficulty, not only for exploring the theme I have chosen, but also in a larger sense for communication among scientists and between scientists and laymen. We are immersed in disparate disciplines which become ever more technical. How do we tell the outsider what we are up to? Isn't this the way the questions come: "You are a mathematician, now what is mathematics?" "So you are a nuclear physicist. Fine, just what is nuclear physics all about?" And so it goes. And what do we answer? We give the kind of definition of "physics" above. I have done it many times for philosophy, myself. We have something pat, highly abstract, and generally meaningless to someone outside the field.

I hope you will bear with me a little more on this problem, for its implications for mutual understanding are important. Let me now take a definition of "science" from a respectable book on logic and scientific method by Cohen and Nagel. "We reserve

ARKANSAS ACADEMY OF SCIENCE

the term 'science' for knowledge which is general and systematic, that is, in which specific propositions are all deduced from a few general principles."(1) At first blush this definition seems clear enough and perhaps adequate insofar as such brevity can ever be adequate for extensive disciplines such as the sciences. But a little reflection presents certain stumbling blocks. By this definition St. Thomas Aquinas' Summa Theologica is science. The knowledge there noted is general and systematic. He deduces specific propositions, even to the adornment of women and the economics of the market place, from general principles. Yet today, a certain uneasiness develops when a definition of "science" embraces at once, without qualification, Thomas' Summa and Newton's Principia. Such a definition would seem to slur over important distinctions between the two works, and I doubt that I am alone in suspecting that the definition requires some clarification.

We are back where we started without a definition. It would be easy, but unprofitable here, to supply other definitions presenting difficulties. In view of such difficulties we might ask after the tremendous burst of scientific investigation over the past 300 years providing a vast store of knowledge, why is it so troublesome to state simply and clearly what science is? I suggest that one reason is this very growth of a considerable variety of sciences and that these sciences in turn are in varying stages of development. Physics is much older than sociology and possesses a precision which the latter cannot begin to approximate at the moment. Is it then possible to find a common core to the sciences such that the term "science" can be used in any meaningful way at all? With some recent writers the attempt is abandoned altogether to the extent that even the expression "scientific method" is considered naive. The new locution should rather be "scientific methods."

Before we too quickly accept this latest fad, I

ON SCIENCE AND PHILOSOPHY

shall be old-fashioned enough to suggest that it is still meaningful to speak of scientific method, and that if it is meaningful to speak of scientific method then the word "science" has significance at least in terms of a basic unity of method. Today no one, of course, will deny that the various sciences need instruments, techniques, and theoretical constructs appropriate to their particular problems. Clearly one of the retarding factors in the development of the social sciences was an almost blind aping of physics in the 17th and 18th centuries, especially as to approach and types of theory construction. The ideal in the social sciences was the achievement of a kind of social physics. In more than one writer, man was conceived as a social atom, motivated by various imputed forces -- pure selfishness, enlightened self-interest, a social sympathy, or one of these in common with reason, and so on, in much the same way as physical atoms moved in terms of the law of gravitation and the invariant laws of motion. Fortunately this unhappy mimicry of physics has been transcended. But if it has been transcended, does this mean that there is nothing in common between, say, physics and sociology?

I suggest that there are present in all scientific investigations certain factors or traits of sufficient importance to warrant our speaking of a common scientific method. What then are these common factors? I shall list them in one, two, three fashion, but I do not mean that they are so many serial steps followed in every inquiry. They are rather common traits.^{2/}

1. A problematic situation. The origin of scientific inquiry is in problematic situations, situations of indeterminacy, perplexity, doubt. It is these

^{2/} My indebtedness to methodological analyses of John Dewey will be obvious.

ARKANSAS ACADEMY OF SCIENCE

which generate investigations. The investigator who has no doubts, no questions, no perplexities, literally ceases to investigate. Inquiry is at an end. On the other hand, the seminal mind in a science is the mind that in a sense flourishes on doubt, perplexities, questions leading to the formulation of new problems. One of the prominent characteristics that distinguishes science from religion, as religion is frequently conceived, is precisely this search for novelty in contrast with a passion for certainty. There is, furthermore, a close relationship between the determination of problematic situations and a habit of mind of the scientist. This habit is that of holding his beliefs, even his most cherished and confirmed beliefs in some degree of suspension. Should this suspension become rigid, genuine inquiry ceases.

2. The careful formulation of a definite problem out of the problematic situation. This factor consists of procedures utilized to transform an initially perplexing, doubtful, indeterminate situation into one of greater precision. The techniques are numerous and usually include such matters as the examination of procedures and the results of investigations in allied problems and the search for significant as opposed to irrelevant elements in the situation under investigation.

3. The formulation of possible solutions to the problem or, in more sophisticated language, the development of hypotheses. The search may be brief or lengthy. The first proposal may be successful, or many alternatives may fail in the tests. All this is familiar. It is this element in the process which is perhaps the focal point of the creative activity of scientific inquiry. It is also here that the more systematic a science becomes, the more the symbolic formulation of hypotheses tends to be mathematical.

4. The testing of the hypotheses. From the 17th century to the present day the insistence has been

ON SCIENCE AND PHILOSOPHY

upon some sort of experimental situation for the testing or confirmation of hypotheses. If this experiential situation can be experimental, the actual manipulation of the conditions of the problem, so much the better. With the development of the experimental sciences, the testing is increasingly a function of instrumentation. In an important way the history of modern science is a function of the history of instrumentation. In 1925 Whitehead commented: "The reason why we are on a higher imaginative level than earlier scientists is not because we have finer imagination, but because we have better instruments. In science, the most important thing that has happened during the last forty years is the advance in instrumental design."(10)

5. The systematic development of the logical consequences of hypotheses. Sometimes an hypothesis is not directly testable; hence logical consequences are deduced, usually mathematically, for the purpose of finding testable situations. Thus Galileo could not test directly his hypothesis that the acceleration of a freely falling body was proportional to the time of the fall. A logical consequence is that the distance of the fall is proportional to the square of the times. This proposition could be experimentally confirmed. The situation was, of course, his classic inclined-plane experiment. Again, if an hypothesis is confirmed in one instance, what other consequences can be developed to be tested? As the confirming tests increase, confidence in the adequacy of the hypothesis grows.

Again, the five factors just described may, or may not, occur in the order named. The formulation of a definite problem, the formulation of hypotheses, the testing, the development of logical consequences interpenetrate one another in the actual reflection of the scientist as he goes about his work. But these factors can be discerned in the analysis of inquiry called scientific and constitute basic distinguishing traits of that inquiry.

ARKANSAS ACADEMY OF SCIENCE

The end results of inquiry as here described yield statements about "Comparative Effects of Total Body and Tail Heating on the Peripheral Leukocyte Count of the Rat," (7) or "The Effects of Wind-Drift of Weed-Killer on Some Puerto Rican Trees," (8) or "A New Dense Crystalline Silica," (9) or in other words, that vast store of experientially verified propositions or the so-called factual information about the physical, biological, and social world.

But scientific inquiry also yields statements of a higher degree of generality than those just noted; e.g., Galileo's Law of Falling Bodies, Boyle's Law of Gases, Ohm's Law, and the like. (I realize the term "law" is subject to criticism in contemporary methodological analyses. I merely mention these hypotheses as they are usually referred to in the literature.) Their greater generality comes in part from the large, perhaps indefinite, number of phenomena falling within the law.

Noting this matter of generality, we turn now to a sixth trait or element in scientific inquiry: The search for system and sometimes its achievement in terms of a relatively few abstract hypotheses from which propositions of less generality are deduced. This is that aspect of science referred to previously as Cohen and Nagel's definition of "science." To call it the meaning or the nature of science seems narrow, since this trait obviously is not present in every scientific investigation. It is more aptly called the ideal of science. A clue to this factor as an ideal is that such systematization is found only in the so-called advanced sciences. As a matter of fact, I suspect "advanced science" and "achievement of systematization" are equivalent expressions. In the early history of modern science the illustration which leaps to mind of this sort of ideal of science is Newton's Principia. There the work of investigations in certain branches of physics and of astronomy from Copernicus to Newton over a period

ON SCIENCE AND PHILOSOPHY

of 144 years received the consummate systematization. Because of this achievement Newton's name became in the 17th to the end of the 19th century virtually synonymous with science. It is this same sort of achievement of even a higher order of generality that in our own day Einstein has accomplished, I am told. (I have to add the "I am told" for I do not have the technical equipment to understand the mathematics of what he has accomplished.) I should like to read a fairly lengthy quotation from Einstein on precisely this matter of generality:

Among the various pictures of the world which are formed by the artist and the philosopher and the poet, what place does the world-picture of the theoretical physicist occupy? Its chief quality must be scrupulous correctness and internal logical coherence, which only the language of mathematics can express. On the other hand, the physicist has to be severe and self-denying in regard to the material he uses. He has to be content with reproducing the most simple processes that are open to our sensory experience, because the more complex processes cannot be represented by the human mind with the subtle exactness and logical sequence which are indispensable for the theoretical physicist.

Even at the expense of completeness, we have to secure purity, clarity, and accurate correspondence between the representation and the thing represented. When one realizes how small a part of nature can thus be comprehended and expressed in an exact formulation, while all that is subtle and complex has to be excluded, it is only natural to ask, what sort of attraction this work can have? Does the result of such self-denying selection deserve the high-sounding name of World-Picture?

ARKANSAS ACADEMY OF SCIENCE

I think it does; because the most general laws on which the thought-structure of theoretical physics is built have to be taken into consideration in studying even the simplest events in nature. If they were fully known one ought to be able to deduce from them by means of purely abstract reasoning the theory of every process of nature, including that of life itself. I mean theoretically, because in practice such a process of deduction is entirely beyond the capacity of human reasoning. Therefore the fact that in science we have to be content with an incomplete picture of the physical universe is not due to the nature of the universe itself but rather to us.

Thus the supreme task of the physicist is the discovery of the most general elementary laws from which the world-picture can be deduced logically... In every important advance the physicist finds that the fundamental laws are simplified more and more as experimental research advances. He is astonished to notice how sublime order emerges from what appeared to be chaos.(5)

This ultimate search for comprehensive order is what I referred to in my theme as "the objective of scientific inquiry in its best sense."

But now what are we going to do with philosophy in this paper? I have struggled so long in trying to point to what seems to me to be the common elements of scientific inquiry that little time is left for philosophy. I am sure that any one of you, the practicing scientist, could have made wonderfully clear in one-half or one-fourth the time just what the essence of science is. I suspect that since I am a practicing philosopher you expect me with similar dispatch to make wonderfully clear precisely what philosophy is. And it is here that I am embarrassed,

ON SCIENCE AND PHILOSOPHY

for I must confess I do not find it easy to state briefly the nature of philosophy. Oh, it is easy enough to toss off the pat definitions to which I referred earlier. Philosophy is the love of wisdom. Philosophy is seeing life steadily and seeing it whole. But these vignettes require a world of elaboration, and thus we are back to our old difficulty.

I can make quite clear, quite briefly, what I think philosophy is not. Philosophy is not a system of static beliefs. A man will often ask his neighbor, "Well, just what is your philosophy of life?" Meaning frequently, what is that system of last-stand beliefs to which you will hold no matter what. In this sense philosophy becomes identical with some people's view of religion as a set of ultimate, unchallengeable beliefs. Philosophy may be -- in fact, it is in some of its branches -- concerned with last-stand beliefs, but it is not concerned with them in this manner. For philosophy is preeminently a quest, an inquiry.

What then is the nature of this quest? The best answer to this question is the study of the history of philosophy. Since such a proper study would be out of the question in so short a time as five or ten minutes, I shall have to indicate what my own study finds characteristic of its history. I think philosophy in its best moments is a quest, an inquiry working toward a critical, systematic, and comprehensive view of man's experience. Now "experience," as William James pointed out, is a double-barreled word. It means both the objects of experience and the way we experience them. I use "experience" here in this double-barreled sense. Quite obviously the objects of our experience are the totality of what we do experience: the natural world around us, the totality of culture with its complex institutional framework, and our own internal experience. "Incredible," you say, "that any man should dare to embrace so much." Incredible it may be, but

ARKANSAS ACADEMY OF SCIENCE

a few have so dared, and I think their daring has been profitable for mankind. Very early in its history certain types of questions emerged as the most persistent in this quest; questions which have prompted the development of, broadly speaking, three major areas of philosophic inquiry: (a) Questions about nature, producing metaphysics, the study of the most pervasive characteristics of nature; e.g., space, time, and causality, and cosmology or theories of the development of the universe; (b) questions about knowledge, which have led to studies, in the language of Locke, of "the origin, certainty, and extent of human knowledge," and to logic, the analysis of the weight of evidence for our beliefs; and (c) questions about values or what men consider worthwhile, leading to ethics, the analysis of religious experience, and to theories of art. The effort in the greatest of the philosophers has been just this: In these fields to examine critically the foundations of each, to attempt some systematic treatment within each, and to undertake some comprehensive, systematic view of the relations among these fields. It is this sort of enterprise that in its history the greatest of the philosophers such as Plato, Aristotle, Spinoza, and Kant, or on the contemporary scene, Whitehead, Russell, Santayana, and Dewey undertook. This is philosophy in its best sense.

What, then, has this conception of philosophy to do with the theme of this paper? If I have interpreted correctly the objectives of science and philosophy in their best senses, it should be clear that they are identical in the search for comprehensive order within man's experience. The physical scientist takes a portion of that experience; e.g., the physical world, and in this selection his objective is more restricted. The philosopher undertakes to understand the unity there achieved and to relate it to other types of experience: biological, social, moral, religious, aesthetic. What the physical sci-

ON SCIENCE AND PHILOSOPHY

entist achieves has always, and will always, influence profoundly the nature of the unity achieved by the philosopher, for the exploration of the relation between man and nature is one of the crucial philosophic problems. Every philosopher worth his salt has always tried to understand and appropriate the best available knowledge of the natural world of his day. I can see no other road for a genuine philosophy.

From what I have just said, the idea might arise that there is but a one-way path from science to philosophy; that is, the scientist provides comprehensive unities which the philosopher employs, but the philosopher has nothing to offer in return. I do not think this is the case. Actually I have made a second claim in my theme -- that in the intellectual history of Western civilization the union of scientific and philosophic inquiry has often provided its most fruitful moments. I believe this contention can be documented abundantly, but I shall illustrate briefly only from ancient Greece and the 17th century.

It was in ancient Greece that the enterprises of philosophy and science, as we have come to know them, were born; born, one might say, as twins. The history of Western philosophy began about 600 B.C. with a group of Greek philosophers who wrote "about Nature." What is it they sought? They sought to understand the material basis of the universe and the energizing forces that are responsible for the ceaseless change that takes place. Here was formulated at least the clear notion of a universe, the idea of a comprehensive order. The theories were naive, but this idea is not naive, and within two-hundred years Democritus stated the not so naive theory that the universe consists only of atoms in motion governed by inexorable laws. I am sure that Democritus would have felt very much at home in 1687, the year Newton's Principia was published.

ARKANSAS ACADEMY OF SCIENCE

A second extravagant speculation, but of the most profound importance for the entire history of science, was the Pythagorean notion that number is the key to nature. The Pythagoreans were bewitched by their controlling idea and readily generated a numerical magic, but their faith that nature is through and through a mathematical order was to work later a kind of magic in modern science. Plato readily adopted the notion and made it a cardinal element in his theory of knowledge and theory of nature. It was this Plato, poet mathematician, philosopher, who was to contribute to the birth of modern science by being a factor in the transmission of this mathematical faith. In the Italian Renaissance, there was a strong revival of Platonism, and through it impetus was given to the search for mathematical relationships in nature. Galileo himself says:

Here [in his collected works] will be perceived from innumerable examples what is the use of mathematics for judgment in the natural sciences and how impossible it is to philosophize correctly without the guidance of Geometry, as the wise maxim of Plato has it... True philosophy expounds nature to us; but she can be understood only by him who has learned the speech and symbols in which she speaks to us. This speech is mathematics, and its symbols are mathematical figures. Philosophy is written in this greatest book, which continually stands open here to the eyes of all, but cannot be understood unless one first learns the language and characters in which it is written. This language is mathematics, and the characters are triangles, circles, and other mathematical figures." (6)

A third illustration of the intimate tie between science and philosophy in their early years was a

ON SCIENCE AND PHILOSOPHY

Greek discovery which lies at the heart of the very possibility of both. It was the Greek philosophers who discovered discourse, and Aristotle more than any other at that time who systematized this discovery. What does the discovery of discourse mean? It was the Greeks who found that the pushes and pulls of nature could be transmuted into discourse which then has meaning in terms of the actual events out of which the discourse is generated. It is discourse, statements, propositions, which are seen to have meaning and to be true or false. Events are not true or false. And it is our statements and propositions as they are systematized and tested which constitute the heart of science. This the Greeks clearly saw, a discovery which Dewey calls the greatest single discovery of man. Logos, the word, discourse, is then itself made an object of study to provide us with logic, and within this general study the first careful treatment of the idea of science as system is found in Aristotle's Posterior Analytics.

I shall turn to only one more example in classical Greece of the tie between philosophy and science. Aristotle, I suppose, is the best example at that time of scientist and philosopher. Few people, sometimes even in philosophy, seem to realize that Aristotle wrote on biology more than on any other subject matter. Historians of science are wont to call him the father of biology. No less a biologist than Darwin commented, "Cuvier and Linnaeus have been my two gods, though in very different ways, but they were mere schoolboys to old Aristotle."⁽²⁾ But we can not pause to examine why these encomia are made. One of the rare occasions when Aristotle, the dispassionate writer, shows any sign of emotion is in a passage at the close of the first book of a work, On the Parts of Animals, in which he eloquently urges the study of animal and plant life. The influence of Aristotle's work in biology upon his total philosophy was profound. It permeates, for example, his

ARKANSAS ACADEMY OF SCIENCE

ethics, one of the finest statements of a naturalistic ethic that has ever been written. Man is a perfectly natural, not a supernatural creature, Aristotle argues. In terms of this natural basis and the fact that he possesses intelligence to a higher degree than the other animals, what is the good life for man? Those who pursue science as a naturalistic undertaking, but put man in a separate non-natural category for his moral behavior, would do well to read this challenge to their supernaturalistic assumptions.

Well, I have come here not to praise the Greeks, but to illustrate the virtual union of science and philosophy, as they were born in Western culture. The union persisted in the social sciences until recent date and still does in some respects down to the present. It continued with the physical sciences I think at least until Newton. Galileo fought with more than one philosophy professor of his day, usually to the discredit of the philosophy professor, but I think the argument was not about science as against philosophy, but what was correct in philosophy. It seems he argues in this way: Does not philosophy have something to do with the advancement of knowledge? Scholastic philosophy has become sterile in its blind obedience to authority. Correct philosophy is to be found in getting on with the study of nature, a view, interestingly enough, that Aristotle pushed hard in the first book of his Metaphysics.

The union between the scientist and the philosopher in the 17th century was often so close as to be virtually indistinguishable. Descartes, you will remember, invented analytical geometry. He saw this invention as an illustration of a new method of philosophizing which he would apply to all of man's experience. This method is described in his Discourse on Method and is further illustrated in his Principles of Philosophy, a work on a theory of nature. His mathematical discovery he did not see as something

ON SCIENCE AND PHILOSOPHY

separate from his philosophizing. Galileo was never more critical of scholastic philosophy than Descartes; yet curiously enough there is the common notion that Galileo fits into the history of science and not philosophy whereas Descartes fits into the history of philosophy and not, or only secondarily, in science. I suspect they both belong in both streams. Descartes' most speculative hypothesis was his mechanical view of nature. This is, of course, a revival of the Democritean view: Nature is composed only of matter in motion, operating in terms of invariant laws. This is the view that has given Descartes' name to what some historians call the Cartesian Revolution. The history of modern science until the latter part of the 19th century seemed documentary proof of the hypothesis. It was Newton, of course, who provided evidence for this view in a way that Descartes never accomplished.

Newton's work is so frequently referred to by a single word of its title, Principia, I sometimes think that, if not the title, then certainly the significance, has been forgotten. You will recall it, Philosophiæ Naturalis Principia Mathematica; i.e., Mathematical Principles of Natural Philosophy. What did Newton mean by this title? Perhaps it was an accident. Perhaps Newton didn't really know what he meant. Or perhaps it means what it says, that he is dealing with the mathematical principles of natural philosophy, or as he himself says in his introduction, "I have in this treatise cultivated mathematics as far as it relates to philosophy." (4) What the early Greek philosophers had dreamed about, a theory of nature which would make intelligible the great ebb and flow of things in nature, is now realized in a language they could not yet know, a highly developed mathematics, and with evidence that required the patient observation of numerous individuals. A general theory of nature; yes, a science of nature had now been achieved. What remains is primarily the com-

ARKANSAS ACADEMY OF SCIENCE

pletion of the details, an undertaking which seems to have been the primary occupation of the energies of physical scientists during the 18th and well into the 19th century until new evidence within physics required reexamination of the basis of the Newtonian Theory. You will note this reexamination and reformulation came from no promptings and virtually no help from within the philosophic fraternity.

Why is this so? The reasons probably are numerous, but one clearly is a product of the 19th century. If the 19th century did not invent, at least it fostered, specialization of inquiry in a way never known before. The advancement of knowledge turned into a kind of assembly-line process. The results have been both a blessing and a curse. Items, one might almost say atoms of knowledge have proliferated at an unbelievable rate. But high specialization has fostered an insularity such that one social scientist can hardly talk to another of different breed, let alone to a physical scientist. Except in physical theory, the systematic organization of large areas of experience seems not only to lag, but even to be shunned. The same trend has operated in philosophy. The men in 20th century philosophy I mentioned earlier are all dead except Russell; and he has passed, I suppose, the peak of his imaginative production. Where are the young men in philosophy who dare to see man's experience steadily and wholly? They haven't spoken yet. For one thing, I can see no adequate philosophy without an adequate theory of nature, and it is a plain fact that most philosophers today do not know enough about contemporary physical theory. I should be the first to confess this ignorance. On the other hand an adequate theory of nature is not an adequate philosophy of life because, fortunately or unfortunately, man is a moral and aesthetic creature besides a thinking creature. The spectacle of certain scientists who have suddenly become excited about the consequences of the atom

ON SCIENCE AND PHILOSOPHY

bomb and turned moral philosophers, has not been an encouraging one. The world did not have to wait for the atom bomb to raise the question of the relation between man's knowledge and his moral beliefs. The question has been explored and clarified over a period of twenty-five-hundred years in Western philosophy. Why not be aware of and use that analysis?

What then would seem to be the lesson in this predicament? I have tried to show that the objectives of scientific inquiry in its best sense and of philosophy in its best sense have much in common; that in the intellectual history of the West the interpenetration of science and philosophy has provided some of its most fruitful moments. Would not the lesson seem to be that somehow, as scientists and philosophers, we must disenthral ourselves? That somehow we must rise above our specialties for the enhancement and enlargement of one another's minds in the pursuit of what seems to be a common objective -- to understand nature and man's place in it.

LITERATURE CITED

- (1) Cohen, M.R. and E. Nagel. Introductions to Logic and Scientific Method. p. 191. Harcourt, Brace New York. 1934.
- (2) Darwin, Charles. The Life and Letters of Charles Darwin. 2:427. D. Appleton. New York. 1891.
- (3) Kimball, A.L. A College Text-book of Physics, 4th ed. p. 1. Henry Holt. New York. 1929.
- (4) Newton, Isaac. Mathematical Principles of Natural Philosophy and His System of the World. Trans. by Florian Cajori, 1917. University of California Press. Berkeley. 1934.
- (5) Plank, Max. Albert Einstein, Prologue to Where Is Science Going?, 9-11, W.W. Norton. New York. 1932.

ARKANSAS ACADEMY OF SCIENCE

- (6) Randall, J.H., Jr. The Making of the Modern Mind.
p. 237. Houghton Mifflin. Boston. 1940.
- (7) Science. 118:20-21. 1953.
- (8) Ibid. 74-75.
- (9) Ibid. 131-132.
- (10) Whitehead, A. N. Science and the Modern World.
pp. 166-167. MacMillan. New York. 1948 printing.