

IS SCIENCE THE ONLY WAY TO TRUTH?

by *Richard Schlegel*

Abstract. In the context of contemporary life questions, especially that of world peace, this essay first develops the view that truth is essentially scientific truth. Although religion gives insights for living, as science encompasses more and more of human experience it reinforces and modifies religious truths with its own firm knowledge. However, because of several limitations, it is concluded that science alone cannot give a complete account of humanity and the universe. For our first beliefs and principles we must look to other kinds of truth, which are in accord with scientific truth but go beyond scientific method in their justification.

The immediate importance of a scholar's topic is often manifestly slight, except to a small peer group that shares a recondite interest. But in considering my present question I am struck by its pressing relevance. Taking an obvious and painful situation in our current public affairs, I can point out that nuclear warheads are a direct consequence of sophisticated scientific truths; in particular, the nuclear reaction, for purposes of electric power or weaponry, would never have been developed by mankind without the truths of quantum theory and the special theory of relativity. Yet, right now the nuclear missiles are poised, in land silos, aircraft, and submarines, ready to go to targets in our country or in the Soviet Union. I cannot recall anywhere seeing an appeal to the propositions of science as support against sending them off, with all the death and destruction that would follow. If there is no way to truth, beyond that of science, we have, it would seem, no reasonable arguments or principles against using the missiles.

In this paper I will first try, briefly, to establish some historical perspective for the problem of religious and scientific truth. Then I shall turn to some aspects of the attempt to support religious truth by

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finding harmony between it and the truths of science. An evaluation of that effort will be my central task in the paper. In making my statement I will use salient aspects of what appear to be the limits of scientific understanding.

EXTERNAL EXPERIENCE, INNER ILLUMINATION, AND THE RISE OF MODERN SCIENCE

In the high medieval period an active scientist, Roger Bacon, born about 1214, not surprisingly stated that experience is more fundamental than argumentation in obtaining knowledge. But, he said, even in natural philosophy inner illumination is necessary, in addition to the experience that comes through the external senses. He distinguished seven degrees of interior illumination, extending from one that is required for certitude in knowledge and rising through apprehension of virtues, the beatitudes, the spiritual sense, the peace of God, and, finally, raptures.¹ Historians see Bacon as somewhat backward with respect to the theology of his day in that he did not share in the contemporary effort to analyze theological propositions in terms of principles of reason and of faith. Nonetheless his statement is of interest as an early expression of a respected tradition among scientists: to have faith in science requires something beyond what is given in sensory experience; and, further, religious knowledge comes entirely from such inner experience.

Even today, many scientists accept a bifurcation whereby a less elevated realm gives us the external experience on which natural science is based, while belief or knowledge with respect to a divine realm is otherwise vouchsafed to us. There is, then, no conflict between science and religion; each has its own principles and, so to speak, theaters of operation. It is evident that the acceptance by a scientist of two such domains has been no barrier against high achievement. Isaac Newton in the seventeenth century was devoutly religious, and likewise, James Clerk Maxwell in the nineteenth century had a firm Christian faith in a Creator.

However, in general the recognition, following Bacon, of a role for inner experience beyond that which comes from the senses did not fare well in the first few postmedieval centuries. We need only think of John Locke's *tabula rasa*; knowledge comes in consequence of the impress of external experience on an initially empty mind. Indeed, the success of physical science was so great in the Newtonian synthesis that for many it seemed that the single, proper way to truth had been found. This response is not surprising. Certainly, nothing like the Newtonian mechanics had ever before come into human ken. It described nature not in words but rather in exact mathematical statements, readily tested both for empirical correctness and for internal

consistency. Also, the new physics had the widest generality: it was a universal mechanics, from which description and prediction could be extracted for an indefinite number of particular phenomena of nature.

It is easy to understand why Locke and others were dazzled by mathematical physics, in contrast with scholastic philosophy that can appear so much a matter of mere words. We can add the fact that the empirical explorations that went along with the new natural philosophy consistently reported null results with respect to basic tenets of Christianity. Hell, at least not literally, was found nowhere on Earth, and Heaven nowhere in the skies; the biblical accounts of creation and of physical phenomena, such as the sun standing still, were trivial folklore when contrasted with firm results from physical science. Intellectually, the medieval faith did lose out to mankind's remarkable discovery of an impersonal science, mathematically exact and universally true for the aspects of nature to which it is relevant. The historic effect has been summarized well in a recent article by the Newtonian scholar, R. S. Westfall: "Theological depth has become for most scientists irrelevant. . . . In the three centuries that have passed since Newton published the *Principia*, Christianity and science have exchanged roles, and natural science today occupies the position in Western civilization that Christianity once held . . . and every other intellectual discipline now measures itself against [science]. . . ."²

Yet, religion has not withered away. Much of it, to be sure, is in association with superstitious belief, as in contemporary Christian fundamentalism. But among intellectual leaders of Western society, including, as already noted, some scientists of first order, there have been those who persistently sought to maintain Christian belief, reasonably modified to be in accord with the propositions of science.

I first will take note of the efforts to see evidences of God's existence in properties of nature not analyzed or explained by natural science. This kind of natural theology is exemplified by William Paley's argument from design; or, also, by Newton's suggestion of divine interference in maintaining the planets in their orbits.³ Recently, the astrophysicist Robert Jastrow has suggested that, in discerning the origin of the universe in an initial expansion event, astronomy has come to a limit where religion must take over.⁴ In a word, natural theology may take the stance that God is necessarily present as an explanation where science fails. I will later on give a sense in which this view is defensible. As it has generally been used, however, God is brought in as a surrogate for a scientific explanation. Many will agree, I believe, that such a substitution forms a poor argument for a divine being. The scientist can hardly be satisfied with so nonscientific an extension of his science. And if, as has repeatedly happened, we later learn how

the particular event or phenomenon in question is encompassed within an enlarged science, do we not then have evidence that, after all, it is an error to see God as a necessary entity for natural philosophy?

So we find that science, essentially on employing Bacon's external senses, is brilliantly giving us natural knowledge. In contrast, divine knowledge, based largely on inner illumination, seems relatively vague and ineffective and has largely been disrupted and discredited. The search for God in the larger external world disclosed by science has not given convincing results; indeed, we might say, not so much as a single, tiny divine tree has been desecrated on the vast horizon of the terrestrial and astronomical universe.

DIVINE ASPECTS OF NATURE

There is an alternative way in which religion may be supported by science. We might expect that we will not find evidence for the traditional supernatural Creator in natural science; by definition the God so understood is not part of the natural world. If we want to accept science as the road to truth we are then perforce committed to a Godless universe, unless we make a significant change in outlook. However, if we broaden and enrich our concept of nature so that it includes the traditional divine properties specified by religion, we can bring science and religion together; our natural science tells us of factors of nature that can be identified with elements in traditional religious doctrine. This is an outlook, I believe, that is congenial to many of us who are seeking to maintain religion in an age of science. We believe traditional religious statements contain truths that are essentially important to humankind and also that, although these truths have been reached in non-scientific ways, they correspond to facets of the natural world. In the words of Ralph Burhoe, "there are scientific grounds for supposing values, goals, attitudes, and preferences are factual, objective scientifically investigatable processes or patterns of living systems, developed under nature's laws."⁵

I want now to specify some of the aspects of nature that have been seen as appropriately associated with concepts of divinity. But first I wish to say that an identification of God with any part of the nature disclosed by science could hardly be religious in the traditional sense as long as science so emphasized the mechanical, inanimate properties of nature. The Newtonian world machine, conceived as basically constituted of simple material particles moving in strictly determined patterns, could be regarded as evidence of a Creator but not as part of a free divinity, a source of inner illumination.⁶ However, in the nineteenth and twentieth centuries, as science has been extended to include more biological, psychological, and social phenomena, the

plausibility has much increased for a natural occurrence of traditionally religious properties.

Certainly, Charles Darwin's theory of the evolution of species is a substantial factor in the development of a natural philosophy that allows a divine element within it, even though initially the theory was seen as antireligious, with God rejected in favor of natural process. Today evolution has been discerned not only for biological organisms but for all parts of nature: we speak of the evolutionary development of the earth, of the individual stars, of the universe itself. In the nonbiological realm we of course are not employing the fitness criteria that are so important in our understanding of biological evolution. We are, however, emphasizing that change occurs everywhere in nature; the processes that are innovative of new orders of natural being may be associated with God as the creative agent in the universe.⁷

In social psychology and anthropology, religious beliefs have been found to have a role both in the development and the stabilization of a society, as indeed, we would expect to some degree.⁸ The identification here is not of a natural occurrence with the divine, as when, for example, we might cite natural love as a manifestation of God. Rather, we are saying that in their psychosocial behavior humans have found religious belief to be one of the natural ways of coping with the problems of living. We thereby gain justification for continuing to strive for a religious outlook (but, obviously, one that is meaningful in the context of our accepted standards for belief).

Today, even as for Bacon in the thirteenth century, the strongest support for religion comes from inner experiences. Although Locke, in the seventeenth century, could discount such experiences, except as they came ultimately from the outer senses, the philosophical trends since that time have not passively accepted such a simple psychological empiricism. Broadly speaking, we can say that Immanuel Kant initiated a concern with a subjective, human contribution to what we find the universe to be. In consequence, in the eighteenth and nineteenth centuries the relatively pure externalism of mechanistic philosophy fails, at least among philosophers and theologians if not among scientists. Kant put forth strong arguments specifying that we do not truly learn of the universe in our empirical science when we neglect the human elements in our formation of and response to experience. His thought led followers in many different directions, but in brief we can say that doubts, still with us today, were cast on the notion that science, at least as far as it goes, tells us of nature truly and essentially as it is.

In order to be at least a little bit more complete historically I should mention the romantic movement of late-eighteenth and nineteenth

century thought and art. That movement, stemming from sources independent of Kantian philosophy, emphasized inner feeling and intuition, and to a degree was often openly antiscientific.

For us the significance of trends toward greater attention to inner experience is this: the world of human thought and feeling has gained existence status in the universe. For the philosophical materialism associated with Newtonian physics, what a man or woman thought or felt could not be at the base level of what was taken to exist, to wit, matter in motion. With a discrediting of that materialism the insights from inner experience gain credibility as indicators of what is the ground of being. I shall not try to disentangle the factors of genetic inheritance, individual personality, and societal education that act to form inner conviction or illumination. Suffice it to say, what we discern or feel in nonscientific ways can justifiably be giving us information about the universe even as science does.

Thus, specifically to consider what traditionally has been a religious theme, the human behavior motivated by love for others rests on an inner sense. That this feeling can and does occur is a fact about nature—that is, about a particular kind of natural creature. If we wish to call such love one of the divine aspects of nature, we do make an association with the tradition of those religious leaders who advocate that love. Likewise, nature is such that honored human properties as wisdom, aspiration, courage, joy, and tenacity, to name a few, do occur and hence are *bona fide* existing aspects of nature. It may be desirable to speak of them as forming parts of God, whose name, then, is reserved for elements of the natural world that relate to what has been called divine.

There are those who see reasons to reject altogether traditional religious language. I do not want to argue that point here. I assert, however, that every person has abundant evidence that his or her life is guided by intuitions or convictions that are in the traditional domain of religion, for example, the inner, felt resolve or decision that to religious-minded persons seems to come from God.

THE HUMAN ROLE IN DETERMINING NATURE

Physics generally has been a bastion of scientific objectivity, sheltering the concept of a natural world altogether independent of human contribution. Yet, in our twentieth century the Kantian theme that nature is formed jointly by man and an exterior universe has been established even in physics. This new subjectivism, I should emphasize, has nothing like the form which Kant proposed; nonetheless it carries a significant relaxation of the complete independence of nature from man that was characteristic of the classical Newtonian physics.

It has been found that on the atomic level and smaller the arrangements set up for observation or experiment do themselves have an effect on the particles or systems being studied.⁹ Here we are not confronted merely with an inevitable disturbance of the object system by the physical interaction involved in the observation. Physicists have made a much more profound discovery: the physical entity to be observed is not even physically defined with respect to all its properties until the act of interaction-observation occurs. Thus, an electron in free flight cannot be defined abstractly as having a definite path and velocity; only an interaction with other particles—in what may be an observation—will precisely fix the electron's path in space and time.

One might demur that a role for man in determining atomic and subatomic properties in laboratory experiments is hardly very important. We must remember, however, that what goes on in the laboratory also occurs generally in nature. Hence the fact emerges that everywhere on the elementary-particle level physical properties are being determined only as a natural process occurs.¹⁰ Larger scale regularities remain, to be sure, and we continue to expect the sun to rise tomorrow. But on the atomic level of natural process we have discovered a plasticity, a quality of nature taking its form not by pre-determination but only in the act of becoming. Hence, there are possibilities for novelty and adaptation that did not exist in the deterministic mechanical universe described by the older physics.

The role of man in partially determining nature is particularly significant for the natural domain that is of primary importance to each person: his or her own mind and body. Here the statistical chance that plays a role among events of inanimate systems is somehow transmuted into flexibility and creativity.¹¹ We clearly do not know the psychophysical details, but we can be assured from physics that there is no basis for the strictly determined, set-for-all-time behavior that often has been held as showing freedom to be an illusion. In other words, we have grounds on the basic, physical level for seeing human choice as a natural process emerging through evolution. Hence, again there is a reasonable identification of a religious theme, that of personal self-determination, with human capabilities and potentialities consonant with natural science.

THE COMPLETION OF RELIGIOUS TRUTH BY SCIENCE

I have been arguing that, although we maintain that science is the firm road to truth, we need not give up religion. The wisdom that has come with religious insights may be maintained and even strengthened by science as it grows into the domains of human experience to which religion is relevant. Further, science already has

given indications of nature being so rich, so complex, that divine factors once taken as supernatural may plausibly be regarded as aspects of the natural world. Traditional religion to a considerable degree may thereby be regarded as within the compass of science.

I suggest the following statement of attitude as a summary of the approach to science-religion relationships I have been discussing. Attitude A: *Truth is essentially scientific truth. Religion has given insights for guidance of life that are ahead of science; but as science encompasses more and more of human experience, science reaches the truths of religion, reinforcing and also modifying them with its own firm knowledge.*

From one point of view, this statement could be taken as an expression of secular humanism: a striving for the best ideals of our culture, yet with recognition of the new strengths that come with achievements in the sciences. Or, giving a different emphasis in interpretation, we can see the attitude as a statement of natural theology, asserting that the divine elements of religion are within the scope of rational-empirical thought. With either priority, secular or religious, Attitude A bespeaks an eventual merging of science and religion. It implies an expectation that the sciences' way to truth will one day bring us to the fullness of understanding that we seek in religion.

LIMITS OF SCIENCE

It would be comfortable to be able to say that I now have presented my basic thesis about scientific and religious truth, and it would be easy to go on to various details about prospects or achievements with respect to the scientific basis of religious doctrines. I do not think, however, that I then would have given a fair estimate of what can be achieved in a religious outlook based essentially on the truths attained by science. For, if religion is to have a dependence on scientific truth, we should take account of some limits inherent to science itself.

A delineation of these limits can be variously approached.¹² My way will be through three topics: the partial, fragmentary nature of science; the necessary limitation on explanation by science; and the symbolic character of science. As I discuss each of these I will try to show its relevance for religious doctrine.

The Partial, Fragmentary Nature of Science. The factor of limitation in its subject matter is an essential feature of science. By circumscribing the range of phenomena studied the scientist works with a manageable number of variables. Thus nature is subdivided into many different domains, as those studied, for example, in physics, botany, microbiology, psychology, and sociology. Further, the practitioner in each special science proceeds by attending to a specific, relatively narrow aspect, typically his current problem. Generalization, to be

sure, is a goal of science as in Maxwell's equations for electromagnetic phenomena or the DNA structure of all genetic units, but even then description is for a relatively specialized aspect of nature. For example, in the Hubble law, descriptive of expansion of the universe, we learn something about the recessional motion among all galaxies but nothing about the vast richness—including perhaps many kinds of life—of a single galaxy, which may contain hundreds of billions of stars.

If we wish to gain a scientific account of a human being we must obviously employ many different sciences. The anatomist, physiologist, biochemist, physician, psychologist, educator, and economist—each of these and others has something important and different to contribute. However, in religion and also to a degree in philosophy, the person functioning as a whole being is of interest. Questions of guidance in living and of relations to other persons are paramount. Information and elucidation from any one special science do not answer these questions. We live, indeed, in a matrix of belief and social constraint that is far larger than the propositions of science—even though more and more we are fitting statements from the sciences into that matrix.

I suggest, therefore, that, because of its being so partial and selective with respect to experience, science does not adequately give the whole-person, whole-situation knowledge that is sought in religious doctrine. I think a questioning of the bases for one's own behavior will readily support my point. There are many notable instances where scientific information has changed our standards of behavior, but I think no one can find guidance from science for all the essential decisions demanded in a free human life.

The Necessary Limitation on Explanation by Science. Science not only extends our knowledge about the world, telling us of many things ordinarily beyond our ken; it also gives explanation of phenomena, answering the "Why did it happen?" question for many occurrences. In part it does this simply by placing an event in the order of natural process. An eruption of Mount Saint Helen, if it were an event of a kind not known to its witnesses, could be an occasion for many specious and perhaps fearful conjectures; but with a science of geology the eruption, even though destructive and disturbing, can be regarded as a part of the normal processes of the earth's mantle. Or, an unpleasant illness is made a little less frightening simply by knowledge of its name and previously observed characteristics.

Explanation given by science also can be more penetrating and generally more satisfying. If a theory or so-called natural law has been established relative to an occurrence, we can do more than place it

among the events of nature; we can regard it as an expected consequence of general natural properties. In referring the event to the broader process we gain a sense of deeper understanding of it or, often, of explaining it. Thus the illness might not only be identified as a known clinical occurrence but also be understood as arising from the action of a particular micro-organism, identified and seen with a microscope.

Explanation by reference to a more general statement about nature has been particularly successful in physics where the concern is with universal properties—motion, mass, energy, fields of force—conceptually abstracted from the particular, concrete entities of nature. Physicists have been able to formulate and confirm theories that give precise relationships of wide generality among various sets of these abstractions. Hence, the impressively great power, already referred to, of mathematical physics—both for explanation and for prediction or control of the phenomena that are within its purview.

For the professional physicist, perhaps the most impressive example of terse mathematical description of a wide set of natural phenomena is in electromagnetic theory. The four equations of Maxwell have been found unflinchingly to cover, so to speak, the realms of electricity and magnetism—including the properties of light and other electromagnetic waves, whose character may be deduced from the basic four equations. I must add the reservation that on the atomic or quantum level of nature there are certain inadequacies. Still, we have an impressive explanation of the wide range of large-scale electromagnetic phenomena by reference to the statements of how nature behaves given in a set of quite simple equations.

Newton's law of gravity is the obvious example of explanation by referral to a general law. Why did the tree fall? Because the earth pulled it to the ground in accord with the attraction that exists between any two masses in the universe. The law is so general and has been found to be exemplified in so many instances, both terrestrial and astronomical, that there is a satisfying of the desire to understand when we employ it in an explanatory way.

Still, for Maxwell's equations or Newton's law there are further questions that readily occur. What are the electric charges that the equations describe, and what physically is an electric or a magnetic field? Or, as many high school students have asked, why do two masses attract each other across an expanse of empty space? In the case of Newton's gravitation law we can give a further stage of explanation: Einstein in his theory of gravity has taught us that geometric changes in space-time are associated with the presence of matter and do require the force that Newton described. Yet, we can go on to inquire, why does space-time take the form it does, relative to mass-energy that is present? There are, to be sure, even more general

principles in physics, valid for all its various subsystems. The special relativity and quantum theories, and the laws of thermodynamics are notable examples. Some understanding of the “why” can come with deduction from these most general to the more specialized theories. However, for a universal theory there also are assumptions where we stop, rather than explain further by reference to a wider law.

The point I am making is that scientific explanation, no matter how complete or successful, requires acceptance of a set of concepts and equations (or other relations). In somewhat the same way that Euclidean geometry is developed on axioms and definitions, so science rests on basic concepts and principles. Currently there is an effort in physics to bring together into a single theory our knowledge of electromagnetic, elementary-particle, and gravitational forces. Such a theory would bring a notable unification of physics, just, for example, as did Maxwell’s unification of optical and electromagnetic phenomena. However, there then again would be a new set of first principles to be understood. As is often said, the answering of a set of questions in science commonly leads to a new set of puzzles. And, indeed, there are general arguments against a closure that would leave no unanswered questions in science.¹³

We are discussing scientific theory and scientific explanation that utilizes theory, not the relatively more empirical facts of science that, once firmly established, are not altered by subsequent developments. So, when we look to theory in science for answers to ultimate questions, we can expect to be given a set of ultimate assumptions, now or at any time in the future. In contrast, religion traditionally has given in its own way a sense of peace and acceptance with respect to the final “why” questions about the universe and our own life in it.

One response may now be, “So much the worse for religion—we have learned in science of a superior way to gain understanding, and we accept that way even though it means forgoing final answers.” To this one may reply that what is appropriate for us humans as scientists is not sufficient for us as religious beings. I suggest that firm belief *suffusing all aspects of life*, intellectual and emotional, is required in addition to the always less than complete certainty of science, just as, we have noted, we need concepts relating to the whole person beyond those provided by the various special sciences. It has been argued that historically even the advance of science itself has been dependent partly on a religious outlook and religious concepts.¹⁴ What we can say without question is that the form of scientific explanation necessarily lacks the certainty and integration into a total outlook that is traditionally characteristic of religious explanation.

The Symbolic Character of Science. Science as contained in books and papers is constituted of symbolic elements: words, equations, graphs,

photographs. These symbols have an intension that is conjugationally in nature and in the mind of the scientist, thereby giving science its intimate concern with nature. Nonetheless, science is a verbal or otherwise symbolic mediation between man and the natural world. Science strongly depends on immediate experiences of that world—that is, on our sense experiences—but it is not those experiences; even in its most empirical forms it consists of symbolic statements.

In contrast, what is typically called a religious experience is not primarily symbolic. It may be described in symbols but the description often is evaluated as highly inadequate; commonly, religious experiences are said to be ineffable. Mystical experiences have an important place in Christianity and are prominent in many other religions, but, even without citing such experiences, we can say that in Judeo-Christian religion there is a dependence on immediate feeling. In prayer and meditation, or simply in ordinary services of worship, the religious person has inner illumination—again to use Bacon's term—which enlightens or gives evidence with respect to the divine entities of religious belief. As we have said, the sense experience basic to a science does not itself form the science, but to a much larger degree direct religious experience is a component of religion. An identification of religious truth with scientific truth would therefore seem to have the effect of disbaring an important part of religion.

We might want to say, in agreement with Attitude A, that the subjective experiences we have in the realm of traditional religious themes do provide the religious aspect of life. That is, I have suggested that our convictions and feelings relating to the root questions of behavior and attitude are experiences of what we may call the divine aspects of nature. These subjective experiences also may be of a kind that can be reported just as are observations generally in science. For example, one can speak of one's sense of conviction that one should not injure others for selfish gain, or of one's confidence and determination with respect to some personal goal. The "divine aspect" is, therefore, religious in its function and yet is within the net of scientific (i.e., symbolic) statement.

However, I believe there are many religious persons, altogether respectful of science, who will assert that more is required in religion. I have already referred to mystical religious experiences. A common element in them, to the extent that they can be verbally described, is a sense of oneness with the universe or, as it is often expressed, of being united with God. Also, in a less dramatic way, many people who would not regard themselves as mystics nonetheless speak of gaining support and even joy in life from not readily described religious feelings.

There is one noncognitive experience that is of essential significance in science and religion alike, and it illustrates the inadequacy for

total knowledge of science alone. Suppose we read in an astronomy text of the existence of a star having certain characteristics and located at a given point in a defined coordinate system. What does it mean for the star to exist? We have a clear sense of the difference between its existing and its being but a hypothetical star set up for some purpose by the textbook author. The meaning of existence can come from only one source—from the immediate sense each of us has, as a living being, of what it is to exist. Other properties may be given that are associated with physical existence, such as the capability of the star, as we view it, to block off light from a source behind it. But our immediate sense of existence for the star, as for anything else in the universe, rests on our own direct experience. We use the relatively narrow base of our own minute experience, we might say, to give us comprehension of what existence is for the entire universe. We do not, of course, necessarily ascribe sentience, or other properties we have, to all other existing things.

I believe that, typically, in religious belief we are giving to the cosmos other features beyond mere existence that are likewise based on what is taken to be immediate intuition or perception. A religious doctrine, such as God's existence, might be felt by some persons to be supported in this immediate manner; also, in a less specifically religious form, a suffused feeling in a person for the goodness of life—or, alas, for its harshness—could inwardly arise in an immediate, non-verbal way. Here, one as a scientist could seek for genetic, cultural, and environmental factors as origins; nonetheless, the deep feeling exists in its own right as a tacit comment on the nature of things.

BEYOND SCIENTIFIC METHOD

So, we have once again come to Bacon's "inner illumination." The limits on scientific knowledge may be cheerfully accepted as such by the scientist who knows how much can be achieved by use of his procedures. But it is questionable that we can encompass the whole of human living and understanding within the confines of scientific knowledge. Since the concern of religion is with just such total aspects of life, we have reason to doubt the adequacy of scientific truth for religion asserted in Attitude A.

I therefore propose an alternative statement. Attitude B: *Science cannot give a complete account of man and the universe. We must look to other kinds of truth, coming from other approaches, for our first beliefs and principles. These must be in accord with scientific truth, but they go beyond scientific method in their justification of assumptions we make in science as well as in other components of living.*

Most emphatically, I am not suggesting in Attitude B that there is an alternative to scientific truth with respect to the domains of nature

described by science. The method of science with its appeal to empirical confirmation gives us knowledge that is relatively firmer than any other approach, and where applicable science should always in my view, be given first priority. But I do propose that there are domains of thought and behavior where our living requires knowledge other than that which we achieve through science.

Further, I believe that some propositions of the required extra-scientific knowledge have greater validity—that is, are in better accord with how the universe is—and hence are more adequate. We are here appealing both to correspondence and pragmatic criteria for truth. Often only tests of experience can tell us, pragmatically, which beliefs are best for us. But general components of the universe and particular personal attributes are jointly reflected in what is developed as a first principle for living. Hence, the principle must have a correspondence with existing properties. It is then a truth, and we must therefore agree that there are truths not reached by the way of science.

What is the method by which we achieve what I shall call the religious truths that seem to be both broader and deeper for our lives than those of science? It is, I think, one of inner illumination, in that each person reaches his or her own religious conviction in a personal, subjective way. Yet, we also know that the cultural milieu makes an immense contribution; indeed there must be a large factor of accepted authority or tradition in everyone's religious beliefs. The great religious leaders, who may not be theologians or prophets in the ordinary sense, presumably have had insights that are accepted as truths by some group of followers (or, we might simply say, group of influenced people).

The truths of science are, to use a rather formidable philosophy-of-science phrase, "intersubjectively verifiable": all persons who are properly trained and equipped can confirm their validity. Religious truths do not have this property—at least in part because of their closer relationship to inner illumination. In consequence we have, I suggest, the bittersweet history of the effects of religion. Mankind is elevated and succored by those who are extra-ordinarily devoted to religious truth, however, people also have been repeatedly divided, even to the point of inflicting cruelty and death on the grounds of religious differences.

RELIGIOUS TRUTHS FOR SCIENTISTS

Earlier I quoted Westfall to the effect that where Christianity once held sway we today find science to be the dominant religion. If we consider religion as codified doctrine, I think we must agree that this is a correct statement: we are in a secular age, and many look to science as the final authority. Yet, I believe I have given a discussion

that shows the inadequacy of science as a religion. It has been my purpose to indicate the appealing road that has brought much of the world to Attitude A but then to express the reservations that lead to a consideration also of Attitude B. In this final section I want to delineate briefly what I see as some minimal extensions beyond the scientific secularism of Attitude A that must be recognized as appropriate.

Let us think of a person who disclaims any traditional religious beliefs; I will refer to him or her as a scientist (S). If S reflects on foundation beliefs, it will be evident that even for his science there are assumptions not derivable from other, broader principles. Hence, for an acceptance of his belief system S must utilize what I will refer to as the noncognitive completion of science.¹⁵ With respect to the domain of science the assumptions accepted may seem so satisfactory and adequate as a base that S and his colleagues rarely question them (although, it may be noted, during the twenty-five or so centuries covered by the history of science root ideas and assumptions have altered drastically).

Also, S has a set of goals and interests that determine how he wishes to spend his life. Here, of course, many factors about S as a person and about his nurture are significant. But the human being is such that we do not expect precisely to derive S's convictions about himself and his life from knowledge of these factors—and the basic quantum-theory discovery that being is defined only in the act of becoming gives support for this lack of expectation. Presumably S enjoys himself and has a sense of personal fulfillment in his doing of science. Yet, neither his hard work in science nor his sense of satisfaction from it can in any way come from science as such. Other factors in nature give rise to that: noncognitive aspects that are different from the rational and observational procedures of science.

S of course has standards about his own behavior and that of others, and also convictions about political and social issues. Even though he says he has no religious beliefs, S probably recognizes that traditional religious ideas have strongly influenced his ethical attitudes. If he lives in the United States, for example, the Christian theme of concern for the life of every human being, regardless of background or station in life, will surely have had a role in shaping his ethical outlook. In varying degree, every person has a sense of what is right and what is wrong. In his science S most certainly will have this in a nontrivial way, for there are strict canons of honesty for work in science, both in the procedures of research and in communication with other scientists. However, if aside from his work the life of S is to be at all satisfactory, either to himself or to his fellow human beings, he necessarily will have further convictions about personal behavior. These, like the ethical standards for activity in science, are firmly held

ideas with a strong feeling component. They are not ultimately altogether within the scope of scientific knowledge.

S might want to invoke Attitude A and claim that scientific studies of science demonstrate the need for honesty in scientific research. Or, he might refer to scientific studies of the role of altruism in animal and human societies as supporting religious convictions about unselfish behavior. In both cases, the scientific support for what I have called religious truth would probably add helpful information with respect to behavior standards. But I again will assert that the conviction S has about doing science properly and the motivation he has toward achieving goodness of life personally and for his society rest on extra-scientific factors.

The impulses and principles that lead S to what he does in life are embedded in a context of feeling and intuition—a context woven, so to speak, of many strands. For S explicit religious activity is not among them, but suppose, as might well be the case, that listening to music and reading novels are important to him. From these activities he receives a rich and often noncognitive input: sensory experiences of musical form, stimuli to imagination, vicarious sharing of ways of life widely different from his own. Any attempt by S strictly to confine his thinking and belief to established scientific knowledge, or within accepted procedures of scientific method, would be an impoverishing truncation of his thinking—both for his science and for his life generally. Very likely such a narrowing is not possible for S. Recognition of mystery beyond what we scientifically know, intimations of factors in life other than those explicitly recognized, and conjectures that come from leaps of reason and imagination, in such as these we often find guidance as well as satisfaction. Even today some scientists accept the extra-scientific person and message of Jesus of Galilee as the best statement they know of what man's ultimate assumptions should be. Our friend scientist S does not, nor does he hold to any other traditional religion; but he is a poor human being if he has not found some set of truths beyond those established in science.

Finally, I turn our attention again to the nuclear missiles. Expediency and self-interest might keep us and the Russians from firing them. We would then be acting, I presume, out of our sense for self-survival; and even that, I note, comes not from science but from a form of inner illumination. It is not, however, a situation that does any credit to the humanity of two adversaries when each survives only because he demonstrates a capability for horribly destroying the other (as well as many other parts of the world). Also, the goal of self-survival is itself but precariously maintained for each side.

I judge that a firm prospect for escaping the missiles can come only with an achievement of mutual trust. We will feel secure with respect to the Russians only when we know that they love us too much to

bomb us to death, and they, likewise, will feel secure about us only when they know we so love them that we would not kill them in a nuclear holocaust. It is not unprecedented that two powerful nations should come to such a state of mutual regard; compare, for example, the feeling between France and Germany today with that during the first four decades of this century. However, much as I love science and proud as I am of its achievements, I do not believe the truths of science alone will bring a desirable human relationship between the United States and the Soviet Union. Clearly, for the sake of world peace, and for much else, in addition to doing science we need to strive to discern and apply religious truths.

NOTES

1. My discussion of Roger Bacon rests primarily on Julius R. Weinberg, *A Short History of Medieval Philosophy* (Princeton, N.J.: Princeton University Press, 1965), pp. 161-64, and the article on Bacon by Allan B. Wolter in *The Encyclopedia of Philosophy*, ed. Paul Edwards (New York: Macmillan, 1967), 1: 240.
2. R. S. Westfall, in "The Career of Isaac Newton," *The American Scholar* 50 (1981): 353.
3. Isaac Newton, *Opticks*, query 31 (New York: Dover, 1952), pp. 401-4.
4. Robert Jastrow, *God and the Astronomers* (New York: W. W. Norton, 1978).
5. Ralph Burhoe, "What Specifies the Values of the Man-made Man?" *Zygon* 6 (1971): 231.
6. B. Spinoza (1632-1677), who did identify God both with the physical universe and the realm of mind, was widely regarded as thereby supporting atheism.
7. See, e.g., Karl E. Peters, "The Image of God as a Model for Humanization," *Zygon* 9 (1974): 112.
8. Notably by Donald T. Campbell, "The Conflict Between Social and Biological Evolution and the Concept of Original Sin," *Zygon* 10 (1975): 234-49; and "On the Conflicts Between Biological and Social Evolution and Between Psychology and Moral Tradition," *Zygon* 11 (1976): 167-208, reprinted with minor revisions from *American Psychologist* 30 (1975): 1103-26.
9. See discussion by Richard Schlegel, "Quantum Physics and Human Purpose," *Zygon* 8 (1973): 200-20; and "Quantum Physics and the Divine Postulate," *Zygon* 14 (1979): 163-85; idem, *Superposition & Interaction* (Chicago: University of Chicago Press, 1980), pp. 23-55, 161-96, *passim*.
10. The physical aspects of the philosophy of A. N. Whitehead are strikingly in accord with the natural philosophy that is emerging in late twentieth-century physics. See his *Science and the Modern World* (New York: New American Library, Mentor Books, 1948) and *Process and Reality* (New York: Harper & Row, Harper Torchbooks, 1967).
11. In his *Mind and Nature* (New York: E. P. Dutton, 1979), p. 174, Gregory Bateson writes: "Ross Ashby long ago pointed out that no system (neither computer nor organism) can produce anything *new* unless the system contains some source of the random." Bateson cites W. Ross Ashby, *Introduction to Cybernetics* (New York and London: Wiley & Sons, 1956).
12. I have given a book-length treatment in Richard Schlegel, *Completeness in Science* (New York: Appleton-Century-Crofts, 1967), and a briefer discussion in Richard Schlegel, *Inquiry into Science* (New York: Doubleday, 1972).
13. See Schlegel, *Completeness*, pp. 248-52, 262-65.
14. S. L. Jaki, *The Road of Science and the Ways of God* (Chicago: University of Chicago Press, 1978); R. Schlegel, "The Return of Man in Quantum Physics," in *The Sciences and Theology in the 20th Century*, ed. A. R. Peacocke (Notre Dame, Ind.: University of Notre Dame Press, 1981).
15. Schlegel, *Completeness*, chap. 14.