

THE SCIENCE OF RELIGION

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Preface

EACH OF THE THREE ESSAYS which together constitute the present volume was conceived independently and written at an interval of several years from the preceding one.¹ Yet, there is a unity and progression of thought which makes them coalesce naturally into a single publication. The first focusses primarily on the nature of scientific method itself and engages in a fairly detailed, at times technical, analysis of that method. The theme is that scientific method, rightly conceived, is universal in its application and that religion, rightly conceived, must conform to scientific method. In particular, reason and faith are seen as aspects of the same epistemological process rather than being in some fundamental opposition where each is viewed as representing a fixed, well-defined mode of knowing.

The second article explores further the relationship between science and religion, focussing more evenly on religion and its role as well as that of science. It is seen that while science supplies the method by which we examine and understand religious phenomena, religion based on prophetic revelation provides us with the essential experience of spiritual realities. Science can prove God's *existence*, but only prophetic religion can give man the *experience* of God for which he hungers.

The last article is devoted to scientific method in its relationship to the Bahá'í Faith itself. In-

deed, it is seen at the outset that the Bahá'í Faith asserts that it is scientific in its method and that religious truth is not absolute but relative. The rest of the article may be fairly regarded as a protracted explication of how this is so. More attention is given to all aspects of religion—the aesthetic, emotional, cognitive, and social—showing them to be parts of one process.

The limitations of both positivism and existentialism are discussed. It is pointed out that, just as the subjective experience of the individual scientist is objectified through participation in a community of understanding and a framework of interpretation, so individual spiritual experience can be objectified through participation in a religious community of understanding and the accompanying framework of interpretation. The important point is that the experience on which religion is based, though often qualified as “mystic” or “spiritual”, differs not essentially but only in its particular qualities from any other type of subjective experience and in particular from that on which other branches of science are based.

All three of these essays should be viewed as very feeble attempts to seize, to the author's limited degree, the powerful insights concerning science and religion afforded by the vast revelation of Bahá'u'lláh. One cannot predict how long we must wait for Bahá'u'lláh's profound vision to become reality, but we can affirm with confidence that the day is inevitable when religion “. . . shorn of its superstitions, traditions, and unintelligent dogmas shows its conformity with science. . .” and will have become “. . . a great unifying, cleansing force in the world. . .” (cf. ‘Abdu’l-Bahá, *Paris Talks*, Bahá'í Publishing Trust, London, 1969, pp. 130-131.)

1. The first essay was published in *World Order*, Vol. 3, No. 3 (1969), pp. 7-19, and the second in the same periodical, Vol. 9, No. 3 (1975), pp. 22-29, 32-38. The third was presented at the first annual meeting of the Canadian Association for Studies on the Bahá'í Faith in January 1976, and subsequently published in Volume 1 of *Bahá'í Studies*. The essays appear here with a few modifications intended to improve their exposition.

Preface to the Second Edition

The first edition of “The Science of Religion” was published in September, 1977, as Volume 2 in *Bahá’í Studies* and is now out of print. This second, revised edition was prepared for publication in response to continued demand. The Introduction is new and was written at the suggestion of the editors of *Bahá’í Studies*, who expressed the idea that such an introduction might be useful in providing information on the background and genesis of the essays. Since a new typesetting was found to be necessary in any case, I have taken the opportunity afforded by the reprinting to revise and expand the essays in various degrees. The first essay has been the one most significantly affected by this revision. In particular, the role of models in the epistemological process now receives a fuller treatment than was previously the case. The second essay has also been slightly revised with regard to a few points which have appeared unclear to some readers.

The third essay, “Science and the Bahá’í Faith”, was reprinted in *Zygon*, Journal of Religion and Science, volume 14, number 3, September, 1979. A number of revisions and expansions were incorporated at that time, and they have all been included in the present version. My thanks to *Zygon*, its editor, Karl Peters, and its assistant editor, Edwin Abaya, for their helpful suggestions.

W.S.H., Quebec, March 21, 1980

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INTRODUCTION

MOST PEOPLE FEEL that they know a certain number of true things about themselves and the world they live in. However, probably not many have thought very deeply about the process by which they have come to hold one thing true and another false. Such a spontaneous and uncritical approach to truth-seeking is reasonably successful in the practical realm of everyday life. For here, virtually everyone seems to rediscover so many of the same truths with comforting regularity: grass is green, fire burns, and unsupported objects fall downward; pain is unpleasant and the threat of pain anxiety-producing; people like to be loved and held in high esteem and dislike the opposite; people usually respond positively when treated kindly and tend to respond aggressively when treated harshly, unless they are too afraid to show their angry feelings.

It is when we try to go beyond the level of common-sense knowledge that we are forced to reflect more seriously about the process of discovering truth, for the unanimity which characterizes the world of practical truth is then rather quickly lost. We may, for example, start wondering about the inner and hidden structure of the things we observe — those forces and entities which we cannot observe directly but whose existence seems required to explain what we do observe. Or, we may ask ourselves whether there is any meaning to be found in the world and our experience of it. Sooner or later, we are led to seek some global context, some point of view, which can infuse a sense of purpose into the external events of everyday life, events which often seem to have no meaning in themselves. In sum, we seek what science calls a *theory*, a consistent set of hypotheses involving abstract concepts which describes a model of reality and which allows us to deduce and thereby explain the known facts. In religious terms, we seek a *faith*, which is simply a theory to which we add a high degree of personal commitment and emotional investment.

Even at this stage we can, if we choose, proceed unreflectively. We can accept a theory not because we have verified it in our experi-

ence but because we can no longer tolerate the existential anxiety resulting from our continued feeling of ignorance. Or, we may suddenly become “converted” to a faith because we feel better about having committed ourselves to *something* which is capable of relieving us from the oppressive self-centredness of daily practical concerns. Moreover, if the commitment to such a faith is reinforced by various practical rewards (for example, integration into a new social group in which we have new-found esteem), we may indefinitely escape feeling the need for serious examination of the bases of our beliefs.

In other words, our theories, and our belief in them, may often arise as much or more from our own inner needs as from the intrinsic validity or explanatory value of such theories. One might have expected the contrary — that the degree of conviction and commitment which a belief system is capable of eliciting would be more or less directly proportional to its degree of validity. But experience has shown that deep, sincere personal conviction and commitment to a belief system are in themselves no guarantee of its truth. We can and often do believe deeply in error.

Of course, it is not only our inclination to project our emotional needs onto reality that gives rise to disagreement and diversity of opinion on the theoretical level. The number of possible explanations for the things we experience seems virtually unlimited, and history is replete with examples of attractive and plausible theories which turned out to be quite wrong. Similarly, history has witnessed a plethora of faiths or religious belief systems.

However, the multiplicity and diversity of belief systems do not, in themselves, necessarily produce conflict. Rather, it is the distressing tendency of belief systems to drift into competition with each other which most readily leads to conflict. This tendency is greatly accelerated when, as is often the case, each separate system includes among its articles of faith the meta-belief in its own absoluteness.

If this process of competition is not checked through some natural force or process, it can

result in fanaticism, giving rise to persecution, oppression, and violence. Fanaticism may be said to be characterized by the conviction that the given belief system is so intrinsically important that literally anything done in its name is justified. Such fanaticism is probably more readily encountered in religion than in science since the depth of commitment to a religious belief system is generally much greater than it is in the case of a scientific theory, as well as being more easily based on emotion. Nevertheless, fanaticism has occurred in science, in politics, and indeed in virtually every realm of man's collective life.

We thus have before us some elements of the human situation which can make the successful elaboration of a valid and fruitful belief system very difficult: our tendency to project our needs and desires onto reality; the number and diversity of initially plausible theories consistent with any given set of facts; and the dogmatic tendency to become fanatically attached to a given belief system once it is formulated. Now, since all of these elements are present in the practice of both science and religion, we cannot draw from this analysis any clear basis for making a radical separation between them. Nonetheless, we know that such a separation is often made, and so we should perhaps try to understand what has led to the apparently widespread belief that this separation is necessary.

If we consider the historical beginnings of the opposition between science and religion, as well as some of its contemporary manifestations, the issue seems to be rooted in certain widespread human attitudes towards power. The broad allegiance which a belief system can command creates a reservoir of power. If the belief system is institutionalized in such a way that this power is easily available to certain individuals or groups (for example, priests, experts of various kinds, or political leaders), the tendency may naturally arise for the favoured group to maintain its position of power by resisting new beliefs and theories, however valid, progressive or socially helpful these latter may in fact be. In other words, so-called ideological battles are often not ideological at all but only symbols for a power struggle between people. This, as I suggest in the first of the three ensuing essays, is largely what happened in the case of

Renaissance science and the religion of the day. Exponents of religion perceived the emerging science as a (latent or overt) challenge to their authority and proceeded to discredit various aspects of the new science, but not from a truly rational point of view.

Following this initial split came the incredible success of the new science, a success which was clearly not attributable to the religion which had so clamorously disowned science. But the spectacular development of this increasingly materialistic science, further dehumanized by the way in which society at large has made use of its fruits, has only served to heighten a general sense of discomfort. For, secularizing science has not provided theories of sufficient depth and breadth to give adequate, satisfactory answers to many of the fundamental questions of everyday life — questions concerning meaning, death, consciousness, self-sacrifice, love, suffering, etc.

At the same time, religion has not been able to provide much comfort since its continued rejection of scientific principles of inquiry renders it incapable of giving any guarantee of the validity of its belief system. People are faced with the unpalatable choice between highly validated scientific theories of limited scope on the one hand, and unsupported metaphysical speculation on the other. Moreover, circumstances have more often than not forced people to make a choice between these extremes and to live their lives accordingly.

The dilemma described in the last sentence continues to characterize the intellectual and spiritual milieu of the late twentieth century. It was within this same milieu that I found myself struggling to come to grips with these questions as a young university student in the mid-1950's. Quite early in my own thinking I became convinced that there was no fundamental, logical or epistemological reason for this dilemma and for the radical separation of science and religion on which it is based. I tested this theory in my reading and thinking, and in discussions with both scientists and religionists. These experiences, and the reflections occasioned by them, only served to validate my hypothesis and thus to deepen my conviction of its truth.

I was astonished, for example, to see how uncritically so many theologians and religious-

minded thinkers had accepted the positivist description of scientific method. In accepting the exclusion of religion from the domain of scientific method, such religionists thereby acquiesced to their inability ever to give epistemological justification to the content of their belief systems. Perhaps this attitude on their part was a vestige of the reflex of their Renaissance predecessors: their unwillingness to subject their thought to the critical methods of science represented a desire to carve out for themselves an area, however small and devoid of genuine social influence, in which they reigned with unchallenged authority, without the nagging necessity for justification and response to criticism.

Truly appalling was the spectre of the unbridled power of secularized science, a power whose ultimate limits could no longer be discerned. This power, divorced as it largely was and is from any fundamental commitment to a humanistic, much less ethical or spiritual, value system, could not fail in the end to be exploited by the basest and most selfish of human interests.

The systematic application of scientific method in certain specific areas of material development coupled with the continual refusal to apply this same method in the critically important areas of the spiritual, the ethical, the social and the political has led man to the brink of destruction. He now has the certain knowledge of how to destroy himself, but only the vaguest, unsupported speculations about how to prevent such destruction. As Carl Jung once expressed the idea: through science and the use he has thus far made of it, man has conquered nature; but he has not yet understood or conquered his own nature.

It was in this frame of mind that I became acquainted with the Bahá'í Faith through the profound writings of Bahá'u'lláh and the commentaries and interpretations of 'Abdu'l-Bahá and Shoghi Effendi. Here was pure religion, unflinchingly addressing itself to the deepest of human questions and yet not only tolerating but inviting critical study. And here was religion one of whose basic principles was the unity of science and religion.

Concerning the relationship between religion and science, the writings of 'Abdu'l-Bahá, in

particular, forthrightly condemn dogmatic religion for its rejection of science. At the same time, 'Abdu'l-Bahá lays bare the inadequacies and limitations of the strictly materialistic, positivistic conception of scientific method. It is fair to say that his analysis and observations, made in the decade 1910-1920, anticipate by almost fifty years the general realization of these same limitations on the part of the philosophical and scientific community.

The Bahá'í writings deal trenchantly with another crucial problem involved in the religion-science controversy, namely the lack of any clearly objective content to religion. With the continued development of science, religion has come to be regarded as an activity which deals essentially (and unscientifically) with the irrational, subjective, mythic, and emotional aspects of human life. Viewed in this way, a religious belief system appears as no more than a collective neurotic mechanism for dealing with the difficulties and sufferings of life: such beliefs are illusions which may give some comfort but which have no basis in any reality other than human imagination.

The Bahá'í Faith addresses this problem through its concept of progressive revelation: religion is an objective, periodic phenomenon called "revelation". The Bahá'í concept of progressive revelation furnishes a theoretical model for human history and social evolution as well as giving objective content to religion, a content independent of the subjectivity of any particular human being. In this view, religion becomes a phenomenon which can be studied, approached, and experienced scientifically without losing any of its multidimensional richness and capacity for emotional enhancement.

These, then, are some of the themes which dominate the three essays of the present collection: the flexibility and universality of scientific method, and its applicability to religion and religious phenomena; the misconceptions about the relationship between science and religion deriving primarily from the various historical contexts in which this relationship has evolved; the distortions in the conception of scientific method wrought by the historically accidental marriage of scientific practice to a dogmatic materialistic philosophy; the view of religion as

an objective, periodic phenomenon with objective content.

The first essay concentrates primarily on a fairly detailed exposition of the nature and scope of scientific method, indicating both its limitations and its potentialities. This description of scientific method is personal and draws heavily on my own professional background in logic and mathematics. Nevertheless, it was written some ten years after my identification with the Bahá'í Faith, and many of its key ideas are to be found in the Bahá'í writings. The essay closes with a brief focus on the theme of religion as a periodic phenomenon.

The second essay, written several years later, quotes extensively from both Bahá'í and non-Bahá'í sources. It attempts to sketch in more detail the current status of the relationship between science and religion. Using ideas developed in the first essay, the question of the existence of God is addressed directly. It is seen that the processes and forces which science has now succeeded in laying bare already provide a model in which the affirmation of God's existence can be clearly formulated as a scientific proposition (refuting contentions by some philosophers that the question of God's existence is essentially meaningless). The question of God's existence is seen to have the same epistemological status as that of the existence of any non-observable theoretical entity (such entities abound in modern science). While science is thus seen as providing the basic framework in which the existence of God can be meaningfully formulated and discussed, religion based on revelation is seen as furnishing man the possibility of the experience of communion with God. Also, the prophetic figures, or revelators, provide an important element of empirical evidence for God's existence.

The third essay deals with these same dominant themes, relating them much more explicitly to the Bahá'í Faith itself. It is seen through direct quotations from the Bahá'í writings that the Bahá'í Faith affirms the basically cognitive nature of religion without in any way diminishing its other important aspects. As with any cognitive activity, religion cannot hold itself aloof from scientific principles of inquiry.

The positivist and the existentialist views of science and religion are each examined in some

detail, and certain deficiencies in them exposed. It is seen quite clearly that positivism does not provide an adequate model for scientific practice, and that the subjectivist, existentialist view completely neglects the social dimension of religion. Rather, existentialism regards religious experience as peculiarly subjective and therefore internal to each individual in a way which renders it virtually uncommunicable, non-objective, and incapable of forming the basis of society. It is seen that science objectifies internal experience by creating a community of understanding which gives a framework of interpretation to individual practicers of science. This enables members of a scientific community to participate in the validation of the internal experience of other members. It is suggested that the creation of a religious community of understanding can accomplish the same (relative) objectification of internal experience connected with religion. It is seen that the ultimate basis for such a community is the objective phenomenon of revelation. After a brief indication of the way that revelation has provided the motive force for social evolution in human history, the essay closes with a discussion of some elements of individual spiritual practice in the scientific spirit.

These essays represent an earnest attempt to address fundamental questions involved in the religion-science controversy which has been such a significant and persistent feature of modern life. Indeed, the basic confrontation between science and religion might be regarded as the background against which the social and political dramas of the contemporary world have been played. The essays do not sidestep the difficult questions or smooth over critical points. Rather, they attempt to focus on these points and bring to bear on them some of the insights contained in the writings of Bahá'u'lláh, 'Abdu'l-Bahá, and Shoghi Effendi, as well as the understanding afforded by modern philosophy of science.

Nevertheless, I am keenly aware of the very relative value of my efforts and harbour no illusion of having brought any definitive answers to these important questions. I shall be happy if this work has contributed, to whatever limited extent, to clarifying these issues and stimulating others to go further.

I.

SCIENCE AND RELIGION

“The Revelation proclaimed by Bahá’u’lláh, His followers believe, is... scientific in its method... religious truth is not absolute but relative....”
— Shoghi Effendi

A CARDINAL PRINCIPLE of the Bahá’í Faith is that science and religion must be in agreement and harmony. In view of the conflict and confusion which have long existed on this subject, one might think that this principle would be a great rallying-point, attracting large numbers of scientists and religionists to examine deeply the tenets of the Bahá’í Faith. This has not yet proved to be the case, however. What has been true is that those people who already felt deeply the need for some reconciliation of science and religion and who chanced to examine the Bahá’í Faith were pleased to find this principle an essential part of the Bahá’í teachings.

The situation is, I feel, quite analogous to another age-long conflict, the conflict between established religious orthodoxies. The relevant Bahá’í principle here is the essential oneness of religion. Yet there has not been any marked tendency on the part of established religious authorities to look with favour on this basic Bahá’í teaching. Because each orthodoxy has been adamant in its claim to superiority over other orthodoxies, there has been no common willingness to accede to the “leveling” belief that a *de facto* unity underlies the various great religious systems. Of course, there is a contradiction between the various rites and rituals, dogmas and creeds to be found in the present form of these religious orthodoxies. What the Bahá’í Faith affirms is that these rites, creeds, and dogmas are largely *irrelevant* to the fundamental teachings, the essential purpose and meaning of religion. These teachings have, without exception, enjoined such qualities as

humility, love, compassion, tolerance. Fanatics can find no sanction for their fanaticism in the recorded teachings of their founder. Present-day religious arrogance is thus seen to be a partly deliberate, partly unwitting perversion of the viewpoint which the venerated founder had originally hoped to engender in his followers. Add to this the further observation that these founders were largely venerated only after the fact and were the object of scorn, hatred, and rejection in their day, and we have a thumbnail sketch of religious history.

I have chosen the conflict between orthodoxies as an analogy to the religion-science conflict because I suspect that it is closer than either religionists or scientists would like to admit. Orthodox religionists would dislike the analogy because they have been forced to admit the value of science after an initial resistance, and the idea that they may one day be forced to capitulate in a similar manner before the pervasive value of another religion which they initially misjudged — this would be painful. Scientists would resist the analogy in that it tends to compare science to the dogma of a religious orthodoxy, a comparison which they would regard as invidious. For if anyone is “winning” the so-called religion-science conflict, it is clearly science. Yet, it is not a novel observation that scientists are increasingly assuming the function and role played by priests in earlier societies. They are the initiated, those who explain the great mysteries to the unwashed masses.

Anyone who has had the opportunity to work in a scientific field knows how often serious scientific achievement is embellished with a liberal amount of sham and wordplay. If these are not rituals designed to charm the masses (or one’s Dean or the National Science Foundation) they come uncomfortably close to it.

Of course, a scientist would object that all of this is not true science. This, he would say, is the concession which the true seeker after scientific truth must make to the ultra-pragmatic world-at-large. The many exigencies of life in the political and social market place force the scientist, as an individual, into compromises, subtle and not so subtle, with the basic principles of scientific inquiry. But, one might contend, this does not compromise science itself, for anyone can plainly see that its principles are pure and lead to excellent results when applied correctly.

Does not all this sound strangely like the well-worn apology for the failures of religious institutions? "Our institution is diyine," we are told, "but you must not judge it by the 'human element' within it or by the corruption of individual exponents who may be weak and unredeemed."

The point is that both science and religion are human, social activities. As such, they cannot claim to be purer or more exalted than their ultimate influence on society. This does not mean that such activities do not draw on invisible sources of inspiration and power to produce their effect. It means only that the *evidence* for the existence of such hidden well-springs of creativity can only be measured by the ultimate, realizable effect which these activities or institutions do indeed produce.

The outline of the Bahá'í approach to the religion-science conflict now heaves more clearly into view. It is that, when the true purpose and nature of science are understood and when the true purpose and nature of religion are understood, then there is, *de facto*, no conflict. An essential unity is discovered, a unity which was there all along but which was hidden by the aberrations in the articulation of the two viewpoints. Just as Bahá'ís make no attempt to reconcile the confusing and contradictory dogmas of different religious orthodoxies, so they make no attempt to reconcile narrow-minded pronouncements by dogmatic would-be apologists for either science or religion.

A notable feature of the religion-science controversy as it has actually existed in our recent history is this: new science came into conflict with old religion. This fact must be borne in mind by anyone honestly seeking to under-

stand the dynamics of the problem. Modern science is, indeed, new in any historical sense of the term. Even to date it from the Renaissance is a mistake. The chief features of contemporary science appear only in the nineteenth century. Of course, its roots go deep into the past, indeed to the dawn of human intellectual endeavour. But this is true of everything. What is certain is that such a profound transformation of science was effected in the nineteenth and twentieth centuries that one can properly speak of a revolution, however revolutionary the original sixteenth-century advances may appear with respect to their prehistory.

Of course, even to date the "scientific revolution" from the Renaissance does not obscure the glaring fact that the religion with which it came into conflict was already past its prime, atrophied, and sterile. Even though it possessed strong political and social prerogatives, religion had long since assumed a position as champion of the *status quo*, a disbeliever in the possibility of genuine social evolution and progress in this life. No wonder that "religion" seems to have been so much on the defensive and so easy an adversary to discredit in the eyes of thinking men. Such men simply had no example of a religion which was a dynamic, creative, evolutionary force. There was nothing in their immediate experience, no analogy or example, which could easily allow them to view religion in any light other than that in which its most volatile exponents chose to present it: a reactionary social force.

But the new science also suffered from the decline of religion. Because man was socially and morally atrophied in so many respects, society tended to use science for prejudicial, unscientific, and irrational ends. Science tended to become a tool to obtain desired (but not necessarily justified) social ends, rather than an attitude toward life as a whole which, from the Bahá'í viewpoint, it should have been. Thus, we now see the specter of scientific achievements being used to destroy nations, render the earth uninhabitable, effect mass murder, disgorge a cornucopia of often useless gadgets, and even to bolster dogmatic and puerile political-social or philosophical points of view about life.

As examples of the latter, one might cite the attempt by some modern-day Marxists to use

science to establish a religion of "scientific atheism" complete with dogma, rituals, and the rest, or the pseudo-philosophy of logical positivism whose inadequacy has not lessened efforts to popularize it.

Scientific Method

WE NOW TURN to a more substantive task of elaborating just how the basic unity of science, and of science and religion, is viewed in the light of the Bahá'í teachings. Our theses are, quite simply: (1) that the basic unity of science lies in its method of inquiry or epistemology, and (2) that the Bahá'í Faith consciously accepts this epistemology as its own, accepting in its wake whatever redefinitions of the terms "religion" and "faith" are consequent to it.

What, in the final analysis, is science anyway? To begin with, science is a collection of statements or affirmations which are taken as truths about reality (or some portion thereof).¹ To say that a statement is true means that the state of affairs which it affirms to be the case is, in fact, the case. To say that the statements of our science are "taken" as truths means that we deliberately include in science only statements which we have judged to be true as a result of a certain process.² We can thus see that science involves at least two aspects, namely the process or method by which we judge statements to be true, and the collection of statements which results from this process. We will begin our discussion with a consideration of the collection of statements and then turn to a consideration of the process by which the collection is generated.

1. We will use the term *phenomenon* to refer to a circumscribed portion of reality. Notice that it is the knowing subject who determines (perhaps unconsciously) what portion of reality he seeks to understand. He thereby contributes an element of his own subjectivity to the phenomenon, even though reality (other than the realm of the knower's own internal states) exists independently of him and of his needs.

2. The point is that a statement can be true (or false) without our knowing it to be so. Moreover, the subsequent analysis in the present article will show that scientific method provides only relative rather than absolute criteria for determining truth. This means that we may unwittingly include some false statements in our science. However, it is one of the fundamental characteristics of science that we commit ourselves to the discipline of a method which reduces the possibility of falsehood as much as possible. Moreover, we reject from our science any false statement as soon as its falsity becomes apparent.

The statements which comprise science (or any given scientific discipline) are subject to highly complex interrelationships. These interrelationships serve to make some statements in the collection much more important than others. The two statements "this paper is white" and the highly pregnant " $e=mc^2$ " are both equally *true* statements of physics, but these statements are not of equal importance. Let us try to make all of this a bit more precise.

The Abstract and the Concrete in Science

THE STATEMENTS OF SCIENCE have two components, an experiential (or empirical) one and a logical or theoretical one. Statements may vary with regard to their empirical and theoretical components. The theoretical component of a statement results in part from the use of *abstract* terms. These are terms which refer to entities or qualities not directly accessible to human observation. "Energy" and "mass" are examples of abstract terms while "paper" and "white" are *concrete* terms referring as they do to observable entities and qualities.

The theoretical component of a statement also results from the relative complexity of the linguistic structuring of the statement and of the terms which occur in it. For example, terms such as "velocity", "light", "mass", and "energy" which occur in the statement " $e=mc^2$ " are complex when their mathematical definitions are spelled out.

In fact, the pregnant statement " $e=mc^2$ " has such a high theoretical component that it takes years of concentrated effort to assimilate its meaning. This statement is far removed from simple, direct physical observations like the whiteness of paper. On the other hand, "this paper is white" has such a simple linguistic structure involving the use of concrete terms that its meaning might even be conveyed by the one word "white" accompanied by appropriate gestures toward the physical object in question. It is inconceivable to think of conveying the meaning of a highly theoretical statement in this manner.

Of course, even a statement like "this paper is white" has *some* theoretical content. It involves abstractions which are not innately given

