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SCIENCE PHILOSOPHY RELIGION

A TWO-DAY SYMPOSIUM

11 - 12 AUGUST 1964

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**AIR FORCE WEAPONS LABORATORY
KIRTLAND AIR FORCE BASE
ALBUQUERQUE NEW MEXICO**

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FOREWORD

In August 1964 the Air Force Weapons Laboratory at Kirtland Air Force Base, New Mexico, sponsored its first symposium on Science, Philosophy, and Religion to which were invited as speakers prominent scientists, philosophers, and theologians. Their primary topic was the relationship of science and the modern ethic.

Such symposiums are not new or unique. Modern man has very frankly investigated the interrelationships of science and morality since Hiroshima. But the Air Force symposium had a distinctly different aura in that its principal speakers are not only men of science - - a physicist, a mathematical philosopher, a chemist, and a director of a national nuclear institute. These men, eminent in one field, all have a common interest in a field generally considered uncommon for a scientist. Each of these four men of science is exceptionally qualified to speak for one or more of the world's great religions or philosophies. Two of these men were speaking as ordained priests in the Roman Catholic and Protestant Episcopal faiths; another spoke as a lay-minister in the Mormon faith; yet another took the position of a "theist with Oriental overtones." An eminent rabbinical scholar-scientist was to have represented Judaism but was unable to attend. However, the Hebraic viewpoint was not neglected. In the panel discussions which followed the formal speeches of the first day, several other clergymen-scholars joined with the scientists in presenting theological viewpoints and expressing ethical judgments.

The Laboratory Committee which arranged this symposium gratefully acknowledges the many courtesies and contributions of all persons involved. Formally and informally the principal speakers were most generous of their time. From the earliest inception of the symposium, Major General John W. White, Air Force Special Weapons Center Commander, and Colonel Raymond A. Gilbert, Air Force Weapons Laboratory Director, enthusiastically endorsed the concept envisioned by the Kirtland AFB Chaplain, Lt Col Willis L. Stowers. Lt Col Lew Allen, as Chairman of the symposium, contributed significantly through his learning, patience, and good humor. Finally, without the ungrudging work of the Committee of junior officers, this symposium could not have come into being. Their work is in great measure the norm by which future symposiums on similar philosophical subjects must be planned. The solid endorsement of the symposium by the civilian-military, scientific-lay communities would appear to be an indication of modern man's concern with all facets of human understanding.

The transcripts of the formal talks and the informal panels are published essentially as they were given. Because a spoken and written

language are frequently at semantic odds, a certain degree of editing by the principal speakers has been performed. Nevertheless, concern has been expressed by a few participants over the interpretation and logical soundness of presentations which necessarily involved spontaneity. The editors, therefore, suggest that the reader bear these comments in mind and qualify any literal interpretation.

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Rev. James Albertson, S.J., Ph. D.

James Albertson was born in Los Angeles, California in 1927. He served in the U.S. Navy during 1945 and 1946. He received his B.A. degree (1952) and his M.A. degree in Philosophy (1953) from St. Louis University, and his Ph. D. in Physics (1958) from Harvard University.

In 1960 Dr. Albertson was ordained to the Roman Catholic priesthood in the Jesuit Order. He became an Instructor in Physics at Loyola University of Los Angeles in 1962 and in 1964 was named an Assistant Professor of Physics. He is also Director of the Loyola Forum for National Affairs.

Fr. Albertson has authored five publications. His research interests presently concern the quantum-mechanical measurement theory and epistemological problems of physics.

Henry Eyring was born on 20 February 1901 in Colonia Juarez, Chihuahua, Mexico, to Edward Christian and Caroline Romney Eyring. He received his B.S. (1923) and M.S. (1924) from the University of Arizona and his Ph. D. in Chemistry (1927) from the University of California. In 1928 he married Mildred Bennion; they have three sons. Dr. Eyring is currently Dean of the Graduate School of the University of Utah.

Dr. Eyring's achievements include five honorary doctoral degrees; membership in Sigma Xi, Phi Kappa Phi, Phi Lambda Upsilon, and Gamma Alpha; he is president-elect of the American Association for the Advancement of Science; he is a member of the General Sunday School Board of the Church of Jesus Christ of Latter-Day Saints. He has authored or coauthored five advanced chemistry text books and over 340 papers in national journals.

Special interests include radioactivity, quantum-mechanics in chemistry, theory of reaction rates, theory of liquids, rheology, molecular biology, theory of flames, and optical rotation.



Henry Eyring, Ph. D.



Filmer S. C. Northrop, Ph. D.

Filmer S. C. Northrop was born 27 November 1893 in Jonesville, Wisconsin. He received a B.A. degree from Beloit College in 1915. After Army service he finished his graduate work at Yale and received an M.A. degree. In 1919 he married the former Christine Johnston. The Northrops have two sons. He did additional graduate work at Harvard, receiving another M.A. degree in 1922 and a Ph. D. in 1924.

Dr. Northrop has been Sterling Professor Emeritus of Philosophy and Law at Yale University since 1947. He has received several honorary doctoral degrees and is a member of Phi Beta Kappa, Sigma Xi, the New York Philosophy Club, and the American Academy of Political and Social Science. He has held membership and positions of responsibility in a number of national organizations dedicated to the field of philosophy. He has authored numerous books, articles, and technical papers.

William Grosvenor Pollard is Executive Director of the Oak Ridge Institute of Nuclear Studies. He is married to the former Marcella Hamilton of Nashville; they have three sons.

Dr. Pollard holds a B.A. degree from the University of Tennessee (1932), a Ph. D. in Physics from Rice University (1935). He has received honorary doctor's degrees from seven different universities and colleges. He is a member of Phi Beta Kappa, Sigma Xi, Phi Kappa Phi, and an honorary member of Sigma Pi Sigma.

Dr. Pollard was ordained a deacon in the Episcopal Church in 1952 and a priest in 1954. He is now serving as Priest-in-Charge of St. Alben Chapel in Clinton, Tennessee. Among the several books he has authored are such timely titles as "Physicist and Christian," and "Space-Age Christianity."



Rev. William G. Pollard, Ph. D.

INTRODUCTION

CHAPLAIN STOWERS

We were advised of a quick story this morning. It seems that one of our local clergymen created a lot of excitement with the announcement that his message was supposed to be the voices of God. The people turned out in great numbers because in the printed announcement the letter "o" was omitted from the word voices!

Now we are expecting great things of this symposium. At this time, I would like to present the Commander of the Special Weapons Center to offer his encouragement and a few words of welcome. Our own Commander of Special Weapons Center, Major General John W. White.

MAJOR GENERAL WHITE

Thank you, Chaplain Stowers. Good morning, ladies and gentlemen. It is indeed a pleasure on such a momentous occasion to welcome such a distinguished group of visitors to Kirtland Air Force Base. I feel we are very honored to have the active participation of Father Albertson of Loyola University; Dr. Eyring of the University of Utah; Dr. Northrop of Yale; Dr. Pollard of Oak Ridge; Dr. Trueblood of Earlham University; Father Perone of Austin, Texas; Father Arenz of Loyola; Father Roth from Fordham University; Dr. Scoville of the Arms Control and Disarmament Council; and Dr. Allen, otherwise known as Lt Col Allen, from the Pentagon-- you will see more of him in a moment. I say this is a momentous occasion for two reasons. Insofar as I am able to determine, this is the first symposium of its kind to have ever been held in the Air Force. And I frankly can not think of three more important subjects than science, philosophy, and religion for men who are charged with national defense to discuss and study. I might even say with the defense of the free world. While I am not a scientist or a philosopher, and obviously not a man of the cloth, I nevertheless would like to say a few words from a layman's standpoint on these three subjects.

I look upon the interrelationship of science, philosophy, and religion as the three-way foundation of the whole man. Science provides man truth and knowledge of the physical laws of the universe; it provides man with the physical and material things of life. Karl Pearson has said that science may be described as a classified index of the successive pages of sense impressions, which enables us readily to find what we want. The latter part of his statement is very important but in no wise accounts for the peculiar content of the strange book of life. Science tells me, as a layman, a great deal about the material and physical things of life. But I must turn to philosophy and to religion for the contents of that strange book of life. Philosophy gives me, as a layman, the general facts and principles of the reality of human nature and conduct, of logic, ethnics, esthetics, metaphysics, and the theory of knowledge. Philosophy gives me truth and knowledge regarding the mental and moral aspects of life.

But science and philosophy cover only two of the three important facets of my life. For the third, the spiritual aspects of my well-being, I must turn to religion. It is only from religion that I can gain truth and knowledge of the spiritual contents of the book of life; and since I am a layman in all three fields, I look to the scientist for truth and knowledge in the scientific disciplines, to the philosopher for truth and knowledge as to my mental well-being and for guidance in my social conduct, and to the theologian for truth and knowledge of my spiritual and moral well-being. I would hate to think of having to wend my way through the peculiar contents of that strange book of life without assistance and guidance from all three of these vital elements of my well-being.

Now many people hold that a good portion of the truths expounded by science, philosophy, and religion are in conflict--that one contradicts another. I feel that one of the principal purposes of this symposium is to bring together experts in the fields of science, philosophy, and religion and let them explore for a short time these alleged contradictions. I venture to say that these alleged contradictions are not as well founded as most persons believe, that when they are thoroughly analyzed they will become less apparent as real contradictions.

And again welcoming you to Kirtland, I want to thank all of those responsible for the development of this symposium. Such a symposium is the brainchild of Chaplain Stowers; but I am sure he will agree with me that credit for all of the arrangements go also to several others, too numerous to mention. I wish for all of you, leaders and participants, a stimulating and profitable time of sharing truths, thoughts, ideas, and experiences which can strengthen and make more effective your lives and your vocation.

In closing, I received, this morning, a telegram from the Chief of Staff of the Air Force and from the Chief of Chaplains. It is very short and I would like to read it.

Greetings to you, your distinguished symposium leaders, chaplains, and all who take part in the science, philosophy, and religion symposium. It is my prayer that during this week a common language will lead to a renewed faith and further commitment to truths. (Signed) Robert P. Taylor, Chaplain, Major General, USAF.

Again welcome. I believe you are next on the program, Col Gilbert.

COLONEL GILBERT

Let me join General White in welcoming you all here this morning. It is a real privilege and an honor for the Weapons Laboratory to join

with the Chaplain's office here in sponsoring this symposium. As General White indicated, this symposium was the brainchild of Chaplain Stowers, who thought it might be a good idea to have a discussion of science, religion, and philosophy held at the same time that a religious mission was being conducted here at Kirtland. One of our regrets was that we were not able to obtain a rabbi to participate in the program this morning. We made several attempts, but each time something prevented the individual we had invited from attending.

Morality is often thought to be the responsibility of the churches, the schools, and the home. With some of the problems that exist today in this country, it is obvious that these groups alone can not do the job, or at least are not doing it at present. Indeed, there are some people who say that even though church attendance is at an all-time high, the influence of the church on national, and even on some personal affairs, is lower than it has ever been in the past. We charge the schools with all kinds of responsibility: training our children and imparting knowledge to them. But if the troubles that we are having with teenagers in a number of areas are any indication, the schools have not been able to discharge this responsibility we thrust upon them. Obviously, a lot of this discipline and philosophy of life and morality starts at home. Something has gone wrong in many of our homes.

There are those who feel as I do that it is the responsibility also of business, of labor, and of government to try to do something about the morality that exists in the United States today. We in the Weapons Laboratory are concerned about this problem too.

So it seemed very appropriate when Chaplain Stowers suggested this symposium, that we take on a joint responsibility with him of planning such a meeting. I conditionally agreed to go along with the idea provided a few people in the Laboratory would take on the responsibility. However, because some of us older people apparently have not done the job the way we should, I thought it might be most appropriate if we turned over the responsibility and all of the arrangements to a group of younger officers in the Laboratory. I was very gratified; the response was wonderful. At the first meeting we had about fifteen people present. They volunteered to do all the work. One of them, Captain Roberds, even volunteered to be chairman of the group. However, he had to leave town and Lieutenant Troutman ended up with a fair amount of the responsibility. Now, instead of just talking about what is wrong in the country, and pointing the finger at somebody else, the object had become, "Let's get a start on the problem. Let's try to do something ourselves."

And so that is the principal purpose of this meeting--to get some background from people who have thought at some length about the subjects of science, religion, and philosophy and how they are interconnected, people who can give us some help and a start on how to tackle the problem.

Hopefully, the people in the audience will interact with the speakers and ask questions. We purposely held the size of the group down so that there could be this kind of interchange with the speakers, and they have assured me this morning that they welcome such an interchange.

Our moderator for the next two days is an old friend of mine and a friend of many of you, Lt Col Lew Allen. Lew took his Ph.D. in physics at the University of Illinois. He spent a couple of years up at Los Alamos, where he had quite a responsible job. Then he came here to the Special Weapons Center and was in what is now the Laboratory, then the Research Directorate for a substantial period of time. But finally he was transferred to Washington, where he is now in the Office of the Director of Research and Engineering. He works with Dr. Hall who is the Deputy Director for Space. It is my pleasure to introduce our own Colonel Lew Allen.

LT COLONEL LEW ALLEN

Thank you, Colonel Gilbert. It is a great privilege to participate with you in this thought-provoking symposium. The questions to be addressed here today and tomorrow are of great significance to many of us. There are but a fortunate few of those who have delved very deeply into science and who have achieved any great equanimity of spirit in their personal relationships with religion and science. The majority of us have uncertainties, and we are often perplexed.

It is hoped that the discussions that will follow will encourage us all to apply intelligent thinking to those matters which are not always subject to objective analysis, but are perhaps the most important matters of concern.

After each of the talks which will occur today, there will be an open period of discussion. It would be appreciated if the questions today would be addressed to the subject of the speakers' talks. For those of you who have questions which depart substantially from that, but which pertain to the speakers' competence, we would like you to write these questions on cards which are available to you on the desk outside the door; you can pick them up as you go out. These cards may then be handed in and will form the basis for the part of the panel discussion tomorrow.

The proceedings here today are being transcribed, so for those of you from the audience who ask questions of a speaker, please pause just a moment after obtaining attention and let someone hand you or bring close to you one of the microphones. We will then be assured of obtaining your question as a matter of record. The transcriptions which are made here will be used to provide the published proceedings of these meetings which will be available some time after the symposium. On your program you have an application blank with which you can ask that these proceedings be sent to you.

FATHER ALBERTSON'S TALK

LT COLONEL ALLEN

The first speaker today is admirably qualified to initiate our symposium and to set the tone for the discussions which are going to take place. Father James Albertson is an Assistant Professor of Physics at Loyola University in Los Angeles. He has a Ph.D. in physics; he is a Roman Catholic priest of the Jesuit Order. I take great pleasure in presenting to you Father Albertson.

FATHER ALBERTSON

The summer of 1964 is a time of divided loyalties. We see Goldwater Democrats and Johnson Republicans. It may occur to you, therefore, that I am simply following this mood of bitter-sweet mixtures, being a priest and a physicist, and that really I should be serious and make up my mind which it is going to be. If so, of course, then that is one of the disadvantages of wearing two hats (or perhaps I should say of wearing two collars). There are compensating advantages, however, and I shall try to make full use of them. I am hopeful, for instance, that you will weigh my remarks with whatever earnest of authority may derive from having tried to deal with both sides of the issues in a professional way, as a priest and as a physicist. Generally speaking there is nothing quite comparable to the view one gets from the inside looking out. It is not the only possible view, but it is a singularly interesting one.

Renaissance scientists, you know, often wrote in Latin, and it is said one of them entitled his major work "De Omni Re Scribili et Quibusdam Aliis." Roughly translated that means "On Everything under the Sun and Then Some." Our discussion of such a wide-ranging topic as science and religion may seem to be comparably ambitious. But perhaps the field can be narrowed somewhat and a portion of the difficulty removed if we begin with a working definition of science and religion.

I do not know how acceptable they will be to others on the panel and in the audience, but for the purposes of my discussion I propose the following operational definitions:

Scientist: A man whose concern or competence is with the technical aspects either of pure or applied physical science, or of the mathematicized social sciences.

Religious Man: One who believes in the existence of a personal God to Whom he prays.

Undoubtedly there are many persons who consider themselves scientists and who are not included in the definition I have given. Undoubtedly, too, many consider themselves religious men and yet do not pray to a personal God. Without contesting their right to define categories differently, I have chosen these definitions because they do fit a great many cases, and because in terms of these rather narrow definitions the comparison between certain aspects of science and religion can be put more forcefully.

It is fair to say that in our contemporary society many scientists are not religious men--using our operational definitions for science and religion--and they feel that their scientific training and mentality are in some way responsible for their lack of belief in a personal God. In other words, their intellectual orientation as scientists prevents them from asserting the existence of a personal God to Whom they can pray. Quite possibly there are statistics available in this matter, but I do not have them. In any case, however, most of us who are scientists can attest from personal experience that the number is a large one. Equally large, perhaps, is the number of religious men who avoid or depreciate science for what they consider to be religious reasons. But I shall not be concerned with them this morning because their stand poses much less of a speculative problem in the mid-twentieth century.

Our concern, then, is with the widespread feeling among scientists that religion and science are incompatible. What I propose this morning is a closer look at the intellectual character of both science and religion in an attempt to pinpoint the origin of that impression. It is not enough merely to observe that the excessive sentimentality and overly anthropomorphic imagery in which some religious people have indulged is a peripheral aberration that should be discarded. Nor is it enough, I think, to suggest that some scientists abandon their rather philistine rejection of all human experience not reducible to meter readings. These attitudes have long since been discarded in responsible religious and scientific thought. The problem, rather, is one which intelligent and sophisticated men find in the inner structure of religious and scientific thinking. It is the examination of this structure, therefore, that I propose. In this way we may hope to isolate a critical point that could serve as a focus for discussion, either during these days or possibly at some later time.

Might a scientist feel unable to pray to a personal God because he finds in history a dramatic record of conflict between dogmatic doctrinal positions of religious bodies and the free-ranging inquiry of scientific thought? There are instances of this, of course. The most celebrated is the seventeenth-century dispute between Galileo and the Holy Office. From this dispute Galileo suffered much, and the Holy Office, I may say, has suffered long. In that unhappy incident one has clear evidence of an appeal to religious orthodoxy being used

to oppose a scientific concept. Now surely the Galileo trouble in some way embodies a fundamental point of the historical opposition between science and religion, but the simple historical fact of the incident can not in itself explain today's situation. Even though it would be impossible for the Galileo incident to be reenacted in the Church of 1964, many scientists still feel unable to adopt a religious attitude, and for reasons which are totally unrelated to the historical conflict. A change in the historical situation has eliminated certain extremes of emotion on both sides, but a fundamental opposition is still felt to exist.

Let me first state succinctly what I believe the root cause of this opposition to be, and then we can examine it in more detail and with more care.

On one side the scientist sees religion proposing a number of affirmations such as "God exists and hears our prayers." These affirmations are quite beyond the range of our perceptual experience; they are untestable; and yet they are said to be unquestionably true. They are beyond the range of perceptual experience because you can not see God as you see your neighbor; you can not talk to God as you talk to your neighbor; and you can not elaborate a crucial test of the truth of the statement that God exists and hears our prayers. And yet the religious man says this is unquestionably so. The scientist, on the other hand, is molded in an intellectual tradition which has a far different attitude toward statements about nonperceptual reality. To a scientist, only more or less probable assertions can be made about such reality, any one of which can be questioned or discarded, and all of which must in some way or another be testable.

On the basis of rather considerable personal and vicarious experience and testimony, I suggest that it is neither their proper repugnance for the folk customs of some religious people, nor their disquietude in the face of some historical incidents which is the common cause of the estrangement from religion felt by many scientists. Rather, it is the above-mentioned diversity of viewpoints or intellectual attitudes. In that area of nonperceptual experience may we make untestable assertions that are firm, or must such assertions be only tentative and probable? In other words, can we have in that area only probabilities or may we also have some variety of certitude?

A closer look at these two opposed poles of probability and certitude is in order.

The philosophers and logical analysts have been plagued by the infinite variety and types of certitude, and you will find no agreement among them on clear and precise definitions of certitude. If you will permit me, therefore, I am going to short-circuit speculation and give

a practical, operational definition of what I mean by religious certitude. I would define religious certitude as the quiet assurance of the presence of a personal God which a man requires and has when he prays to God. Now this definition can be meaningful to you only if you interpret it in light of your own psychological processes. You can not speak, for example, with any confidence to someone whom you think may not be there, listening. The imaginative picture which accompanies this confidence--whether it be the burning bush of the Old Testament that was not consumed, or whether it be the venerable and awesome patriarch--is quite unimportant from our point of view (although it does have a very great cultural significance). The important and relevant fact is that a habit or practice of prayer requires a firm conviction of God's existence, and this conviction is unlike any kind of probability, however high that probability might be from a psychological point of view. A religious man's certitude or firm assertion of God's existence is not measurable by any confidence level or degree of probability. It is simply different. Now the same kind of assertion and assurance may not exist with regard to other religious doctrines, but I will say a word about that later. So in some areas, at least, as far as we have discussed it, the religious man has certitude.

Turning to the scientist, you see a very different situation. By reason of his training in the development and application of physical theory, the scientist is conditioned to speak of nonperceptual reality only in terms of probability statements. With the exception of a very few, rare individuals who are becoming lost in a logical quicksand of infinite regression, all scientists will agree that they can know with certitude, for example, that a particular piece of apparatus is before them on the laboratory table, that this apparatus shows a meter reading of approximately such and such, and so on. But that is an element of perceptual experience; you can see and touch the apparatus. The certitude one has there is a certitude about something perceptual. In the non-perceptual area of experience, the area where physical theory is conceived and operates, probability reigns.

Let us take a rapid glance at one such theory. The most fundamental and successful theory that we have in science today, the one that comes closest to unifying physics, chemistry, and biology, is the quantum-mechanical theory of atomic and nuclear structure. And this theory gives us an essentially statistical picture of the universe. It says, for example, that while we have no certainty that this particular quantum of radiation will ionize this particular atom, we can calculate the probability with which it will do so. With large numbers of quanta and large numbers of atoms ionization probability gets very high indeed, so that we can rely with some certainty on the operation of such practical devices as fluorescent lights. In the last analysis of theory, however, the underlying phenomenon is described by quantum mechanics in statistical terms. The quantum-mechanical universe of atomic and nuclear structure is unavoidably statistical. It is a probabilistic universe.

Probability in science goes much deeper, however, than the makeup of any one specific theory such as quantum-mechanics. The customary view of all theory in science is that theory serves only to provide successive approximations in a line of more and more adequate attempts to account for experimental reality. A theory is created only that it can pave the way to a better theory. Theories are, in a way, self-devouring. Thus none of the conceptual schemes and none of the constructed entities of a given theory can be affirmed to image with certitude that world of reality which the experimentalist probes and prods. Newton's theory of gravitation gave way to Einstein's general theory of relativity, and relativity will one day give way to something else--probably.

Testability, too, is a property of physical theory. Theories must lead to statements which can be compared with experimental findings in a qualitative or, preferably, quantitative way. This numerical comparison between experimental measurements and the prediction of theory forms a negative test for the theory, in the sense that whereas it can not prove a particular theory, it can certainly disprove some theories. And although passing a number of these negative tests does not establish the validity of a theory's basic notions in any logically rigorous way, it does give the scientist a certain confidence in his theory; he does accept it as a working principle. If his theory were altogether untestable, the scientist could not have that confidence.

Clearly this scientific attitude toward knowledge, this intellectual spirit which is characteristic of science, can generate opposition to the certainty with which a religious man affirms God's existence. The object of the affirmation--God--lies beyond the range of our perceptual experience, and the statement that He hears our prayers is one for which no test can be devised. The scientist considers it possible that an adequate explanation of the universe requires a God--a cause beyond those with which he can deal--just as he considers it possible that quantum mechanics may be superseded by another theory. But the important point is that he is not certain, and of course one can not pray to a God Who only probably exists and Who only probably listens.

Richard Feynman has an uncommonly frank and lucid way of putting things and he puts this rather well, I think.

Today, he says, we can not see whether Schrodinger's equation contains frogs, musical composers, or morality--or whether it does not. We can not say whether something beyond it like God is needed, or not. And so we can all hold strong opinions either way.*

* Lectures on Physics (Addison-Wesley, 1964), II, 41-12.

Now this statement is a sharp statement and it is uncommonly common-sensical. The scientist is conditioned to doubt the finality of any expression of our growing knowledge; his doubt is tolerant, but nonetheless it is still a doubt.

And I would ask you to note carefully that the question I pose is not whether quantum mechanics or Schrodinger's equation can prove the existence of God, but whether or not the scientist, intellectually conditioned by such theories as quantum mechanics, can be certain of something beyond his perceptual experience.

If this, then, is the state of affairs, and I believe we may fairly consider it to be so, my proposal is that we examine religious and scientific knowledge more closely in order to see if they are, in fact, so diverse as they are imagined to be. It may turn out that both science and religion have areas of firm knowledge in which there are some assertions about nonperceptual matters that may not be questioned, as well as areas of pliant knowledge where concepts and structures are continually being reshaped, refined, and reordered by inventive and creative minds. Should that indeed be the case, then recognition of the existence of such a similarity might open minds on both sides which were previously closed. Certainly it would facilitate communication. Hopefully it would foster mutual understanding.

Let me say a word about science--in particular, physics. The areas of what I have just called pliant knowledge are very obvious in physics. Those quantum-mechanical statements about atomic processes we mentioned are always statistical; they deal with probable events. And even the status of quantum mechanics itself as a working physical theory is hypothetical or provisional. The probability interpretation of the wave function, due to Max Born, the attendant statistical expression of transition probabilities, and all the rest that goes with it are well known to the physicist. Few people will contest that interpretation, and no one has contested it successfully. Equally well known--again if you allow for the inevitable number of dissidents--is the nature of physical theory as a hypothetico-deductive system. Theories are hypotheses from which experimentally verifiable laws are drawn, and a feedback mechanism is constantly working to adjust theory to experiment.

That is the pliant knowledge in physics, and it is obvious. But not so obvious in physics is what I would call the area of firm knowledge concerning the nonperceptual. It is not so obvious, but it is equally real and discoverable. At the basis of every effort in physics there are two firm convictions about the world of nature: first of all, it operates in a consistent fashion; and secondly, this consistency can be accounted for. There is, in other words, a consistency which can always be described with at least asymptotic quantitative accuracy by constructable theories. Of course I can not really prove that every physicist

gives firm assent to those two propositions. I can only draw on my experience which indicates that they do, and I suggest that your individual reflection also will show it to be the case. And note especially that the two propositions we just mentioned--nature operates in a consistent way, and this consistency can be accounted for--are concerned with something which is not an object of perceptual experience, and that neither of those propositions is a testable proposition.

The consistency of physical phenomena is not an inescapable object of our experience; our perceptual evidence just does not take this consistency and lay it out on display before us. In fact, anyone who has ever worked in the laboratory is quite aware of the apparent inconsistencies of physical phenomena; it is those apparent inconsistencies which spur further experimentation. Nor, on the other hand, is the possibility of constructing successful theories an object of experience. Of course that possibility is compatible with experience because we all know that the growth of science has been nothing other than a succession of successful theories. Each one of those theories was found in time to be deficient and was superseded in whole or in part even though it did meet the difficulties of its own day. But whereas it may be compatible with past experience, the affirmation that every difficulty to be encountered will be only a temporary roadblock in the future progress of physical theory clearly goes beyond our perceptual experience. And for the same reasons, neither the consistency of physical phenomena nor the recurring success of physical theory is the subject of a testable proposition. And yet the physicist affirms both, at least indirectly by his dedication to his science. He does it with conviction and he does it with constancy.

The point I would like to make here is that the physicist (or the scientist) is making a firm affirmation whose object is beyond perceptual experience, an affirmation which is not testable. Whatever view the scientist may take of physical theory (and there are many views)--whether he sees it as invention, or discovery, or a combination of both--and however the scientist takes his stand on consistency--whether absolute or quantum-mechanically statistical--he is nonetheless unshakably convinced that physical theory is an increasingly more accurate parallel to the consistency of natural phenomena. That is what I would call the area of firm knowledge in science.

Are there similar areas of firm and pliant knowledge in religion? Yes, very definitely. In talking about science it was most important to emphasize the existence of the nonexperimental but firm assertions, because that was the point most likely to be overlooked in examining physical science. With religion, on the other hand, and especially Catholicism, it is most pertinent to stress the conjectural, the tentative, and the pliant areas of knowledge or affirmation.

That the religious man makes firm assertions I think is quite clear; we have just been discussing some of them. The range of those assertions differs, of course, from one religious body to another. Old Testament Judaism, for example, insisted upon the existence of one God Who had a special providence and care for those who observed His law. And although the form of that particular affirmation, as it is found in Deuteronomy for instance, was conditioned by the historical situation in which the Israelites were fighting against cultural assimilation by polytheistic neighbors in Canaan, the essential message of the affirmation was easily perceptible. The affirmation is repeated on a more universal scale in the prophetic books of the Old Testament. To this message New Testament Christianity added the assertion that Jesus Christ is the Son of God Who has come to restore estranged mankind to its true filial state. And we could take other examples from other religious bodies.

So much for the firm assertions of religious man. Now, in speaking of the pliant area of religious knowledge, I shall confine my remarks to the one area with which I am personally familiar in a professional way, namely Roman Catholic theology.

One of the functions of theology is to order and correlate religious knowledge in terms of philosophical and psychological concepts. All past and contemporary developments in philosophy and psychology are available to the theologian. Quite evidently this is an area of pliant knowledge, because change and development are continual here. So, however excellent the theology of a given age, by its very nature as an intellectual discipline it must anticipate and assist in its own eventual modification and even replacement through a clear recognition of the tentative and transitory character of many of its insights and systematizations.

When Thomas Aquinas wrote his Summa Theologica, or Resumé of Theology, in the thirteenth century, he was structuring the firm affirmations of New Testament Christianity according to a philosophical framework derived in large part from Aristotle. Quite similarly, Augustine in the fifth century wrote his theology in a Platonic tradition. But neither the theological system of Aquinas nor that of Augustine constituted a firm affirmation of Christianity, Roman Catholic or otherwise. And this notwithstanding the favored status which Thomism eventually achieved. You may know of the historical situation in the late nineteenth century, when, in the face of something very much like intellectual anarchy in the Catholic Church, Pope Leo XIII declared the theology and philosophy of Aquinas to be a guide for Catholic theologians. Subsequently a considerable body of Thomists, as they were called, grew up in the Catholic Church. The Catholic theologians of today, having assimilated that base, show new orientations in this continuing development of theology. Men such as Karl Rahner, Yves Congar, John Courtney Murray, Edward Schillebeeckx, and Hans Kung are expressing the same primary, firm affirmations of Christianity which were of concern to Augustine and Aquinas, but they are expressing them in the tested concepts and structures of our own day.

Let me give one instance of this tentative theology I am talking about. Injustice and mental or physical suffering are certainly facts of experience, yet at the same time Christianity firmly asserts that God Who is all-powerful is also good. How then can we reconcile in our own minds the existence of evil with the goodness of God? This is a problem for theology. To this classic problem of evil, various solutions have been posed by theologians, no one of which has achieved any notably universal recognition. There is a long and agitated history of the question if you care to go into it. But the lack of a universally acceptable theological explanation of the problem of evil does not cause the Christian to question either the goodness of God or the fact of evil. It simply means that Christian intellectuals have a continuing challenge in face of them. And that is true with many other questions of theology as well. Aided by the insights of the past, the theologians of today are able to see further and more clearly than the theologians of an earlier age. And upon the work of these men of the twentieth century, in turn, will be built the theology of succeeding generations. Such is the area of what I have referred to as pliant religious knowledge.

My remarks this morning can be quickly summarized.

In their thought structures both science and religion reflect a basic pattern in man's search for understanding. There is an initial firm assertion that goes beyond perceptual experience and is untestable. For the religious man, as he has been defined in this talk, that assertion is "God exists and hears my prayers." For the scientist it is "There is an accountable consistency in natural phenomena." By the continuing effort at elaboration of more inclusive coherent structures or concatenations of these concepts, deeper insights and more refined correlations are being sought. The theologian has mined more deeply today into our knowledge of man and our knowledge of scripture, and he is bringing much new relevance to his systematic theology of morality and doctrine. The scientist is researching new advances in physics and chemistry, and he is articulating just a bit more finely that interface between mind and matter.

Certainly my remarks this morning are only the beginning of a beginning. Some of the most interesting questions still lie ahead. What, for example, are the origins and what are the foundations of those firm assertions which I say we have found at the basis of science and religion? Where do they come from? Are they individual and private, a matter for each man alone to discover by himself, or do they derive somehow from communal experience in a religious or scientific community? And so on. There are many other questions, all of which will have to be treated at another time. The scope of the discussion thus far has been very sharply limited, and the conclusion that I would draw from it is pointed and, I think, important; namely, that

science and religion--however different their languages and objectives--share a common intellectual pattern. An understanding of this fact should open the way to communication and should also open the way to more mutual concern. Although at this moment in time the outcome of that communication does not have the clarity and detail we might prefer, we can have every expectation that the outcome will be a happy one.

QUESTION - Father, when you say that there is a consistency that the scientists are searching for, this consistency in physical reality, what do you really mean by consistency?

FATHER ALBERTSON - Let me put it in simple terms; I meant something that is simple and not very elaborate. If I perform an experiment today and arrive at a particular result, the experiment performed by another man at another laboratory under the same conditions (insofar as possible) will give the same reproducible result. Thus there is not an essential chaos in our experience of reality. We do not find one thing happening now and tomorrow, under identically the same conditions, something quite different happening. There is a basic consistency, repeatability, or reproducibility in our encounter with reality.

Now I said that such consistency is not absolute. It certainly is not, for if every experiment merely reproduced the results of the previous experiment, then there would be no advance. Generally one finds that what looks to be inconsistency arises because the conditions of the experiment have been changed.

QUESTION - Father, as sort of an extension of what you have said, it seems that your ideas indicate that once a scientist has reached a certain level of certitude in the area of firm knowledge, his basic preoccupation is with the theory and not with that certitude; whereas in the religious area the basic preoccupation of a religion would be with the certitude itself and not with the theory of theology, theology then taking the role of just aiding one in coming closer to that certitude. Would you care to comment on that?

FATHER ALBERTSON - Let me make a twofold comparison here. We started off by talking about the religious man, and then in a moment we were talking about the theologian. Now this is my fault. I should possibly have made it a little clearer that "religious man" and "theologian" are really two different titles. It is a concern of the theologian as a professional to take what I call the firm assertions of religion and then structure and order or correlate them in terms of philosophical and psychological concepts. That is his concern as a theologian. But he does not lose his concern with those basic firm affirmations themselves. As a religious man he still is vitally concerned with them. Of course it is not necessarily true that every theologian is a religious

man. There are people who operate in what we would call a theological area (such as scriptural exegesis, for example) who are not themselves religious men. But apart from that type of person I would say that the theologian does maintain his interest and vital concern with the basic firm affirmations of religious beliefs, even though he is, as a professional, concerned with the interrelation of these ideas, their correlation with philosophy, psychology, sociology, and so on. The professional interest has added to, or is an extension of, his religious interests. Now the scientist is, strictly speaking, a professional elaborator and user of physical theories. So the scientist correlates very well with the theologian. He does not correlate exactly with the religious man as such. Does that add anything to what went before?

QUESTIONER - I think so. What I seem to be saying here is that the theologian and the physicist are perhaps analogous, and perhaps the layman and the religious man are analogous in their relationship to science and religion; but does it not seem that without the aid of theology in religion, just as without the aid of theory in physics, a man has about as much trouble accepting certain beliefs in religion as he would have in the area of physics? In other words, without being a scientist, how does a man come to the conclusion that there is a certain uniformity in the universe, and that it is knowable and so on?

FATHER ALBERTSON - There is as much Sunday supplement religion as there is Sunday supplement science. You can accept your science from the Sunday supplements and accept with it a certain number of conclusions about the structure of the universe. I imagine one of the most common areas for this would be cosmogony, that is, studies of the origin of the universe. There are elaborate physical theories in cosmogony which require sophisticated nuclear physics and mathematics; but they yield a certain number of apparently easily understandable conclusions. People can and do read these conclusions in the Sunday supplements, accept them as fact, and go off with heads full of scientific notions. But they really have not done justice to themselves as people with intellect and understanding of their own. If they have had any kind of an intellectual background, they would attempt to get behind some of the conclusions to the reasoning that went into them. And to do justice to themselves they must.

I think that today there are more and more people who are aware of this. They realize that to be intelligent, educated laymen (not scientists, but simply intelligent, educated laymen) they have to know something about the innerworkings of science. One of the major programs in almost every college of liberal arts I know of is to provide precisely that intellectual insight into science which the educated man needs.

Now the same thing holds true in religion. There are a certain number of religious truths which a person may accept from one source

or another, usually from the community in which he lives. He can accept and act on these assertions or principles without further examination. But this again is not doing justice to his own intellect, his own mind. One should want to examine the foundations of such statements, whatever they be. The intelligent man will be urged on to probe and prod into the intellectual foundations of his religious beliefs.

In a sense, then, every religious man should be a theologian, to the extent that his training and intellectual capacity allow. He should no more rest with a Sunday supplement religion than the educated layman should be content with a Sunday supplement science. So, although the religious person is not a professional theologian, as an intelligent person he should have an interest, nonetheless, in theology and pursue it to the extent that he is able under the various limitations that he faces.

QUESTION - Let me ask you something more fundamental. You used the words Christian intellectual. There has been a lot of debate about whether these two words should be used together at all. I would like to have you comment on this, and could you start off by defining what you think a Christian is?

FATHER ALBERTSON - I took my definition in this talk from what I think is a common denominator of Christianity: the New Testament's affirmation of Jesus Christ as the Son of God Who has come to restore mankind to a filial state--that is, to restore mankind to its sonship with God. Now this can be interpreted, and in fact has been interpreted in diverse ways by different Christian denominations. But if you want the common denominator of Christianity, that is what I would give. A Christian, then, is a person who accepts Christ in that role.

Now is it possible to put the term intellectual and Christian together, taking Christian as I just used it? I frankly do not see the opposition myself. I would simply argue from the fact that there are many Christians who are deeply committed to their religious beliefs in an intelligent way, who are also very intellectual people, who are recognized as scholars in their own field--generally a secular field--and who give all the credentials of intellectuals that are obtainable in our Ph.D.-conscious society. So I would argue first of all from the co-existence of intellectual and Christian in any number of men to the possibility of intellectual Christians. You can not argue against the fact. The fact always demonstrates the possibility.

But perhaps that is not, after all, the most convincing discussion of the question which you have raised. The question is current, and it has a considerable literature. We are certainly conscious of a problem in the universities and colleges which we run in the Catholic church. Cultural difficulties were behind us to be overcome. I hope that there

are none ahead of us yet to be surmounted. But the problems we are facing are, I would say, exclusively practical ones, not theoretical. And one by one we are managing--if not always to solve them completely--at least to alleviate them.

QUESTION - The statement you made about Jesus Christ being the Son of God, is that being compatible with the second statement you made of intellectual inquiry?

FATHER ALBERTSON - Well, it certainly is not incompatible. If you say that, as a matter of fact, there are many Christians who have never applied their intellectual equipment to examining a statement like that, then I would agree with you. There are many who have not. But the fact that many have not does not lead us to conclude that it can not be done. I certainly would urge, and I am sure everyone on this panel would urge, that it be done.

There are many difficulties one can anticipate and worry about. But when we actually come to grips with them, they are not the insurmountable hurdles we thought they were. We may have been leaving out a large body of evidence that it never occurred to us to consider. I would suggest that perhaps the most pertinent area of evidence available today for the Christian intellectual which was not available twenty years ago or fifty years ago is our much deeper contemporary understanding of the archeological and linguistic backgrounds of the Scriptures, both the Old and the New Testaments. Biblical archeology has grown as fast in its own way in the last twenty years as nuclear physics. It does not grow so spectacularly. Occasionally an incident like the finding of the Qumran scrolls near the Dead Sea receives wide publicity. But this is only one incident in a long and continuing history of growth of Biblical archeology. Now all the theologians that I know have applied themselves assiduously to the study of new developments in Biblical archeology and have found that they shed a great deal of light on theological questions. They shed a great deal of light on understanding what is contained, for example, in the apparently simple statements of the New Testament. We are developing today a much better understanding of how the particular books in the New Testament, the gospels and the epistles, actually came to be written, to what extent they are a record of observed facts by eyewitnesses, to what extent they are, on the other hand, an expression of the faith of the early Christian community. All these things we know better today than we did twenty years ago, and they are the sort of things which the intelligent person, whether he be a professional theologian or not, should become aware of if he is concerned with having an intellectual grasp of his religious beliefs rather than a rote Sunday-supplement understanding.

DR. TRUEBLOOD - We have three terms in this symposium, philosophy as well as religion and science. A very important part of philosophy is moral philosophy. I wonder if the speaker would say a word about the moral basis of science?

FATHER ALBERTSON - I presume that when you ask that question that you have in mind the use of scientific developments and findings in a moral way.

DR. TRUEBLOOD - No, I mean moral conditions which makes science possible. The integrity of the reports, for example. It seems to me this is a very important aspect of science.

FATHER ALBERTSON - As scientists we exist inside a community and we accept from other people a great deal of scientific information which we ourselves obviously have neither time nor opportunity to investigate. I have never measured the gravitational constant myself, for example, but I presume it is what I can find in various handbooks. Why do I believe that? Well I think this is a faith in the objectivity of scientific reporting and the cross checks built into it which have grown up in the scientific community over centuries. I suppose it could be traceable back to the first scientific societies of England, France, and Italy in the seventeenth century, in which various groups of scientists came together to discuss their findings and publish results. An atmosphere was built up in which it was very difficult not to be honest. You were reporting to your peers who were competent to judge your findings; you were reporting to men who had performed, possibly, some of the very same experiments. And what you said was analyzed closely and critically. So I think that integrity of reporting is a property of the scientific community; in other words, the confidence we have in scientific reporting can exist because we belong to a scientific community. We see much of that today in looking through the Physical Review. We find similar experiments being done by different groups, different institutions. Brookhaven and CERN, for example, often work on similar problems, and it would be very difficult (not to say foolish) for a man in one of those institutions to publish bogus findings. I do not suppose we could say that it has never happened in the history of science. I am sure it has. Scientists, neither more nor less moral than other people, would be inclined to fudge their data just like anyone else when it might be to their advantage. But there are good checks built into the system because we exist in this scientific community.

QUESTION - Dr. Albertson, the illustrations that you gave concerning the difference between pliable knowledge and certitude in science was very clear in my mind. The illustrations of the certitudes, I would say on reflection, would be completely accepted by almost all scientists. It seems to me that the illustrations you gave of pliable knowledge in religion also are pretty clear. But what is not so clear, to me anyway, are the illustrations of certitudes in religion. I wonder if you could give some that would be anywhere nearly as widely acceptable as the certitudes that you illustrated for science?

FATHER ALBERTSON - In talking about certitudes I think there is one fairly obvious distinction that should be made. I am sure it occurs

to everyone, but perhaps it would be helpful to point it out explicitly. There is, on the one hand, a certitude which I may have, personally, on the basis of particular evidence leading me to that conclusion. On the other hand, there is the possibility of my communicating that evidence to you in a way which will lead you to the same conclusion I drew from the evidence. Now if I am certain of something on the basis of evidence which I have, I may in fact be able, or I may in fact not be able, to communicate the evidence to you in a way which will lead you to the same conclusion. I may or may not be able to do this. But that is not the same thing as saying I may or may not be certain.

So we have here the added question of communicability. There are some things which are more easily communicable than others, and in the scientific area communicability is generally very high--not as much in terms of those basic convictions about consistency, and so on, but in terms of all the other materials with which the scientists deal. For the most part they can be expressed in graphs, equations, and in numbers; and these are communicable. Definite experimental conditions can be set up for given observations. These can be reproduced, and results compared. So communicability is very high in science.

Communicability is not nearly so high in other areas. It is not nearly so high in philosophy, for example. I do not know many questions on which philosophers will agree. What starts as an agreement usually ends up as a very subtle disagreement.

In religion, then, I would want to distinguish between the personal certitude a religious man may have on the basis of evidence which is convincing to him and the possibility of communicating his certitude to someone else. That there is more communicability in science than in religion, I grant; it is simply the fact of the matter. But can we say that there are more scientists who are certain about the consistency of phenomena than there are religious people who are certain about one or another assertion of their religious doctrine? I do not know. In any event a head count is irrelevant.

There is something else that may be useful to mention here, for if not immediately applicable it is at least on the periphery. Appreciable disagreement exists among religious people on questions which I would call theological questions--much more disagreement than agreement. But I suggest that if you examine the essential content of basic religious beliefs of all kinds, Christian and non-Christian, you will find rather striking similarity. I mentioned before that there are images which go along with certain affirmations. Because these images change from culture to culture, you will find diversity in visual representations. You will also find diversity in theology because religion has been expressed in conceptually different philosophical schemes. I am certain (and Dr. Northrop is an expert on this point) that religion of

the East has never found it appropriate to express itself in the same philosophical concepts as religion in the West. But with regard to certain essential affirmations which lie behind these further elaborations (visual images and conceptual schemes) you will find remarkable similarity--for instance, the existence of a personal being on whom mankind is in some way dependent.

In Babylonian mythology there are early creation stories from the second and even the third millennium B.C. We read them today and find them highly anthropomorphic and rather grotesque fantasies. Enuma Elish, for example, speaks of one band of gods warring with another band of gods. In a personal combat of champions one god kills the leader of the opposing forces. He then splits this god in two and forms the earth and the sky, and so on. Behind this literary imagination is an essential, basic, religious affirmation; namely, that somehow or other these people, these Babylonians, are dependent on a personal force which is outside their control. They may see the manifestations of this force in various ways--the floods coming and making the land fertile, for instance. All this is beyond their control and due to a personal force.

I would say, in general, that the apparent disagreements among religious bodies are in many cases on a rather high level of theological articulation and not so acute on the basic levels of fundamental affirmation. In any event you will find more similarity than dissimilarity, certainly more similarity than is at first apparent.

QUESTION - Father, I am not going to say this very well I am sure, but you spoke rather contemptuously of the Sunday supplement type of religion or science, and you encouraged one to intellectually peruse deeper into these things. And yet it seems to me that we must accept Sunday supplement type things which we do not have time in our lifetime to peruse. The speakers of this symposium are far more advanced in science, philosophy, and religion than I could ever be, even if I should take one of the three subjects and spend the rest of my life studying it. Yet two men, or a group of men, as advanced as you gentlemen are in science and religion can not agree upon many theological questions, or even upon a simple printed Bible passage--for example, the keeper of the keys passage. How can we accept Sunday supplement type things when there is no agreement on many things? Or, if we peruse theology ourselves, how can we hope to arrive at some decision we can use in our personal life, if even men like you have no agreement?

FATHER ALBERTSON - I think you are faced here with somewhat the same situation as the layman who wonders if Dr. Teller is right or Dr. Bethe is right on the matter of nuclear arms. He himself is not in a position to evaluate the arguments which either has used to arrive at his conclusion, but presumably each has good arguments. What does the layman do? He appeals to a better informed scientist, I suppose.

Let me take up what I think were two of your questions in the order in which you asked them. We do have to rely very much on other people for the things that we accept. We can not, as I pointed out before, investigate everything ourselves. But each one of us has a different responsibility to investigate for himself. For some people this responsibility may be very minimal. For others it may be a very heavy responsibility. So I certainly do not mean to imply that every person has to take it upon himself to plunge into every question. No, for various reasons we all have to accept some things on the authority of others. Now whose authority do we accept? This, I think, leads to the second question.

You mentioned that there are certain passages in scripture, Old Testament and New Testament--you can pick out passages almost at random in either--where different interpretations are given by different religious bodies. Which one do we believe? Why can not they all agree? I suggest, in reply, that disagreement on the fundamental meaning of particular passages in the books of the Old or New Testaments is disappearing. Disagreement among biblical scholars is less and less. There are places where the scholars are uncertain, of course, but they agree on their uncertainty to the extent that any one scholar is willing to concede that his own opinion rests on arguments somewhat less than conclusive. There are other areas, however, where the scholars agree on the meaning of a particular passage. And continuing study is enlarging this latter area of agreement. So I would say that among biblical scholars matters of fundamental disagreement are becoming less numerous. Consequently, among theologians who are not biblical scholars the areas of disagreement will also be less as they become more familiar with developments in biblical studies.

LT COLONEL ALLEN - I have a question on the matter of definition. (I ask because it perhaps may be useful in some discussions to come later.) You proposed an operational definition for a religious man, and later on a definition, or at least a suggestion, of what might define a Christian. But with regard to your operational definition of a religious man, you pointed out that it is one who believes in the existence of a personal God to Whom he prays. But I do not think you really ever explained what, to you, is meant by prayer. And of course the question that comes to the mind of most scientific people is perfectly obvious. If you mean by prayer a discourse which carries with it some spiritual benefit, that is one thing. On the other hand, if you mean a prayer in the sense of the word of asking for things, an answer to the prayer might involve some influence of the natural world, that certainly is a much harder thing for the scientifically trained person to accept. Would you clarify this part of your definition?

FATHER ALBERTSON - I am happy you raised that question because it is one I had intended to bring up but did not have an obvious opportunity. Prayer is often interpreted to mean exclusively prayer of petition.

To pray means to ask for this or that. Often enough, as you point out, people pray for something which, in its ordinary manifestations, depends on quite natural forces--a prayer for a raise in Air Force pay, for instance. That would be a good thing to pray for possibly, but I suggest that you start by also doing those things which will obviously, in the natural order, lead to a raise in pay. In this case it might depend on influencing the appropriate congressional committee. But "prayer" has a much wider connotation than prayer of petition. Another function of prayer has been familiar in religious bodies since the first recorded history; namely, adoration. In the prayer of adoration one simply recognizes the fact of the existence of God on Whom he depends in some way. The history of sacrificial religious manifestations could be cited here. Sacrifice is not generally a prayer in which worshipers ask for something like rain for a good crop, but rather it is a recognition of their dependence on a personal being whom they may call by various names, their God.

So prayer has many aspects, and I would say that probably the least meaningful type of prayer to the scientifically trained person is the prayer asking for something which depends on many physical causes which are in our competence to manipulate. If we want to have an effect we should manipulate these physical causes. It would be complete abdication of our function as human beings to ignore those natural causes. Such a prayer, I say, would be meaningless to many scientific people. But unfortunately it is the kind of prayer generally thought to be more common among religious people. Possibly it is common only because the physical forces at work have not been so well known. Certainly in older religions it was generally considered that a good crop was purely the result of prayer. One did not build irrigation ditches, or dam, or fertilize; one simply prayed for a good rain. Today we have a better idea of how to produce good crops, and we rely less on divine intervention and more on our own hard work in this area.

In summary, I would say that the type of prayer you mentioned is one which certainly would not, in its very extreme manifestations, be compatible with any scientific mentality. But it is not the only kind of prayer.

LT COLONEL ALLEN - I am certain as you reflect on the comments of Dr. Albertson, other questions will come to mind. Of course he is not getting away as easily as this. He will be here tomorrow, and we will have more time to examine the questions that will come to your minds.

I would like to say that the ability of a person to field questions on a subject as controversial and difficult as this is a true measure of his worth. In that sense I must say that Father Albertson fielded these magnificently. As a Protestant I get the disquieting feeling that I am no longer quite so sure of what I am protesting.

DOCTOR EYRING'S TALK

LT COLONEL ALLEN

The next speaker, I am sure, by virtue of his accomplishments is known to every person in the room who has scientific interests. Because of this allegation of a Ph.D.-conscious community, I will not mention that he, of course, has such a thing. As a matter of fact he has quite a number of them--one at least he earned. But his contributions to the scientific world are far too numerous to mention. I will simply state that he is the Dean of the Graduate School at the University of Utah at the present time; he is the Past-President of the American Chemical Society; he is the President-elect of the American Association for the Advancement of Science; he is a member of the National Academy of Sciences; and he has other honors in the scientific area of great length. He is also a member of the General Sunday School Board of the Church of Jesus Christ of Latter-Day Saints, which is known to most of us as the Mormon Church. It is with great pleasure that I introduce Dr. Henry Eyring.

DOCTOR EYRING

Thank you, Colonel Allen. I think I must qualify not as a theologian, but as a "molecule man" who is religious. Probably I am most interesting to you as a sort of case history. I think that would be the way you should think of me rather than as a religious philosopher who thinks of all of the important relationships and presents them brilliantly and delightfully as Father Albertson has just done. I enjoyed Father Albertson's remarks very much and, like Colonel Allen, I found lots of things I could not disagree with, which is satisfying.

I am reminded of another occasion. A cousin of mine, Marion Romney, prominent in our church, was presiding at a conference in Arizona. Since my father was in the audience, Marion felt obliged to call on him to talk. Father was preceded by a number of very able speakers. Accordingly, he opened his remarks by saying, "Unlike the preceding speakers, I am not trained in public speaking, so I'll just have to tell the truth." I wish that were not so descriptive of me; but I am afraid I find myself in the same position.

I would like to start with a statement of what I think all of us would agree religion is. Religion is a search for meaning in human experience. It is always that. We are immersed in a boundless universe which we must fit into in some kind of fashion. We are part of the universe and yet we are more than just a part of it. That deeper meaning in human experience is surely the thing that all of us are

looking for, wishing for, and finding--or not finding. So how we relate to the universe, what it means, what life means, is not only philosophy and science, but surely in the very deepest sense it is religion.

I am going to start out with a few concrete examples as a "molecule man" would. Harlow Shapley in looking over the universe estimates that there are 10^{20} suns that have planets circulating about them. Estimating that for one reason or another only one in 10^{12} would be suitable for human habitation, he is still left with a hundred million possible planetary homes for man.

Presumably, whatever is going to happen on this planet has already happened many times elsewhere in the universe. The universe is indeed vast. However good Shapley's figures may be, the immensity and diversity of the universe that surrounds us are inescapable.

There are intelligences in this room. In fact, there are some very able ones. In this vast universe there must be many more intelligences. There must be individuals with much greater ability than any I have known. The God I worship is the supreme intelligence of the universe. I affirm that there is such a being. There must be and I worship Him.

Such a pragmatic definition is probably to be expected from a scientist. To illustrate my point, let me tell you a story. The founder of the Welch Foundation, Mr. Welch, went from South Carolina to Texas, and like a lot of other Texans found oil. Unlike some he did not marry and he died with no one to whom he could leave his \$60,000,000 fortune. So he established a foundation to develop chemistry in Texas. He thought that was a good thing to do. It seems to me to be an unimpeachable idea. In any case, the trustees of the fund selected a half-dozen people from outside the state to recommend how the \$2,000,000 annual income should be awarded each year. I happened to be one of them. I go down with my hand open each time, but since I do not live in Texas it really does no good.

The Foundation holds a symposium annually to which the top scientific people in the world are invited. The first discussion, eight years ago, was on the structure of the nucleus, and on the wonderful experiments that have clarified nuclear properties. The scientists are paid generously for coming, and they have an audience of their peers so that those invited usually come. At a dinner, a dozen people happened to be sitting together at a table. (Two of them were Nobel Prize winners, and the rest felt they should be.) Mr. Malone, one of the trustees, was sitting next to me and said, "Dr. Eyring, how many of the people at this table believe in a Supreme Being?" I said, "I haven't any idea, but let's ask them." I asked if anyone objected to

such a question. No one objected, so these dozen people were polled. The answer was unanimous in the affirmative. All believed in the existence of a Supreme Being.

This, of course, proves exactly nothing except the way this particular dozen people felt. Nevertheless it is extremely suggestive. It indicates that people highly trained in the sciences are impressed with the order in the universe, with the number of things that can be systematized and explained. At least, this is my rationalization of this interesting result.

Now if you had quizzed them and tried to find out what they meant by a Supreme Being, you would have found less agreement. In fact, some of them added their postscripts at the time. They wanted to give quite a long discussion, but we said "No, let's stick to the question; do you believe in a Supreme Being? Does that best describe your belief, or does the converse statement better describe your point of view?"

On this basis, all twelve of them are believers. It would be nonsense to say that such a belief is universal among top scientists. But my experience indicates that it is typical. That is, a majority of physical scientists, when they are confronted with the magnitude and the wonders of the universe and the many things that can be predicted regarding it, are not happy with a solution that suggests that the whole thing is a colossal accident and that life is meaningless. Such a situation would really be a fiasco. They just do not believe it.

So I come to the notion that it is natural to believe in religion. The arguments as I shall outline them have been known for thousands of years. Nonetheless, I would like to go over them again and maybe spoil them slightly, but at least give a current formulation.

Before I do, though, let me make one parenthetical remark. (A very strange idea is to suppose that the Supreme Arbiter of the universe is not able to communicate with man should He desire to do so. This would be strange. I know second-rate physicists that communicate with others at a distance.)

Now, to continue, I think one of the strange manifestations of our time is the reluctance that individuals have of accepting anything that is not demonstrable at will. For example, if one knows something within himself, or is convinced of the historical accuracy of an event even though it can not be repeated, he is not necessarily without basis for his belief. To me, an example of the deeply religious man is Paul on the road to Damascus. He was out to destroy the Christians, but he had a personal experience that overwhelmed him. As a result of this nonnegotiable experience his life was transformed. In fact he spent

the rest of his life building up what he had been tearing down and in the process became the foremost missionary of all time. Now to me, that is real religion; but his experience you may say was nonnegotiable. It can not be repeated at will. My own inclination is to take Paul's evaluation of his experiences. He was brilliant and absolutely convinced of Christ's divinity. I accept this and similar experiences as evidence of a God Who is interested in his children.

So what I am trying to say is that in assessing religion and in weighing the points which Father Albertson just made, one must keep in mind that there are many important things about religion that are non-negotiable in this sense. The same is true about geology. You can not repeat earth history. These same limitations apply in other areas of science. One can get unduly obsessed with those areas of science such as physics, chemistry, and other experimental disciplines where experiments can be repeated at will. Such bodies of knowledge are testable and therefore simple to understand and evaluate, but there are lots of things in the universe that are important, and perhaps a lot more important, and yet by their very nature are not susceptible to a direct test. Surely the intelligent man, the interested man, the person who wants to come to terms with the world, does not want to restrict himself to a scientific method which is magnificent for the particular things to which it applies but which is inapplicable to many matters of the utmost importance. For instance, the events in geology that happened long ago are in this sense nontestable. One can not go back in time and repeat earth history at will. Nevertheless by painstaking observation and inference one can reconstruct earth history with considerable assurance and satisfaction.

Thus many of the really interesting problems in the universe are those with which philosophy and religion must deal. But just because they must deal with some nonnegotiable elements, lots of people become frightened and shut their minds to them as though that would make the problems go away.

I would like to give another example of something quite interesting to me. You know you can get so wrapped up in technical arguments that you can not reach a decision. For instance, the discussion of the relative merits of our form of government and that of the communists exemplifies this. The objectives professed by both systems are beautiful, but the test that ultimately matters is how the system works out in practice.

The same considerations apply to religion. Religion is much more than intellectual analysis. An intellectual analysis may be illuminating and interesting but what really matters is how men are induced to act. Jesus expressed this notion which has continued to influence people for good down through the centuries. He said, forget yourself; try thinking of your neighbor as being on a par with your own self, and see whether or not it works. It does.

And so religion is many things. I am emphasizing these pragmatic aspects as complementary to the more abstract questions of principle. Religion is personal involvement. It is a commitment to harmonize one's life with the purposes of the Supreme Being Who tells us that this will bring happiness.

It is natural for me to suppose that the universe in which I find myself expresses the purposes of the Supreme Being. Accordingly, discovery and obedience to law becomes part of one's religion since only in this way can one live in harmony with the divine purpose.

When considering the universe, one is struck by its immensity. The farthest stars revealed by the 200-inch telescope are two billion light years away. This immensity bespeaks the majesty of Him Whose purpose it serves. The precision and universality of natural law are illustrated by Newton's laws of motion. These laws apply on the earth and in the farthest depths of space and at all but the highest velocities. As objects approach the limiting velocity of light, Newton's laws find their natural extension in the special theory of relativity just as quantum mechanics provides the natural extension into the world of atomic dimensions. Using this generalized mechanics one predicts events with an exactness which is amazing. In other words, the laws of the universe are real and universal.

Another aspect of the universe is equally exciting. The second law of thermodynamics assures us that everything that is wound up must run down. And this universe that we find ourselves in is really wound up. In the National Academy I once asked the question "How was the universe wound up?" Nobody said a word. But after the session was over, Professor Milliken came over to me and said, "Oh, I'm a religious man like you are." I afterwards repeated my question to Professor Van Vleck. He said, "I don't know." And I think that is the right answer.

Now this is really an interesting question. If one calculates or tries to measure in any way the probability of the fluctuation which would create a hot sun and all the other temperature differences in the solar systems and galaxies, there is but one answer. It is fantastically improbable. Then contemplate the future promised us by thermodynamics when the universe has run down and all life and all change will have come to an end and have given way to a never-ending uniformity--the heat death. Sometime we may hope science will provide its answer as to how this unbelievable improbable universe got wound up.

The majestic nature of the universe, its obedience to law, and the fact that it is wound up again makes it natural for me to postulate a Supreme Intelligence, an overruling power, Whose will the universe reflects.

Now there are sensible postulates and there are postulates that are not sensible. The element of faith within religion can reflect good or bad postulates. When people tell you that a religion is just a matter of faith, this remark needs qualification. It is one thing to ask me to have faith that there is a town where I have never been, and it is another thing to ask me to have faith that there are people on the moon. Both ideas involve a certain amount of faith since they go beyond my experience, but they are, nevertheless, quite different forms of faith. In fact I am pretty sure there are no people on the moon, and I am quite certain of the existence of Cape Town, South Africa. So I do not like the quick dismissal that to be religious is simply a matter of faith. You can have faith with widely differing degrees of justification.

Some postulates are sensible in the light of experience, and some are not. For me the postulate that the Supreme Being, Who must exist, influences the course of events in the universe is a natural one to make.

Returning to our original argument in which we made the three points (1) that the universe is tremendously big, (2) that it is orderly, and (3) that the universe is wound up, we come to the next point. A universe in which there is evidence of so much design must have a designer, and therefore the universe must serve His purposes. And if the universe does have a purpose, it seems natural for me to believe that an all-wise Providence would be concerned with mankind above all else because of man's unlimited possibilities.

The most exciting and interesting phenomenon in the known universe is the intellectual capacity and depth of feeling exhibited by human beings. Humanity is capable of quite wonderful things, such as the launching of satellites and the never-ending achievements of science, but more important than this, man can wonder where he came from and where he is going. He can love, he can strive for the common good, he can do many things. I can not help believing that such strivings would be matters of great importance to the Grand Designer, the Supreme Intelligence, Who wisely organized and arranged this universe.

I can not help believing that His purpose on occasion is most effectively served by communicating with man. Such occasions requiring direct communication are presumably rare, because the purpose of our being here is to gain experience, to grow up to our potentialities, whatever they are, and to go on growing throughout the eternities.

Schrodinger made a tremendous point of the importance of the individual in his little book What Is Life? He believes that individual personality is so important that it is inconceivable that it should end in death. That idea is not only central in Christianity but in many other religions.

Now accepting the idea of a Supreme Being, one naturally expects there would be justice in the world. Instead, many lives seem to terminate with nothing resembling justice. This leads some people to deny the existence of a God Who is concerned with human problems. However, one may also see in this an argument for life after death where all such seeming injustices will be resolved.

I come to one further point and then I will close. Some years ago Professor Taylor and I were driving Professors Solomon and Einstein to the home of the latter in Princeton. I do not remember how we got onto the question of pre-life and life after death, but I expressed a belief in the continuing existence of the individual, and Professor Einstein asked, "How about animals? How about dogs?" Well, I told him I was a little weak on dogs but, we believe that all things were created spiritually before they were created temporally, including dogs. Religion raises many questions that lie outside the scope of the scientific method. This is not necessarily a serious fault. One can not trisect an angle using only ruler and compass. However one can trisect an angle by more elaborate procedures which go beyond the simple geometrical methods allowed by the ancients. It is an important fact of life that for the believer, revealed religion provides many answers quite beyond the competence of science.

So I close on this note. Religion is whatever is true. It is not necessarily what I say or what can be proved to this symposium today. It is what is really true. This is simply to say there is no possibility of conflict in the mind of God and He can communicate with man. So I end as I began with the statement that much is to be gained by a study of religion even though one may not always find easy answers.

QUESTION - From the overall standpoint of what you have said, faith seems to be more prevalent among mankind, and particularly in your own case, where understanding drops off. We tend to have faith more in things which we understand less, than in things where we can rely on understanding. If this is a possibility, do you then think that as understanding increases, the requirement of the presence of faith then decreases?

DR. EYRING - I have no expectation that such a complete understanding of the world is imminent. You have raised an interesting question, however. In every religion there are people who believe a lot of things that are true and some things that are not true. This is inevitable; the same thing is true in science. There are scientific theories that have outlived their usefulness. The refining process that goes on in science should also go on in religion.

Man gets in his own way in religious matters. He frequently gets so enamored with some particular solution to a problem that if the Lord

did not happen to choose that solution, he gets quite put out with Him. Much trouble comes from religious people who take a dogmatic position that can not be successfully defended. As a result there must be a retreat on such religious questions. But we see the same thing happening in science; in fact it happens in all human affairs.

It would be a mistake to throw away science or be discouraged with it because of the phlogiston theory or any of the other discredited theories. God reveals religious truth in his children, but He does not prevent them from elaborating on it. As a result there is a great deal of interpretation that should be discarded. This should not discourage anyone familiar with the analogous vagaries of science.

QUESTION - I would like to say that you seem quite a bit more liberal than most Latter Day Saints. But my question is this. You appear to be emphasizing a belief in the Supreme Being and arriving at it through a spiritual mysticism rather than a concrete, road-to-Damascus type of thing. I want to know how you arrived, from your own experience, at the knowledge of the Supreme Being--besides the general terms you used in your talk.

DR. EYRING - Jesus's statement is fundamental "Try it and you will know what I say is true." In using the example of Paul on the road to Damascus, I stated my own position as succinctly as I know how to state it. Paul had a tremendous experience and I accept his explanation of what happened. One can get religious conviction from such an interpretation of history. Of course it always must be one's own interpretation if it is to matter. A lifetime spent practicing my religion as best I can has convinced me that man is not alone. He can draw on resources beyond those immediately visible. This is the ultimate source of religious faith. Unfortunately this road is closed to those who are unwilling to travel it.

FATHER ROTH - I think we should be grateful to Dr. Eyring for pointing out something very fundamental in the whole approach to religion, and that is the personal element. And I would link this up with what Father Albertson said in his own talk when he gave what I first thought to be a rather unsatisfactory definition of certainty. I thought it was too psychological. Yet on reflecting afterwards of what Dr. Eyring had to say, I wonder whether this is not the best way in which one should approach God; that is, it is a personal response. Even as much as a religious man would increase the strength of his--whatever we may call it--faith, belief, or certitude, I think there is always the possibility, psychologically or objectively, of saying no. In other words, it is not as clear as a mathematical formula or a scientific problem which has been worked out by a team of scientists, each getting the same answer. I think maybe the good Lord made it that way because, after all, our belief is a personal response. I think Dr. Eyring made the

point there that each one has to solve it for himself. William James had an interesting theory on his approach to God. He admitted a mere possibility with regard to his proof of the existence of a God. I do not go along with him that far. But he hated the click of the mind. He hated reducing the human being to a machine, and he did not want belief to be merely pressing a button. This is more of a comment than a question, but I would like to hear Dr. Eyring's comments if he should have any.

DR. EYRING - I think you have said it better than I could.

QUESTION - Dr. Eyring, I do not want to belabor this entropy business, but I see a problem that might be significant for the younger scientist. I refer to Dean Lindsay's "thermodynamic imperative," where he says we should do as much as we can during our lifetimes to consume as much entropy as possible--in other words, maximize going from a state of disorder to a state of order. Is it not possible that a young scientist, in taking up science seriously and thus in the process of accepting this imperative, can get so involved in, to use your terminology, "winding the universe back up," that he sort of loses sight of the original winding up process? This may be why there is a basic lack of communication between the younger scientists and the religious man.

DR. EYRING - The term entropy, of course, is often used very broadly; Dean Lindsay was using it in this broad sense when he was telling people that by learning things and setting things in a more orderly fashion one is decreasing the entropy. In the sense that I was using it, that is only partly true. One consumes lots more power, much more free energy--and degrades it--than he can ever store with his orderly thought processes.

Possibly the great problem of winding up the universe may turn out to be no problem at all. It might, for example, be that the universe simply expands and then contracts and that we are in the expanding phase where entropy increases. The evolution of the universe may be a periodic process. In that case we may see the universe later contracting again toward the big original windup. We do not know the answers to this question. It would be, as your question suggests, a pity if one were disturbed by this problem, because we do have to take so many things on faith. Since the universe does exist, I am sure there is an explanation of how it got wound up. And I would not be sure that some future scientist after he understands the process may not point out as Father Albertson suggested, that because it is understood we do not need the Lord to help us any longer.

QUESTION - In the previous talk it was proposed that the definition of a religious man be arbitrarily limited to a man believing in a personal God, and praying to Him. I wonder if this feeling is not perhaps a problem here in that this kind of a definition would automatically

eliminate Albert Einstein, as an example, who was extremely religious and extremely moral. And I think that this may exclude a number of people who tend to feel, for instance, for a God who is cosmic. I personally believe in a personal God, but it seems to me that such a definition might be a bit inadequate. Also, we might not be keeping in mind that the particular speakers, because of their experience, speak from a particular viewpoint. Essentially, this morning, we are talking about a Christian world when this, in reality, is not the case. We must realize that the problems we are dealing with are simply not an issue of Science vs. Christianity. Maybe it is a matter of perhaps Gog and Magog; perhaps it is materialism in the communist camps vs. a religious concept. Do you not agree that perhaps we should think in broader terms to avoid the problems here?

DR. EYRING - I thought Father Albertson made it clear in his discussion that the particular definition he used was a useful one for his talk. He can best speak for himself, but I think that he would go along with you in the recognition that there are many people who are called theistic who put God much farther away than you and I and Father Albertson. And then there are other religious traditions that are not Judeo-Christian with a quite different emphasis. Again, I think that Father Albertson should speak for himself, but I suspect that he would agree that such men are religious but not in the context of revealed religion of which he was speaking. I think of myself as a person who believes in revealed religion. That leads to different kinds of commitments and different kinds of thinking than are made by people such as Professor Einstein who are, nonetheless, correctly characterized as being religious.

I would like to report a conversation with Professor Einstein. On one occasion Dr. Brunauer and I spent a morning discussing high explosives with him. At noon we started walking through a plot of ground in front of the Institute for Advanced Studies. Being wartime, the lawn had been plowed up and planted to beans. I am pretty much an authority on beans since I have hoed most kinds, but this was a kind I had not seen before. I asked Professor Einstein what the crop was, but he did not know. As we walked a little farther we came to a gardener sitting on his wheelbarrow. I asked the gardener what the crop was, and he said, "Well, them's soy beans." This led me to an interesting conclusion. Namely, if I wanted to raise beans, I would be better off with the help of this fellow who, instead of working, was sitting on his wheelbarrow, than with Professor Einstein who was not even thinking about what he had been walking through four times a day since the crop has been planted.

And so I would describe Professor Einstein as one who just did not feel the same competence in dealing with religious questions which he felt when considering questions in physics. Consequently, he just laid the matter aside. He had reached the solution adopted

by many scientists which may be stated as follows: "I do not deal with these problems very effectively. I do not particularly want to think about them. I would rather deal with matters which I am competent to handle. Religion can wait." Einstein went on to state his religious position. He said, just a few minutes after that, that he found the religion of Confucius especially interesting because it dealt only with ethical questions. Men have different outlooks and especially different ways of viewing religion. People who put God very far away ordinarily do not want to spend much time thinking about Him. You can call such people religious or not as you like but the people who change society are people like Paul and Jesus. These people get deeply involved with religion and for them it is a vital personal thing. This is the exciting part of religion because vital religion changes the world.

LT COLONEL ALLEN - I think it is interesting that both of the speakers today have discussed a few aspects of religion. One aspect is the kind which Einstein is on record of having agreed with, that is, the cosmic concept of God. But then both speakers have expanded this to the concept of a personal God to whom one prays, which is of course quite different from Einstein's view. It is interesting, I think, that we have not spent very much time talking about the moral aspects of religion. It was Einstein again who said that he believed that scientific knowledge dealt with what is, that religion dealt with what should be. He felt that religion was on its highest plane when it had the cosmic concept of religion, and that through this cosmic concept one could obtain an understanding of human relationships, or some understanding of what should be human relationships.

Now your original definition of religion, Dr. Eyring, did deal with this search for the meaning of human relationships. You did not come back to that very much. You mostly spoke the remainder of the time of what might be called the cosmic concept of God. Do you have any explanation or any further statements you would care to make about this aspect of human relationships?

DR. EYRING - When the leaders in a society become deeply concerned with the philosophical and moral aspects of religion, including the concept of the justice of an All-Wise Creator, then religion can not help interacting with and changing the society for the better. The ethical aspects of religion are the dividends that come from an affirmative answer to the question, "Is there a God?" Needless to say religion does not always succeed in reforming mankind. When people point to someone in my church and say, "Now that is one of your brethren and he is a mess," my response is, "Perhaps, but you ought to see what he would be like if it were not for the church." The world is very much better for the message that Jesus brought to it two thousand years ago.

QUESTION - Do you believe that the moral aspects of religion are separable from the intellectual aspects of religion?

DR. EYRING - I think it is a pity when they are separated. If a person is concerned with religious and philosophical questions concerning the Creator, it would be a shame not to let such insights influence him morally.

But that leads me farther than you perhaps wanted me to go. I would like to define what I think sin is. We live in a world governed by natural, moral, and civil law. Every benefit of law is predicated upon fulfilling certain conditions. Sin consists in making choices which run counter to the Divine Order. The purpose of life is the development of the individual. This requires free choice. But if free choice is sanctioned, then wrong choices must be allowed, i.e., sin is permitted.

QUESTION - We are talking about a regime here, science; and science is a world-wide thing. There are also Oriental scientists, for instance. I can not help but wonder this morning if we are orienting our talk, or if we are at least slanted to a very limited Christian-Judean concept. But the Oriental scientist is working right along with our own scientists and all other scientists of the world, producing various theories and solving various material problems. Are we here losing sight of the tremendous Oriental philosophies and the Oriental backgrounds? The first speaker said that this is part of the pliancy. I would like to think that sometime during these two days someone would consider the fact that the Oriental religious beliefs frequently are 180°, ethically and otherwise, out of phase with our own limited concepts despite the so-called Golden Rule of Confucious. We know very little--in spite of the amount of reading that the American people do today on Zen philosophy and so forth--about the historicity of Oriental religious thinking, very little in contrast to our own Judaic road-to-Damascus study. Would you have a comment on that thought?

DR. EYRING - Your point is a good one. God loves all his children and no single group has a corner on truth. I think we can easily be much too parochial in our approach to such matters. Nevertheless it is reasonable to suppose there is a best way, and to find it one should look as widely as possible. Unfortunately many people are not even interested in looking for the best way.

LT COLONEL ALLEN - Before we break for lunch, I would like to ask one more question of Dr. Eyring, in his capacity as a Mormon. I certainly do not want to offend him in any way by asking a question that deals directly with the Mormon religion, but I think to some of us who are not very well informed about the Mormon faith, it seems to carry with it a number of aspects which are less well understood as being documented

in the sense of biblical archeology which we discussed earlier. Mormonism carries with it a number of rather extensive concepts of after-life which certainly are more real to a Mormon than they are to other branches of the Christian faith. Many of these aspects of the Mormon religion would seem to be particularly difficult for a scientist to accept. Obviously he has not had difficulty accepting these. Perhaps he could comment in some other way on these particular aspects of the Mormon church.

DR. EYRING - Would you specify a particular thing? That should make it easier for me to answer.

LT COLONEL ALLEN - Well, I had in mind the obtaining of the tablets the Book of Mormon, the visit of Christ in South America, and so forth.

DR. EYRING - The Book of Mormon in general?

LT COLONEL ALLEN - Yes. I am sure it is not, to the majority of the people in the room, as well documented archeologically as the visit to Palestine.

DR. EYRING - I am glad you asked this question. Joseph Smith said in dictating the Book of Mormon, that he thought about it until he was completely convinced in his own mind that what he was writing down was true. And then when he was not on the right track, a stupor of thought came over him and he stopped his dictation. He also said that if there are things in the book that are not true, these are human mistakes. I accept that explanation. The Book of Mormon is accurate to the extent to which God was using Joseph Smith. I am convinced that God used Joseph Smith to restore the early Christian point of view; also, that Joseph Smith was not infallible.

As nearly as I can weigh the Book of Mormon in terms of the influence that it has for good and what it accomplishes, I am convinced it serves the Divine purpose.

I think that it is tragic when something good like the Bible or the Book of Mormon is regarded as completely erroneous because it is imperfect. If one refuses to work with science because of the approximations, one becomes sterile. The same is true in the religious world.

LT COLONEL ALLEN - I hope that tomorrow we can go a little bit into the Mormon concept of afterlife.

DR. EYRING - I would like to.

LT COLONEL ALLEN - The morning session stands adjourned. Thank you very much. We will reconvene at 1330.

DOCTOR NORTHROP'S TALK

I.T COLONEL ALLEN

Our next speaker is a gentleman we are profoundly honored to have with us. He has been a student of mathematical physics for many years; he is a true philosopher and has been working in the field of philosophy for many years. Dr. Northrop received his Ph.D. in 1924 and has been Sterling Professor of both philosophy and law at Yale University since 1947. He is the recipient of many honors, of honorary doctoral degrees, and memberships of many societies. I think that the opportunity now to hear a discussion which is on a substantially different tenor from the ones this morning will benefit us all. Dr. Northrop.

DOCTOR NORTHROP

One virtue of this paper is that it is not too long, and with professors, especially with retired professors, that is important since they have no terminal facilities.

I am beginning, as the two previous speakers have done, by giving a distinguishing mark of religion and science and their similarities and perhaps differences. The distinguishing mark of religion is its concern with those factors in the cosmos and in human nature that are timeless. I might just amplify that a little bit. I mean that religion is not primarily concerned with the transitory, dying body. It is concerned with the soul and with its possible immortality, that is, with the timeless part of a person. One of the scientific questions about religion then becomes: Is there a factor in human nature that is timeless? I think that this is a perfectly straightforward scientific question.

This criterion of the religious is in accord with traditional usage. The ancients once made the statement that all things were full of gods. These ancients were, I believe, materialists. A materialist is a person who thinks that souls do not exist and that nature consists of billiard-ball-like atoms and that they are immortal. When these ancients said all things are full of gods, they meant all things were full of immortal materialistic atoms, the word "god" being the name for what is timeless. Similarly, in the physics and metaphysics of Aristotle and the medieval Thomists, God is the final cause of the universe which is timeless.

This identification of the Divine with the timeless also has the merit of freeing the definition from reference to merely the Western Semitic religious usage. In Buddhism, for example, there is a religious factor in experience that is timeless but not theistic; its name is Nirvana.

This concern with the timeless does not mean that the temporal and perishing are ignored or neglected. Instead, one's temporal nature is enriched by the cultivation of the timeless factor by prayerful, meditative, or operational yogic or other procedures and their expression in personal behavior in time. This is in accord with Dean Eyring, when he determines the cosmic and human nature, and then allows ethics to be its expression. Religion is the application of the eternal to human behavior in time. A person behaves differently if he thinks there is nothing to him but the transitory. If he thinks man is nothing but a pleasure-feeling animal, he will be a hedonist and will tend to seek pleasure for himself and he may let other people go.

Science is concerned with the determination of theoretically consistent and factually confirmed knowledge of the cosmos and of man. The question, therefore, of whether there is a scientific meaning for religion becomes that of examining both ordinary and scientific knowledge to determine whether there are factors in each which are timeless.

This is a perfectly straightforward scientific question that an atheist, a skeptic, or an agnostic can proceed to answer, just as well as a believing Christian or Buddhist. Are there timeless things in experience?

The science whose business it is to carry through such an undertaking, that is to analyze the de facto ordinary and scientific knowledge that our ordinary experience and the scientist put at our disposal, is the theory of knowledge, or epistemology. Such is the case because, as I have written elsewhere, "Any scientific inquiry is an exercise in human knowing, and the special science whose business it is to investigate human knowing qua human knowing is epistemology."* It examines the process by which a physicist relates himself to what he purports to know. The physicist has his mind on his subject matter and if he is a good physicist he will probably forget that he is a thinking person, that he has a mind. Knowledge really is a miracle if you stop and think about it. Ordinary, secular knowledge is also a miracle. How is a little bit of a speck in the universe, like one of us, able to know the internal constitution of a star millions of light years away? How this can be is the kind of a question the epistemologist has to answer. How is it that a little piece of the universe can know what is not that piece? How can I so relate myself, or anybody so relate himself, to other facts of experience? How does he know them? Clearly, this inquiry requires a specialized science, namely, epistemology. Hence, any science whose primary concern is some subject matter other than human knowing qua human knowing is a combination of the science

*Northrop, F. S. C., and Helen H. Livingston, Editors, Cross-Cultural Understanding: Epistemology in Anthropology, Harper & Row, New York, 1964, p. 8.

of that subject matter, physics, chemistry, sociology, psychology, and so forth, and epistemology.

The Far Easterners were epistemologists six or seven centuries before Christ. Since ancient times in the Far East, as well as at the inception of Western science with the ancient Greeks in the West, epistemology came into the scientific consciousness. There is a different epistemology involved in the mathematical physics of the Democritean scientists, from whom our laws of acoustics came, the Platonic scientists, and the Stoics, than in the physics and theology of Aristotle. Aristotle's epistemology is largely that of a superb natural-history biologist. He founded the latter science. All modern natural history biologists stand on Aristotle's shoulders. Modern physics began when Galilei and Newton rejected the epistemological theory of the meaning of the word "heat" of Aristotle for that of Democritus, Plato, and the Stoics.

Such epistemological considerations have turned out to be especially important in recent mathematical physics. One of the last things Einstein wrote near the end of his life is:

The reciprocal relationship of epistemology and science is of noteworthy kind. They are dependent upon each other. Epistemology without contact with science becomes an empty scheme. Science without epistemology is--insofar as it is thinkable at all--primitive and muddled.*

I knew Einstein very well. I went to see him, as a young Assistant Professor at Yale, in the 1920's. He was then in Berlin. Later, when he came to this country, I saw him, as I did Whitehead, almost every year. What is behind this statement by Einstein? He told me after he discovered the new assumptions of his Special Theory of Relativity, in order to account for the Michelson-Morley experiment, he did not dare publish his findings. The reason was that Einstein had been convinced of the truth of Newton's statement that he made no hypotheses but had instead deduced the fundamental concepts of his Principia, the concepts of mass, mathematical space and time, and his laws of motion, from the experimental data. This meant, to use technical epistemological language, that Newton was a naive realist. To understand Einstein's concern, this epistemology must be clearly stated.

Naive realism is the thesis that (1) objective knowledge is possible for human knowers, notwithstanding their different subjective

*Schilpp, Paul A., editor, Albert Einstein: Philosopher-Scientist, Library of Living Philosophers, Evanston, Ill., 1949, pp. 683-684.

feelings, their different senses, and the different places where they are standing when they make their observations, i.e., their different frames of reference, and the different times when they are looking, and (2) objective knowledge is observed directly, that is, naively.

A person who denies realism is a radical empiricist. He says that all naively given, that is, directly observed, knowledge is relative to the observer, his various senses, when he is looking and his frame of reference. In this, the radical empiricist is correct. Concretely, this means that direct awareness never gives us objective knowledge.

This is contrary to what the ordinary man thinks is the source of scientific objectivity. Many scientists still labor in this error. They think that the reason why physicists get objectivity is that they do not resort to speculative theory, but restrict themselves to "nothing but the facts," and it is only philosophers sitting in armchairs who speculate.

Unfortunately, this naive realistic notion that we directly observe objectivity is erroneous, as radical empirical epistemologists the world over have shown. The reason is that we can observe only with our senses and all objects of the senses vary from observer to observer, from sense organ to sense organ, and from one frame of reference to another.

Radical empiricism is the thesis, therefore, that observation does not give objectivity. It does not follow that objective knowledge is nonexistent. What does follow is, as Einstein has noted, that if objective knowledge is meaningful, it must be known in some other way than by observation alone, and get its scientific defining properties from some other source than images either directly sensed or imagined.

It is important for the purpose of this conference that we examine the character of radical empirical knowledge in greater detail. In the first place, the senses do not warrant the idea of a lasting continuous object. Any of the senses gives one merely a sequence of perishing particular images, everyone of which comes into being, perishes, and is succeeded by a different one. Furthermore, these perishing images succeed one another in cycles.

I have examined many cultures of the world. You will not find a culture unaffected by Western mathematical physics that does not think of time as cyclic. The reason is simple. Time for primitive people is sensed time, and sensed time is a sequence of perishing qualities, for instance, the sequence of darkness and light called day and night. No primitive person thinks of day and night as having anything to do with a three-dimensional, spherical mass moving in a Keplerian orbit which is

an ellipse. I once had a Burmese Buddhist who wrote his Ph.D., in philosophy under my direction on the problem of putting Western contractual law in a Buddhist Asian Society. What was the moon for him or the children in his village? They regarded the moon as a playmate. Why? Because, when the moon came out to play with them, they did not have to go to bed so early. The moon was the immediately experienced brightness. A Chinese poet hinted at the same thing when he said, "The three of us sat together one evening--myself, my shadow and the moon--on the garden wall." To him, the moon was just a two-dimensional golden patch sitting there on top of the wall.

The darkness of night is succeeded by brightness, and the succession goes round and round and round. Then in the darkness of night appears a narrow little flat golden crescent. A little later, there is a quarter, then a half, and then a three-quarters, two-dimensional patch; that sequence goes round and round and round. From this, one gets the radically empirical monthly cycle.

Such seasons do not have anything to do with the sun and the earth's rotation. The annual seasons are the luscious fresh green of spring, the riper colors of summer, the browns and fading yellows of fall and the greys of winter. This is the world of radically empirical immediate fact. Everything definite in it is a sequence of perishing particulars which succeed one another in time. Human beings are similar. There are the birth, the springtime of life, the maturity of life, the fall of life, and finally its winter. Good conduct consists of taking factual immediacy with equanimity.

As William James, who described himself as a radical empiricist, noted, when one introspects, one finds no substantial self but "the flow-of-consciousness"--a temporal succession of perishing particular moods, feelings, and images. What identity is there between the Northrop who was a boy on a Wisconsin farm going out at five o'clock in the morning to bring in the cows and the Northrop who is talking about these things now? We could not have two persons more different. The radically empirically introspected person is never twice the same.

Naive realistic theory states that we naively know objective external objects and we naively introspect a substantial determinate personal self. The Buddhists and nondualistic Vedantic Hindus deny this, saying that the notion of a permanent determinate self is Sunyata, that is, empty and empirically without factual warrant. It does not correspond to anything that exists empirically.

In 1939 I was in Professor Takakasu's course in Buddhism for five weeks. He listened five days a week to my lectures on the philosophy of Western science, as I did to his on Buddhism. He opened his lectures on the Buddhist religion by saying that it rests on one empirical fact--namely, that all determinate things are transient and perish. By

"determinate" is meant any factor of fact which is different from another factor. For immediately experienced, that is, radically empirically known fact, this is the case as the foregoing considerations show and as Hume has reconfirmed for modern Westerners.

Reference was made above to Einstein. What was it in his reading of Hume that convinced him that Newton was wrong when the latter said that he made no hypotheses, but had deduced the postulates of his Principia from the radically empirical, experimental data? Hume made it clear to Einstein that we do not sense causality. What we sense is temporal succession, and temporal succession is not causality. Causality, as it appears in modern and contemporary physics, is the thesis that, given the present differentiated state of the system, you can deduce the future state. In short, the present necessitates the future. And Hume made it clear that you do not sense necessary connections. Now, the genius of mathematical physics is its remarkable predictive power, which derives from its mechanical causality. One of its most dramatic examples occurred upon the return from orbiting of Commander Shepard, the astronaut. The Captain of the Navy's recovery vessel went out on the bridge of his ship, looked at his stopwatch and signaled to the helicopter pilot to take off and proceed to a spot sixteen feet above the surface of the Atlantic. There the pilot found the space capsule arriving simultaneously, all mathematically calculated to a split second and predicted ahead of time. This is causality. That is deductive mathematical thinking.

With this kind of causality, it is not necessary to have ever seen a previous instance of the future state of the system. You can predict radically empirical particular perishing events in the realm of immediacy that have never been observed before.

In Aristotle's different, teleological causality, you must have seen the final state of the system in some previous example, like an acorn growing into an oak tree. Only after seeing that, you can "predict" that, given an acorn, if it grows at all, it will grow into an oak. But in mathematical physics of the logically realistic type, knowing the present state you can deduce the future whether you have seen it before or not. This is the way you get novel predictions.

Einstein told me that it was his reading of Hume which made it clear to him that the idea of causality in Newton's and subsequent physics is not observed, observation giving mere temporal succession, and hence Newton was in error when he wrote that he had introduced no hypotheses, but had merely observed experimental data and deduced the objective entities and causal relations of his mathematical physics from the experimental data. Instead, the deduction, or logical implication, in the experimental mathematical physicist's method runs in the opposite direction, not from the directly observed experimental facts to the

objective assumptions of the physicist's theory, but from the speculatively introduced, axiomatically and relationally defined entities and causal laws of the theory to the radically empirical, directly observable data. Concretely, this means that in mathematical physics, as in radically empirical human experience generally, objectivity is not observed, but is known, if it be knowable and meaningful at all, only by nonsensuously defined relational constructs and by speculative means. This way of knowing is best described as logical realism.

What Newton had done, when he wrote in ordinary language, was to put a naive realistic epistemological interpretation upon the symbol for mass in his mathematically mechanical equations when in fact, as Mach later made clear, it is not a naively observed entity, but is instead a speculatively introduced relational entity or construct which is confirmed as to its objective existence only indirectly by way of the epistemic correlation of its mathematically deduced consequences with radically empirical experimental data. This is what Einstein means, in the quotation above, when he says the "Science without epistemology is--insofar as it is thinkable at all--primitive and muddled." If epistemology became necessary for Einstein, in order for him to avoid this muddle, it is likely to be equally necessary for the rest of us.

The foregoing analysis of the scientific method, its objectivity, and its prodigious predictive power, of mathematical physics helps us also to understand the following statement by Einstein:

The belief in an external world independent of the perceiving subject is the basis of all natural science. Since, however, sense perception only gives information of this external world or of "physical reality" indirectly, we can only grasp the latter by speculative means.*

When Einstein's reading of Hume made him aware of this, he realized that Newton's premises could be changed, thereby accounting for the experimental data of the Michelson-Morley experiment as well as the data of Newton's mechanics and Maxwell's electromagnetics, after the manner which his Special Theory of Relativity prescribes. Having thus used Hume's and his own epistemological analyses to clarify both the deliverances of directly observed fact alone, that is, radically empirical immediacy, and the complex epistemological nature of the method and objective content of mathematical physics, Einstein forthwith proceeded to publish his epoch-making scientific papers.

*Einstein, Albert, The World As I See It, Covici, Friede, New York, 1934, p. 60.

You will now understand Buddhist, nondualistic Vedantic Hindu, Taoist, and the jen component of Confucian Asia if you realize that such people live in the world of radically empirical immediacy. This is natural to expect, since people will first try to account for the facts of experience using concepts derived solely from the facts themselves. When you do this, and if you hold in any subject that every word you use refers for its meaning solely to directly observable data, you are a radical empiricist, or positivist. As noted above, such experience does not give one a substantial object, the same for all knowers. Nor does it give the notion of a persisting substantial self. That is why, with respect to religion, such Asians will tell you they are not theists. Theism is the thesis that God is both determinant and timeless. Theism also is the thesis--in its classical Judaic, Christian, or Islamic versions--that one has a determinate personality or soul which is immortal. Now, radically empirically, neither theism nor the immortality of the determinate person is warranted, since, as shown above, all radically empirical determinate things perish.

What meaning, then, can religion have for such radically empirical Asians? Clearly, the Buddhist and Hindu Asians, at least, do have a religion. Moreover, they constitute in fact the largest religious community on the surface of this earth. Also, religion plays a greater role in their lives than is the case with even most believing Christians at the present moment. The important question, therefore, arises: What meaning for religion does radically empirical immediacy provide?

Hume described this immediacy as nothing but the temporally successive perishing particulars, each relative to the observer as the perceiver is relative to them. The radically empirical William James, like the ancient Buddhists and Vedantic Hindus long before him, noted that radically empirical immediacy exhibits another factor. He directed attention to it by pointing out that (a) it is only the factor in radically empirical immediacy within the focus of radically empirical attention that is differentiated into the successive "flow-of-consciousness" perishing particulars, and (b) the periphery of radically empirical immediacy is vague and indeterminate.

To experience radically empirically what this means, let us now, as far as possible, dismiss all beliefs and speculatively introduced hypotheses from our present consciousness and note what we immediately apprehend as pure, radically empirical fact. Is it not the case that we immediately feel and experience an all-embracing continuum of immediacy which, at the focus of attention, is differentiated into the successive, introspected and sensed particulars? The latter only are perishing. Moreover, in radically empirical knowing, time is meaningful only for the successive perishing particulars. Hence, time does not apply to the all-embracing continuum within which the successive particulars come and go. This is what the Hindu Upanishads mean when

they say that the Atman-that-is-Brahman-without-differences, the divine factor in the Hindu religion, escapes the ravages of death. In summary, radically empirical immediacy may be best pointed at by the words "the differentiated aesthetic continuum," with respect to which the differentiated part of you and me perishes and the continuum part, which is identical in all of us, does not. In short, one grasps the Buddhist and Vedantic Hindu concept of the divine when one rejects all hypotheses or inferences, restricts oneself to radically empirical immediacy, and, by yogic or other meditative exercises, eliminates all differentiations from the continuum which is this immediacy. What remains is appropriately referred to as "the undifferentiated aesthetic continuum."*

Is it possible for a scientifically minded person today to accept this thesis? The answer, there are reasons for believing, is unequivocally "Yes." As noted above, the epistemology of contemporary scientific method and its mathematical physics entails radically empirical immediacy related by "rules of correspondence," or what I prefer to call "epistemic correlation," to speculatively introduced and indirectly confirmed, logically realistic, relational constructs. The latter factor in scientific knowledge by itself is merely a mathematical possible. Only by accepting radically empirical immediacy is this possibility turned into something with existential and factual import. To understand contemporary mathematical physics and its method is, therefore, to accept radically empirical immediacy as irreducible. It is not all that is epistemologically and scientifically meaningful, but it is essential.

Furthermore, it is impossible to define the all-embracing continuum apart from its differentiations in terms of the differentiations. Certainly, no combination of determinate meanings can give the undifferentiated. The Nirvana Brahman-that-is-Atman timeless factor in radically empirical immediacy must, therefore, be taken as elemental. We are led then to the thesis that the radically empirical sensitivity, emotive consciousness which we experience is a cosmic field consciousness. It is not a pluralistic aggregate of atomic, spiritual or mental substances. In short, the traditional modern theory of Locke, Descartes, Berkeley, and Leibniz, that our introspected consciousness is an inner property of a local private mental substance, is erroneous. All the traditional modern psychologists and philosophers, who affirmed and tried to believe in this theory, found that this pluralistic mental or spiritual substance theory of introspected personal consciousness simply does not work. It claustrophobically traps each conscious mind or spirit in its own mental substance interior, leaving it an utter mystery not merely with respect to how the mind knows its own body, but also with respect to how one person can communicate with or know another, to say nothing about knowing the Divine consciousness.

* Northrop, F. S. C., The Meeting of East and West, Macmillan, New York, 1946, and Man, Nature and God, Simon and Schuster, New York, 1962.

The mathematical physicist, Professor Erwin Schrodinger, has put the matter quite clearly in his book, What is Life?, where "after noting that 'the pluralization of consciousness or minds...leads almost immediately to the invention of souls, as many as there are bodies,...' thereby generating the insolvable body-mind problem,(he) concludes that the 'only possible alternative is simply to keep to the immediate experience that consciousness is a singular.'"*

It follows, therefore, that the radically empirical Oriental concept of religion is empirically valid. In the timeless component of our radically empirical immediate experience and selves, all persons and the Divine consciousness are identical; only in our transitory, differentiated, radically empirical selves are we distinguishable from one another and do we perish.

It does not follow, however, that this is the sole factor in a contemporary scientific concept of ourselves, the cosmos and religion. For, in addition to the radically empirical part of our knowledge, there is also the speculatively introduced, indirectly confirmed, and epistemically correlated logical realistic component. Is there any meaning for the Divine in it?

If religion be defined and identified with that part of our knowledge which is timeless, as the thesis that God is eternal affirms, then the answer again is "Yes." The reason can be put very briefly. The logically realistic, indirectly and experimentally confirmed theories of physics have the remarkable property of distinguishing between what is relative to the observer, to different frames of reference and their respectively different time systems and what is truly objective and timeless. The criterion of the latter factor, put in technical mathematical language, is that the mathematical laws of nature satisfy the principle of relativity or, in other words, have the property of being invariant for any transformation of coordinates.

This timeless component, the invariant factor in the imageless relational laws of mathematical physics, is determinate in character. Being, therefore, both timeless and determinate, it provides a meaning for theism. We conclude, therefore, that an adequate conception of religion must regard it as an epistemic correlation of the (a) undifferentiated, radically empirical Nirvana-Vedantic Hindu component of the Divine timelessness with (b) the logically realistic and determinate theistic component.

*Northrop, F.S.C., "The Mediational Approval Theory of Law in American Legal Realism," Virginia Law Review, Vol. 44, 1958, p. 359.

It remains to specify briefly and more in detail what this means. Lord Bertrand Russell, who can hardly be accused of sentimentality in matters scientific and philosophical, has put the matter accurately and succinctly when he tells us that what we know in mathematical physics is a relatedness with very complicated formal properties. Such is the nature of the scientific objectivity that is articulated in logically realistic knowledge. Fully to clarify the relation between our successive mathematically physical, experimentally tested theories and the Divine relatedness involves two notions--one, the formal logical and mathematical notion of isomorphism, and the other the asymptotic approach to a limit. Time does not permit the development of these details here. They are to be found in the later chapters of my Man, Nature and God.

It is important, however, that we do attempt to make clear here what is the nature of a logically realistic scientific theory or object. Since, as noted above, observation through the senses does not give one objectivity, logically realistic thinking has to strip the idea of any scientific entity free of all definition in terms of sensed qualities, the reason being that sensuously defined entities are relative to observers and hence only purport to possess objectivity when in fact they have none. In short, Aristotle's definition of scientific objects in terms of sensed qualities has to be rejected, as does also St Thomas' theological thesis that there are no ideas in the intellect which are not first in the senses. None of the entities or relations in logically realistic thinking is given through the senses.

How then does a logically realistic entity take on scientific meaning and content? The answer, put very briefly, is, as Mach made clear in his relational theory of mass and as the mathematician Hilbert showed more generally, entities become defined relationally and syntactically by way of the formal properties of their relations to one another. The pure mathematician's definition of serial order provides an example:

One begins with a set of bare entity variables denoted by the symbols x , y , and z . One then concentrates on a relational variable R , of which the countless entity variables x , y , z ,... are the relata. One then proceeds axiomatically to lay on R the four following formal properties by what is called axiomatic construction.

(1) For any two distinct entities, x , y , of R , either xRy or yRx . Expressed in ordinary language, this means that any two entities in the field of R are related to one another by R .

(2) The second postulate is that for any entity x in the field of R , xRx does not hold. Expressed in ordinary language, this means that the formal properties of R are such that it is meaningless for

any entity x to be related to itself by the relation R . "Father of" or "perpendicular to" are examples of such inreflexive relations.

(3) The third postulate is that for any two entities, x and y of R , if x stands in the relation R to y , then y does not stand in the relation R to x . This, in ordinary language, is called the insymmetry of the relation R .

(4) The fourth postulate is that for any three entities, x , y , and z in the field of R , if xRy and yRz , then xRz . This formal property of a relation is called transitivity.

Note what we have done. No sensed qualities or objects have been used to define the formal properties of the scientific entities in this logically realistic relational theory of scientific objects. Instead, all the properties of the entities derive from the formal properties of the relation in which they are the terms.

Concretely, what properties does any set of entities possess as given by the four relational postulates noted above? The answer is that they become serially ordered entities. These four postulates in fact constitute the pure mathematician's definition of serial order. When we epistemically correlate radically empirical sensed successive perishing events with some of the entity variables in the aforementioned postulates, we then get Newton's mathematical noncyclical time. Suffice it to say that the invariant laws of mathematical physics are simply more complicated cases of such relationally constructed entities. What Einstein achieved in part in his General Theory of Relativity was to specify a relation R which had within it the formal properties that would define as a single relatedness the three separate rational theories of mass, space, and time.

Quantum mechanics in no way modifies the concept of causality in such theories, as the physicist Professor Henry Margenau and the writer have shown.* It merely introduces the concept of theoretical possibility into the definition of state of a mechanically causal system. Given the new definition of state of quantum mechanics, causality holds for it as much as it does for the different nonprobabilistic definitions of state of Einstein's theories of relativity and Newton's mechanics.

What we have described here is not peculiar to contemporary or even classical Newtonian mathematical physics. Newton tells us that he stood on the shoulders of the ancients. Einstein adds that the person who has not been thrilled by Euclid does not understand

*Northrop, F. S. C., Introduction to Werner Heisenberg, Physics and Philosophy, Harper, New York, 1958, and Margenau, Henry, The Nature of Physical Reality, McGraw-Hill, New York, 1950.

contemporary mathematical physics. This means that logically realistic thinking is as old as the ancient Greeks. More specifically, it is as old as Democritean, Platonic and Stoic Greek mathematical physics, as the contemporary mathematical physicist and historian of science, Professor S. Sambursky of the Hebrew University in Jerusalem, has recently shown in his Physics of the Stoics.*

Modern and contemporary physics does, however, differ from the physics of Aristotle. What happened with Aristotle is that he shifted Greek mathematical physics and Western science and religion generally from the logical realistic way of knowing of Democritus, Plato and the Stoics to naive realism. We conclude, therefore, that the Judaic-Christian and the Islamic theism must reject its traditional naive realistic formulation if it is to find any scientific meaning or sanction and take on a logically realistic epistemological interpretation.

This also is nothing purely contemporary or novel. It had precisely this interpretation with the Greek and Roman Stoics. Moreover, they applied the logical realistic method of relational construction to the normative sciences of personal morals, religion, and politics. The results was the creation of Western contractual legal science from which our own liberal democratic American Declaration of Independence and federal Constitution derive. Today's world is, therefore, in the normative as well as the natural sciences a world of logically realistic constructs. This Stoic theory of religion passed over into Judaism through Philo and into the Christianity of the first verse of the Fourth Gospel. In the mathematical physics of Euclid, the Greek word for logically realistic relatedness is "Logos." The first sentence of the Fourth Gospel of the New Testament reads: "In the beginning was the Word, and the Word was...God." The Greek for "Word" is "Logos." We conclude, therefore, that contemporary mathematical physics and contractual law give meaning to the Stoic Roman logically realistic interpretation of Judaic-Christian, Islamic theism.

It remains merely to remind ourselves that this is but one component in our scientific knowledge and our religious experience. There is also the radically empirical factor which it was the genius of the Buddhist-Vedantic Hindu Orient to have discovered. The complete nature of the Divine is, therefore, an epistemic correlation of the two.

LT COLONEL ALLEN - Due to lack of time, questions will be foregone both now and at the end of Dr. Pollard's talk.

*Sambursky, S., Physics of the Stoics, Routledge, London, 1959.

DOCTOR POLLARD'S TALK

LT COLONEL ALLEN

Our next speaker was a little late arriving today due to some mechanical difficulties with airplanes. We are fortunate to have him with us. He is the executive director of the Oak Ridge Institute of Nuclear Studies and he is well known for many contributions in the field of atomic and nuclear physics. He has been associated with the field of nuclear research since some time before the war and has been very active with Oak Ridge since the time of the war. He has received many honorary degrees and many other honors of note throughout the country. However, shortly after the war Dr. Pollard caused a great deal of surprise among many of his contemporaries in the scientific field, that is, he became first a deacon and then was ordained a priest in the Protestant Episcopal Church. Now, in addition to his function as executive director of the Institute, he is the priest in charge of St. Albans Chapel at Clinton, Tennessee. This is the community near Oak Ridge. This duality makes Dr. Pollard a very unusual person and an extremely capable person. We are honored to have him.

DOCTOR POLLARD

Thank you, Colonel Allen. I want to contrast for you, as a way of getting into this subject, two viewpoints about the nature of the world and particularly of history. These are the biblical viewpoint and the prevailing scientific viewpoint. If one considers biblical thought about the world around one and the events which take place in it, the thing that stands out is the deep sense of the intimate and active involvement of God in everything that happened to Israel in her history. It is a story which from the call of Abraham, through the exodus from Egypt, through the exile, and after the return from exile makes clear that the whole life, generation after generation, of an entire people was consciously responsive to the action of God in the great events of their history. There is a sense of the intimacy of this Divine involvement, either in judgment or redemption, in all the historic events. This is an intimate part of the Judaic-Christian heritage of western civilization; this sense or feeling that the events of history are under the providence of God; that in the things that happen to each of us we are the recipients of God's grace; that the events of our lives, in retrospect, seem to make manifest the fact of God's activity in our lives. As long as one is deeply involved in this biblical, Judaic-Christian outlook, all of life and all of history is purposive. History is an intimate engagement with an active, purposeful God.

Now contrasted with this is the sense that grew upon Western man from Newton on. This began with the development of modern science

and its essence can be stated: that basically the world is governed by immutable impersonal laws which science is in the process of uncovering more and more completely. This approach says that things happen the way they do, not because God willed them that way, but because they can not help themselves. The laws of nature are so determined that this is the way they had to come out. As science advances and develops we are going to see more and more areas in which we will realize that what actually happened, happened because the world is structured in a certain way and not because God in any sense of the word is involved in any effective way in the history of this world.

These are the contrasting viewpoints. A great many people today, both scientific and nonscientific, believe this latter viewpoint to be the true one and that the only way God could act in the events of our history would be by intervention, that is, by interference with a system that would otherwise run on its own. The word intervention frequently arises in discussions of providence or miracle. Yet it is not in any sense a biblical word, because biblically speaking history would not go at all without God. It is not a matter of His intervening; He is active at every moment, in every event, in everything that happens, if one speaks about it biblically.

What do we do with these two viewpoints? Are they really as irreconcilable as they sound? Well, it seems to me that the trouble with this second notion is that it is based on an erroneous idea of what the scientific description of the world is like. It is based on false expectations arising out of seventeenth to nineteenth century science which the great flowering of science in this century has shown to be wrong. Let me explain this by saying that the laws of nature do not determine the course of events in history; that the laws of nature are not of the same character as they were thought to be in classical Newtonian mechanics; and that this is true all through science from physics to psychology. All the laws of nature that we now have in our possession are of a different character; that is, they are statistical. The general situation is one in which there are several alternative courses that can be taken, with the lawfulness of things arising from the possibility of determining the probabilities with which these different alternatives will be taken.

A very simple example which will make this statement concrete is the law of radioactive decay. Most of you have heard about the atomic cocktail, Iodine 131, used in treating disorders of the thyroid. Iodine 131 is a form of iodine chemically exactly like ordinary iodine, except that it has built into it (in its nuclear structure) a fundamental instability of such a character that it may at any time change itself explosively into a very different substance, Xenon 131. It does this by emitting an electron, an antineutrino, and gamma rays in a sudden transformation. Now one can describe this process by the so-called

law of exponential decay, and the application of this law allows you to predict quite accurately what the probability is that a given Iodine 131 atom will in fact undergo this explosive change into xenon in a given period of time. If this law is applied to a tremendous number of Iodine 131 atoms, the probabilities tend to become actualized. The greater the number the more certain can you be about the behavior of the entire group. Thus, you can say for a great number of I-131 atoms (and there are always a tremendous number in any actual dose administered to a patient) that half of these iodine atoms will have made the decision to change into xenon within eight days, and the other half will not. In another eight days half of the remaining will undergo this transformation and half of them will not. It is a statistical law such that if you have a large number of identical systems to start with you can make quite accurate predictions. But if you have a small number, it begins to fluctuate wildly, and if you have only one atom you have no idea when it is going to undergo radioactive decay. It might in the next minute; it might be in two months. There is no saying with one instance.

We are familiar with this kind of law in sociology and psychology. I think we are generally familiar with this sort of thing in our ordinary life. The predictability, the dependability of living, is based on probabilities that we can more or less depend upon. The laws that the biologist study, say of genetic mutation, are of this character. The biologist can plot curves of the mutation rate of a particular type of mutation and a particular organism as a function of X-ray dosage, temperature, oxygen partial pressure, or of the concentration of a given mutagenic agent like caffeine. This gives smooth curves. But what is being done in each case is plotting the probability that a mutation will occur against some influence affecting it. In individual organisms the vast majority do not mutate no matter what the X-ray dosage is, or what the temperature, or the concentration of the mutagenic agent. They go through numerous cell divisions without that particular mutation appearing at all.

The laws of nature are such that you can not predict in individual cases. Our predictions are confined to statistical statements about probabilities and this has an enormous significance for the particular problem that I set out to discuss. It means that the laws of nature so operate in the world as to determine the most probable course of events, but other courses of events are always possible, and in real history frequently actualized. As long as everything is going along the way our scientific information would lead us to expect it to, there is no sense of providence in history. Providence is there but it is not evident. The providential character of history manifests itself in those moments, those turning points, when the most improbable things happen; the most unexpected. But in such instances there is no intervention or anything unscientific or contrary to the expectations of science. It is simply that what happened was the last thing that

you would have expected scientifically. And these very improbable turns of events often are coupled accidentally with other unrelated causal sequences with which they combine decisively to produce some great achievement. It is in just such great events that the purposeful and providential activity of God, biblically speaking, manifests itself. This is a miracle if you wish. For a miracle is an event in which many independent causal sequences are harmonized in some great new development in the life of a person or of a community or of a nation. We all know of such events in our own lives. They are often, in retrospect, seen as a quite accidental congruence of quite improbable happenings. We do not see them in any way as violating the laws of nature. But in a natural order which operates by statistical laws in which the regularities of the world can only be expressed in terms of probabilities, all that science can say about such an event is that it was most extraordinary that all those unrelated things happened together in order to make it take place.

We blind ourselves to the actual character of history. There is a way in which a concentration on a scientific description of the world shuts out from us vast areas of actual life and experience simply because we choose to ignore it as extraneous. I have been struck by the realization as to how much I was hoodwinked when I studied classical hydrodynamics, a very beautiful theoretical system. The mathematics are impressive--it is wonderful how you can derive Stokes' law and all the various other features of a classical fluid in streamline flow. The subject is confined to what is called laminar flow and it is all beautifully determinate and smooth and regular throughout a whole course in it. One becomes fascinated by the beauty of this kind of approach. In the text the author now and then speaks about Reynolds numbers and turbulent flow, but this complication is not emphasized and the impression is left that laminar flow is the common type with turbulent flow merely a complication on the fringes.

After having this course, I went on for many years thinking that the standard type of flow was laminar flow because a whole course had been devoted to studying it. Only much later, as I came into contact with chemical engineers and worked on the gas diffusion project, did it dawn on me that laminar flow scarcely ever occurs. Even if you want to demonstrate it to a class, it requires extraordinary ingenuity. With the most delicately designed devices you may get it, but at any moment during the demonstration it is likely to break down into the mess which is turbulent flow. But the laws of turbulent fluids are all statistical, and can only be expressed in terms of probabilities.

The great example of planetary motions and the immense power of classical mechanics to predict the orbits of the planets and eclipses of the sun and of the moon tended to give us a false picture of mechanics. Such motion constitutes actually only a small part of

astronomy. The astronomers and astrophysicists today deal very little with that kind of thing. They have the laws of turbulent motions of vast interstellar gas and dust clouds. When they discuss the formation of the sun and the solar system, they are involved with the laws of dynamic condensation out of a turbulent mass, which are all statistical. All of the analytical tools applied there are statistical.

Technology is a way of narrowing down the alternatives, of creating an artificial situation in which you make things behave as regularly as possible. The whole field of ballistics is that way. But even in ballistics, bullets never follow exact Newtonian orbits. If they did, every bullet would land on top of every other, right in the center of the bull's-eye, and they do not do that. They follow different paths no matter how well we design, and you have to go to extraordinary lengths of exact shaping, rifling, and the like to even approximate Newtonian orbits.

All the laws of nature are operative in each event in history, but there are many independent causal sequences that in the actual history of the world enter into the achievements of history in ways that could simply not be predicted.

The whole course of evolution is just this kind of thing. After the beautiful scheme for coding of information in the DNA code was developed there arose the possibility for a tremendous development of information coded in DNA. We know that in two billion years this has led, by a whole sequence of processes, to the possibility of DNA directing the putting together of human persons, which is a fantastic achievement for any information code to do. I suppose a lot of people have the notion that somehow or other the laws of nature made this inevitable, but all you have to do is look honestly at the description of the processes given in modern evolutionary biology and you see what actually took place. Each major step, such as the change from sea animals to land animals, or earlier the development of the living cell, was achieved through the accidental congruence of many factors, environmental and biological. Each one of these major turning points in the process seems to have occurred explosively. There would be long dormant periods and then a great period of change. Such periods involved accidental congruences of environmental factors, that had nothing to do with DNA, combined with quite improbable mutations. Yet they combined in such a way as to harmonize themselves into an achievement; a major step forward in what, to me, is a very purposive process. It is a process which in retrospect bears all the imprint of Divine purpose creatively working out each great and meaningful step forward. In between where the development may have been slow and regular, and the most probable was what happened, the outcome seemed determined by the laws of nature, and the providential character of the process is not evident. This character appears

only in the great and unexpected congruence of mutant forms just at the crucial moment when some major environmental change would through natural selection move the new creation to the fore. In such moments the great achievements of the evolutionary process were made, including man himself.

Bismarck used to say that there is a special providence for drunkards, fools, and the United States. If one looks objectively at American history one sees it as an absolutely extraordinary sequence which, at one turning point after another, turned fortune in the way of this nation. It was not planned; it was not anticipated by anyone. You can go back to the American literature of the last century and find that nobody thought America was going to come out where she is today. Yet the weaving of a coherent and meaningful story from such a long sequence of chance and accident is the very substance of providence, biblically speaking. Those who have found this biblical key to history, this secret of the Divine activity in events, can see God's action in their own lives. It becomes quite clear and evident to them. But at the same time you can see yourself and everything about you responsive all the time to all the laws of nature. You never sense anything like an intervention, an interruption of the normal order. No, the providential takes place within the normal order. It may be the arrival of a storm at a crucial point in a battle which thereafter changes the whole course of events. These great accidents of history, quite obviously and clearly involving causal chains which had nothing to do with each other, are the stuff out of which the great achievements of history came. And yet one sees in all of them, looking at them scientifically, the clear operation in the whole behavior of the storm, in the behavior of the opposing generals, in their military strategy, that all are governed by laws based on probabilities. The laws of military tactics are surely only statistical. You can not be certain that your men will behave the way you expect them to. You can not be certain that the opposing army will do as you think it most likely that they should or that all the different causal sequences will harmonize together at a particular moment.

Some will say, oh well, at least the storm was determined, it at least had to occur at that time. But this is not true. The laws of weather prediction are certainly statistical laws because they deal with a turbulent air mass. The laws of turbulence are such that one can assert only what is most likely. Weather predictions are certainly of this probabilistic character. There might be a storm, or at least the conditions are suitable for thunderstorms to develop, but where, at what spots, at what moments, one can not say for sure. The total situation is statistical; it involves many probabilities working together. Indeed all the elements in the natural physical world which a physicist deals with--the weather,

earthquakes, flash floods, and the like, and the actual ongoing of natural events--all of them are statistically determined. All we can ever hope to do, therefore, is to predict the most probable course of events. Yet history frequently makes use of the most improbable alternatives for its greatest achievements. Herein lies the complementarity of natural law and providence.

There is a fascinating new book out by the evolutionist George Gaylord Simpson, who would scarcely be classed as a religionist, although he shows a somewhat different viewpoint in this book than he had in earlier ones. In one section of the book he deals decisively with the widespread conviction that there must be man-like life on many other planets around the universe. Most people feel that all you have to do is have a planet like the Earth somewhere which satisfies the conditions for the development of life, and life will inexorably move from raw DNA to human beings. This conviction is not a scientific one but really expresses an unrecognized belief in providence, and that is what Simpson shows. To have anything comparable to the evolutionary history of this planet repeated so as to produce the same thing would involve the most incredible set of improbabilities. The actual course of events on the Earth which has in fact led from primordial nucleic acids to man has time and again involved the most incredible accidents and the most extraordinary improbabilities, and they all had to be timed in just the right sequence to end up with man. Man could have been missed very easily with just slight changes. The primates could have developed in quite a different way and never have led to man, or even themselves not have been produced at all. Simpson just demolishes the notion of man-like life on other planets, on the basis of science. It is the last thing you would expect, from science alone, anywhere else in the universe, and yet there is a deep ingrained feeling, deeply seated in people, that if it is possible for such a long chain of chances and accidents to develop DNA to the point where a creature appears in the midst of creation made in the image of the Creator, then DNA will in fact be elaborated to produce such a being. To be made in the image of the Creator means to possess imagination, freedom, the capacity for knowledge; this speck that can embrace within himself the whole fabric of things, with understanding such as apart from him is only possible with God Himself. From the standpoint of biblical providence it is natural to believe that if it is possible for such a creature to emerge in the evolutionary process, God will do it again. He will do it in quite a different sequence, but we have a feeling that there is an unseen power at work that will move things to this outcome. This is a trap for the biologist. Any of them who feel that anything like man is likely anywhere else in the universe and know anything about the evolutionary sequence through which man entered upon his existence here, must believe in providence, and in the Divine determination of sequences in history, or they could not possibly imagine this outcome ever occurring again.

SYMPOSIUM
PROCEEDINGS OF THE SECOND DAY
(Morning Session)

LT COLONEL ALLEN - To give you some idea of how we may proceed today, I would like to tell you very briefly what I plan to do, with the full recognition that it will dissolve into chaos almost immediately. First of all, you will notice that there are four new faces at the table today--new to some of you at least. I will introduce these people. Then I would like to open the discussion by giving each one of these four an opportunity of addressing a question to the four speakers of yesterday. Following that, perhaps, if the four members (yesterday's participants) wish to address questions to one another we shall entertain that. As soon as this interchange ceases, if it ever does, we will then proceed to the questions which have been presented to us from the audience.

We were extremely gratified to find a very large number of questions given to us; I think we have about 40 different questions, each one of which is worthy of at least two hours discussion. There were, by the way, very few duplications. There is simply no chance of going through all these questions. I want to explain this to everyone so that no one will be offended to find that his question is not specifically brought up. We have tried to go through these in our own minds to understand the tenor of them, and I will do my best to guide the discussion in such a way that we get at most of them. I gave some of the questions to the speakers today so that even though a particular question may not be asked the speakers will keep them in mind as the kinds of questions we wish to have explored.

The program this morning is intended to be a panel discussion. We do not invite the audience to participate. This afternoon we will open the discussion to the audience and we would like everybody to participate as much as possible.

The purpose of the gathering as stated in the brochure was to demonstrate coherent relations among science, philosophy, and religion, or how the learning of man applies to the purposes of life. The purpose as I understood it in the original discussions with the Laboratory people (as contrasted with the co-sponsoring Base Chaplain) was to attempt to explore in some intellectual depth the meaning of religion. There appears to be a period which is inherent in everybody's development, particularly among the young, highly trained, scientific people, in which one questions the real meanings of life and the meanings of religion. One customarily comes out of this period in one of several ways: Many of us get old and tired and no longer question things as actively as we once did. We find ourselves

falling into a pattern without asking the deep, intellectual questions we would like to. Others, who represent deeply thoughtful people in scientific fields, become atheistic. Now this atheism, I believe, is in a higher sense than that found in many nonintellectual groups, and is represented by many highly developed physicists by the kinds of thinking which Einstein has so carefully documented. That is, the individual regards himself as a deeply religious man, but not a person who believes in a god with any anthropomorphic characteristics. Other people find themselves with that fairly unusual, and much to be desired, equanimity of spirit which comes from discovering a real relationship for themselves with religion.

I have become a bit concerned because of some discussions I have had with the Laboratory people between last night and this morning. Apparently, it is felt that the make-up of the panel is not fully representing the atheistic point of view, and it deserves to be represented as the sounding board against which the thoughts of a personal God are thrown. Today I will undertake in what way I can to represent that view, and for those of you in the audience who either find this entertaining intellectually, or who hold these kind of views, I would appreciate your help and your consideration in bringing out these questions in a profitable manner. This symposium is distinct from the religious "mission" which is going on at the Base. That is, the mission is an evangelical endeavor. This symposium is an endeavor to explore the intellectual basis of religion both pro and con. And so it is necessary for us to try and bring out the cons in order to put them in their proper perspective with the pros. So with considerable apprehension I will undertake that job where I can today.

Now to briefly summarize what we did yesterday. The first speaker was Father Albertson. He presented us with a written version of his speech which has a very excellent summary. I would like to present this without adding any interpretation to it:

In their thought structures, both science and religion reflect a basic pattern in man's search for understanding. There is an initial firm assertion that goes beyond perceptual experience and is untestable. For the religious man, and he has been defined in this paper, that assertion is, "God exists and hears my prayers."

You will recall that Father Albertson's working definition of a religious man (which is of course not a universally accepted definition but the definition with which he developed the thoughts on his paper), was that a religious man is one who believes in a personal God to Whom he prays.

For the scientist there is an accountable consistency in natural phenomena. By the continuing effort at elaboration of coherent structures or concepts and relations, deeper insights and more refined correlations are sought. The theologian probes more deeply into our knowledge of man and scripture, bringing new relevance to his systematic theology of morality and doctrine; the scientist researches new advances in physics or chemistry, articulating more finely the interface between mind and matter.

This keynote which Father Albertson initiated was touched on by almost every other speaker. It seems to be an essential highlight of what went on yesterday. That is, that almost every scientist in his search for understanding nature must believe that there is a consistency in natural phenomena, and it is his job to try and understand this consistency and to put it together in a way which is both useful and which predicts new phenomena.

I would like to add one thing to the summary, and that is Father Albertson's definition of a Christian, which I think is simply this: "To the Old Testament law, Christianity added the assertion that Jesus Christ is the son of God Who came to restore estranged mankind to its true filial state." And I believe you added, Father Albertson, that even though this statement was not made as a definition, it would serve to define a Christian.

The next speaker was Dr. Eyring whose discussion was very broad, so it is going to be difficult to summarize it in a sentence or two. But as I understood the key points, he started out by presenting, in a way, Einstein's concept of a cosmic religion. To begin with, he felt it must be pointed out that since the universe is so big and is so orderly, one must ask the question, "How did it get wound up? And how is it going to wind down?" From this he said that the universe must have a purpose. It is inconceivable that this enormous complexity of orderly events was put together without there being some purpose. All of these things led Dr. Eyring to a firm conviction that there was a Supreme Being, a Supreme Intellect and a Supreme Order and Purpose to the entire universe. From that point, Dr. Eyring went beyond the cosmic concept of religion which does not necessarily involve a personal God. He presented statements of his own personal belief which, in general, were not stated with rational argument. Rather, it was in the form of a testimony of his belief that there does exist a personal God, that this belief is extremely useful, and that it is very important to the welfare of mankind that one finds this belief in a personal God. Such a belief will affect one's living and one's human relations in a very fundamental and deep way.

The third speaker was Dr. Northrop. One thing which was most commendable about his speech was that he said that humanity must avoid speaking in clear language. I think that in many cases the philosophers have done this very well. Seriously, though, I think for the reasons I stated a minute ago, we all must make a very earnest effort to understand the kind of reasoning which Dr. Northrop presented to us yesterday in order to provide in this symposium a clear perspective. Dr. Northrop presented another side of the picture. He discussed three disciplines of thought: naive realism, radical empiricism, and logical realism. He developed the definitions of each of these, which I will ask him to repeat at this time.

DR. NORTHROP - Realism is the thesis that mortal, finite human beings can get objective knowledge that is the same for all knowers. Naive realism is the thesis that you get such knowledge by observation, naively. Naive means directly apprehended. Radical empiricism is just another name for naive. Radical empirical means given with immediacy. Radical empiricism has two positive affirmations: that all meaningful words get their meaning by pointing at or denoting immediately experienced factors and that all immediately experienced factors are relative to the observer. They are not objective, they are different for each observer, e.g., the corner of that table as observed by me is an obtuse angle; it is only when I get perpendicular to the table that I see a right angle. The sense world does not give us angles that are constant all the time. Radical empiricism is the thesis of naive observation which does not give objective knowledge. Logical realism agrees with radical empiricism that observation does not give you objective knowledge. And that objectivity is found only by speculative construction and produced by the knower, which is verified indirectly through its deduced consequences being correlated with the relative radical empirical images. Now that is logical realism. Logical realism is a correlation of radical empiricism from observation. Logical realism is what you get from your experimental data, with speculative constructs. Einstein states this very clearly when he says "Physics, like common sense, believes in the existence of an external world." That is realistic knowledge, the same for all knowers. Since this is not given by observation alone, through the senses, we can only know an objective reality by speculative meanings. Now that is an affirmation of logical realism.

LT COLONEL ALLEN - Thank you, I think we are all going to have to come back to this several times to get the full meaning of it. The final statement which Dr. Northrop made yesterday was most challenging and I felt for the first time my lack of education in the humanities. Dr. Northrop stated that he felt that the evolution of logical processes and mathematical physics had developed over the last fifty years in a way which substantially outstripped the logical processes of thought in the humanities. The estrangement between

science and humanities these days was not really the fault of the scientists but was rather the fault of the students of humanities who were still using archaic techniques for developing their own logic. I think it is specifically here, without facetiousness, that he referred primarily to the concept of plain language. That is, the humanities, in trying to express themselves in plain language, get into ambiguous terminology and to serious semantic difficulties and have not yet learned to use all of the more vigorous tools that are presently available from mathematical physics. Is that a fair statement?

DR. NORTROP - Yes. I should like to say that same thing in a different way. I believe that the troubles of our world, even with atheism, arise from thinking about scientific objects, when they are logically realistic as if they were naively realistic. This enables you to get those old billard ball atoms of the nineteenth century which gave Marx his materialism and Hobbes the materialism that is in free world ethics at the present moment. The humanities are in the same pickle. That is, they are describing radical empirical experience as naively realistic so that they give us a false account of the esthetic immediacy. They are describing the real world naively realistic and give us a false account of the fatherhood of God. They get a naively realistic God; that is, they get the anthropomorphism that prevents scientists like Einstein and people like me from being a theist. I am very uncomfortable when I go to Church because I have to listen to things that disturb and bother me and raise more questions in my mind than they answer.

I am sure this is also the case in law. Law is filled with logically realistic constructs, and our judges, the old supreme court, interpret them naively realistically. With this you get an extremely laissez faire individual. When you treat a person like a materialist treats an electron (as a little billard ball, an atomistic mental substance) you get laissez faire people and man is no longer a social animal in his essence. He feels, the less government and the less I have to do with other people, the more free I am.

Now logical realistic thinking undercuts laissez faire individualism in Protestant Christianity. Catholicism does not have this. I have a terrific respect for Catholicism. I think the only error in it is that its ideas have been formulated (the predominant ones, as Father Albertson pointed out yesterday), in an Aristotelian, naive realistic theory of knowledge. With this I think you get an anthropomorphic God, although if you take Aristotle literally you come out with one that is not very far from the one that I outlined yesterday.

I should say, too, that this logically realistic thinking did not originate with Galileo and Newton; it was discovered by Democritus

first and then by the Platonists and the Stoics. And that is why, when you identify the fatherhood of God the way I did yesterday, it is really a return to Augustinian Stoic Christianity and this will not bother in the least a Catholic who knows his history.

LT COLONEL ALLEN - The last speaker yesterday was Dr. Pollard who spent some time going through a view of the physical world where many times a statistical interpretation was the only practical one. Dr. Pollard began with the statistical interpretation of quantum mechanics and proceeded through such complicated phenomena as turbulent flow of fluids, weather, and other examples, all of which show that science can not be fully determinate in a microscopic sense but must everywhere be accorded, or must in many cases be accorded, a statistical interpretation. This allowed him to give some interpretation of, I believe, what he referred to as providential actions which could occur within the natural law of order in many ways. And that it is perfectly realistic therefore, returning to Father Albertson's definition of a religious man, for a religious man who believed in a personal God to know of God's intervention in, if you like, natural phenomena.

DR. POLLARD - I deny that God ever intervened; I deny that categorically.

LT COLONEL ALLEN - Well, of course you said very clearly that providential action occurred within natural order.

DR. POLLARD - He is as essential and as fundamental to every happening as the laws of nature. There is no intervention. He is part of the determination of every event.

LT COLONEL ALLEN - Your statement with regard to providential action as counterplayed against a statistical physics interpretation, is that God's interaction is in every event. Would you explain what you mean by providential action? You developed the theme that the statistical interpretation allowed many things to occur which were not immediately causal.

DR. POLLARD - It fails to determine them. It leaves you with either the alternative of supposing that the most important things that happen are just a matter of law, of a person or a nation getting all the good or bad breaks. Either it is just a matter of chance, of accident, given no meaning or interpretation, or that the further determination beyond chance and accident in everything that happens is providential in the biblical sense. But, the two complement each other. The laws of nature provide a rather open system. History has many ways it could go; there are many conceivable histories for individual biographies. The one way that it does go involves providential activity.

LT COLONEL ALLEN - Well, then, perhaps let me restate your primary thesis: the laws of nature, as we understand them, require statistical interpretation which means that nature itself is indeterminate, and that a Supreme Being is present, controlling the actions within the laws of nature of the entire sequence of natural events. Have I got it now?

DR. POLLARD - Let us say that all events are determinate; part of their determination arises out of structure of the natural order, but this in a probabilistic way. The remainder of the determination in history arises out of the supernatural order, in a very different way, not in a willful, purposeful way, not in a way that can be described empirically, scientifically. That is my point. It is a total determination; these two are complementary. Part of the determination is through natural law, the remainder of the determination is through Divine providence. The two together establish the course of events in history.

LT COLONEL ALLEN - Based on several questions which have come in, I think that we should return to some of these particular points during the morning. I did want to mention one thing in summary that Dr. Pollard related to us. This is based on some of the questions received, and it obviously intrigued the imagination of a number of people just as it intrigued mine when I read the article. Dr. Pollard referred to a book recently written by George Gaylord Simpson, This View of Life. There is a recent issue of Science magazine (which incidentally contains an extremely glowing three-page eulogy to Dr. Eyring on the occasion of his election to the Presidency of the American Association for the Advancement of Science), first article in which is entitled, "The Nonprevalence of Humanoids," by George Gaylord Simpson. It is a chapter out of the book which Dr. Pollard referred to. This intrigued me enormously when I read it. Dr. Pollard discussed it yesterday, and the comments in the questions which were turned in showed that it also intrigued the audience.

The basic point is in some degree argumentative with what Dr. Eyring had discussed earlier. He referred to Harlow Shapley's arguments about the enormous opportunities there are for planets to exist and therefore the high probability that there exists somewhere a race of humans, humanoids if you like, comparable to our own. Simpson goes through, as Dr. Pollard said, and simply demolishes this argument in a very effective way, although admittedly, non-quantitative in most aspects. But Simpson traced the evolutionary process, pointing out the number of branch points that exist, the peculiar set of circumstances in the evolution of a planet that would cause life to evolve, and he ends up with two points. One of which Dr. Pollard made strongly, the other I would like to

reiterate because I think it is also very significant. Simpson's point is this: that the probability that humanoid life (life which in some way can be compared intellectually with the life that exists on earth) does exist, ever has existed, or ever will exist on another planet is very small, certainly not large as many people have argued. You will have to look at this and decide for yourself whether you like the conclusion or not.

DR. POLLARD - I think that I would like to comment that he demolishes Shapley's arguments on the basis of science alone. If you grant Shapley a belief in Divine providence, then the purpose of the Creative Prophet is perfectly conceivable. This is the trap in which scientists labor.

LT COLONEL ALLEN - Now the second point is to me almost equally significant because it is in a certain way a dodge of the trap. That is, Simpson points out that even if there does exist humanoid life somewhere else in the universe, the probability of it existing on the nearest stars is of course infinitesimally small. The probability that life exists elsewhere must become larger as one goes farther out in space. And as one goes through the concepts of distance that are involved in our enormous universe, one comes to the following conclusion: Even if we accept this probability as significantly high, the probability that we will ever know about it is still vanishingly small. That is, when one thinks about communication processes that might take thousands of years for a one way message and then try to imagine what the circumstances would be under which he could establish the communications, it just becomes almost completely unreasonable to imagine that we would ever learn about such life--even if it did exist. Even though the probability is so small, as Simpson points out, it is still worth trying (as is being done by some radio telescopes now making some, but admittedly very feeble, attempts) to determine if there are any transmissions from other galaxies which might contain some order in them. But the point that really comes out of this in your discussions is that the intellectual aspects of human life and the relationships with God as we know them may be a very wonderful thing and they may be a unique thing.

I would like now to introduce the other four members of the panel. First of all there are two religious missionaries who are present on Kirtland Base during this religious emphasis week. At the end of the table is the Rev. Rocco Perone who is missionary at St. Austin Church of the Paulists Fathers of Austin, Texas. He is a native of Hartford, Connecticut, received his college and seminary training in Washington, D.C., was ordained in New York in 1949. He is noted for his preaching and teaching ministry, in conducting religious missions and revivals in the Roman Catholic Church.

Dr. D. Elton Trueblood, the next person around on the right, was born in Iowa, of Quaker parents. He has received many honorary degrees; he earned his PhD from Johns Hopkins University; he has a very large number of awards noted in the description of him in the brochure handed out for the Protestant mission. He has held professorships at Harvard, Stanford, and is presently professor of philosophy at Earlham College, Richmond, Indiana.

On my far left is Father Robert J. Roth who is associate professor of philosophy at Fordham University. A very interesting article was written by him recently on Charles Sanders Pierce, a philosopher whose religious writings foreshadow many of the ideas that are being discussed at this symposium.

The next person to the left is Dr. Peter Scoville who is the technical director of the Arms Control and Disarmament Agency. Without trying to offend him I would like to regard Dr. Scoville as our Dr. Strangelove. Perhaps he is the antithesis of it in the sense of how control and disarmament can contribute to our thinking today. Dr. Scoville is known to many of us in the nuclear weapons business because of his previous association with the Armed Forces Special Weapons Project, now DASA. Also, recently Dr. Scoville was Deputy Director of CIA for Research and Technology. I have known Dr. Scoville for a long time. Let me say very sincerely, that his competence and his ability in fields which many of us have a knowledge is unquestioned, and his contributions to the security of this nation are among the highest.

With that introduction of the four new members I would like to start the panel questioning by inviting each of them, perhaps starting in the order which I introduced them, to ask a question of the speakers of yesterday if they care to do so.

FATHER PERONE - I plan to listen for a while.

DR. TRUEBLOOD - Well, this is a very severe limitation to say a question. I hope we will get a chance to say something.

LT COLONEL ALLEN - You certainly will. With that, I will amend it and say, would you like to make either an opening statement or ask a question?

DR. TRUEBLOOD - I would especially like to speak later on this question of the personality of God which is a subject which needs terrific clarification, and which is often horribly confused and need not be. But I do have one question right now to ask Father Albertson. I was very glad for his operational definition of a Christian. At least everybody knew what he was talking about when he stated this, and I

will accept this as my own. That is, a Christian is one who believes that God is genuinely existent and that He is not merely a projection of our own wishes, and as One to Whom we can pray. I will proceed with that. But what worried me, Father Albertson, was that I thought you conceded far too much to your critics on the question of petitionary or intercessory prayer. Now I know that you were very brief on this subject, and it is possible that I misunderstood you, but I understood you to say that we need not include the prayer of petition or intercession, and that we might limit ourselves to adoration and so on. Now, all I can say is that I think that this utterly destroys the significance of prayer if this is the case. That is, I do not believe for one minute that natural order is autonomous or independent. There is not anything for which I would not pray. I believe in germs but I will pray for the person who is sick. I believe in the physical order, but I will pray in regard to an earthquake. Why? Because I think that the purpose of the living God is superior to these supposed laws. I wholly agree with Dr. Pollard that these laws are statistical laws and therefore not mandatory; therefore it is an open universe; therefore the notion of the Supreme Order, of the Divine Mind, is a perfectly rational conception. So, as one who tries to be a Christian, there is nothing for which I will not pray. And I do not claim that this is anthropomorphism, this wretched, silly word that we hear thrown around so. I think this is just plain good sense if you believe in God. Now I would like to hear what Father Albertson says about this.

FATHER ALBERTSON - I do not wish to leave the impression, which may have been given yesterday, that I am opposed to prayer of petition. I am not. From earliest days of the Church petition has been a prominent part of the Christian community worship, both private and public. It is conspicuous in the liturgy of my own church today. I objected to something that is not prayer at all, but rather a pseudo-prayer. Typically it is an attempt to substitute prayer for work. To take an instance with which every teacher is probably familiar, we can note the student who wastes sixteen weeks of the semester without studying and then thinks he can approach the examination with some confidence if he says a "prayer" beforehand. This is not authentic prayer such as you have described; it is pseudo-prayer. Prayer is an adjunct to the exercise of personal responsibility, but not a substitute for it.

DR. TRUEBLOOD - I am so glad to hear you say that. Now it is quite obvious to you that I would not uphold this pseudo-prayer. I do not think that prayer is an alternative to work. I see no reason at all why a man can not have both of these in his livelihood. Why in the world is there any conflict between them? I think we ought to pray as though it all is dependent on God and work as though it all depended on us.

LT COLONEL ALLEN - Father Roth, would you like to either make an opening statement or have a free question?

FATHER ROTH - I would rather make an opening statement. I am going to play the part of the fool who rushed in where angels feared to tread and pose a question, or perhaps a series of questions, in answer to that very excellent paper and very learned paper of Professor Northrop. I had the advantage of reading it three times beforehand, and then I gave up. And then I began to go back to the grammar school days of phrasing and outlining every sentence which, after all, I guess is the only way to read a paper of that type. I also want to play the part of the ordinary man here.

I am supposed to be a philosopher; at least I teach philosophy and I would like to play the part of, well, maybe William James, who talked about a kind of abstractionism when we make definitions. James called it vicious, but I would not use that word in the context of religion, so we will avoid the word vicious and simply say that it is a type of abstractionism which can overlook some important elements. Therefore, James called himself the slouchy philosopher. He says that philosophical ideas and scientific ideas do not always come out quite the way you want them, like a boarding house where the pancakes and syrup get messy; they do not always come out neat and clean. The same thing is true here.

I would like to pose some questions on Dr. Northrop's divisions. I am not sure, at least in my own mind, that they are as clear cut as they at first seem. For example, on the definition of naive realism the statement was made that it holds that human knowledge exhibits factors which are objective in the same sense of being identical for all knowers, and such factors are known naively, that is, by direct experience, by observation. This entails that the purported objective factors in human knowing be defined in terms of sense qualities. I would like to challenge that last statement because I am not so sure for the naive realist, at least the examples that I have been given, that sense qualities are the objective factors to be obtained by either philosophical or scientific thinking. As an example, take men like Plato who had a great distrust of the sensible. He worked out a theory of getting back to the absolute. This was his whole theory of pre-existence, the view of the eternal essences in the pre-existing order, and then the theory on this life where sense experience does not give us the objective order, the theory that I must transcend in the sense experience and really remember the objective, necessary absolutes which I had learned in a previous existence. This theory is exhibited in the whole dialogue of Meno (of the little servant boy) where he shows or tries to prove that the boy is not learning how to work out a geometrical problem, but that he is using memory.

The same thing is true of Aristotle; I would question that Aristotle would hold that the objective is the sensible. Take his whole treatise on the physics. It is true, I think, that this is a question for Aristotelean interpretation, and I would not say that this is the only interpretation. Professor Randall, for example, tried to interpret Aristotle in actualistic sense and biological sense, and one reviewer of his book said it was great Randall theory, but not too much on Aristotle. Again, it was a theory of interpretation. I feel here that Aristotle is going beyond the sensible. You know he admitted that when you see the bent stick in the water this is not the objective fact and that there must be a correction on this. This is true of Augustine and the medievalists like Thomas Aquinas and Bonaventure. All of these recognize very well the transitory character of sense data, and they were seeking to get beyond that data. That is why one man characterized Plato's great insight as the sense of the abiding, whether he was talking on the ontological level or logical level. For these men the only truly objective or the abiding subsistent realities are gotten not by sense experience alone. And this is just the starting point from which we eventually must transcend sense experience and go beyond them to get to being realities like God substance, the soul for example, and on the logical level, universal ideas and universal definitions.

So these men, I think, can be called naive in the sense that they did not institute a systematic critique of knowledge which we only know in modern philosophy. They were naive in this sense, and this is the sense in which they should more properly be called naive because they said Aristotle saw the fact that the bent stick in the water was not objective reality; and when someone challenged him and anticipated the Cartesian question, "How do you know you're not dreaming?" he said, "If you dream you are in Athens some night and you are really in Corinth, when you wake up in the morning, you don't walk over to the public square of Athens because you know you are not in Athens; you're in Corinth." There is a correction you make upon certain data, and you know these are not the objective facts.

Now granted the fact that the problem still remains for these men, how do they get beyond sense data? I think Professor Northrop inferred that you make some intellectual leap beyond the sense data, and this was the leap which Hume refused to make; and that is why we move into that second category. In this category it is valid to make the leap, and so we move into radical empiricism, the theory which affirms that all knowledge in any subject whatever finds entire meaning in factors given through the several senses or immediately apprehended together with the realization that all deliverances of the senses, whether they be relations, entities, or properties are relative and are not reality to the perceiver even at the moment they are perceived. And so Hume posed the question very clearly. He took a stand with the position

that we sense only this type of knowledge. He concluded by denying the existence of substance, denying the existence of an abiding persistent self. It was said that for Hume and for this type of a mind the self is merely a series of successive particular psychological states.

Now Humian scholars, of course, will argue whether Hume was a complete skeptic or not, whether he had his tongue in his cheek. On a sophisticated level he had to hold for a complete skepticism. In fact when he came to the question of what we can be certain about if we restrict our knowledge merely to sense data, he said he could not know the existence of an abiding self and so he corrected, or at least he challenged, Descartes's position that one is thinking when he is asleep. Hume stated that when you are asleep you do not exist; the self does not exist; the psychological states stop. When he got to mathematical knowledge, he walked on the tightrope and said, "Well, I even hate to question my memory; I am not quite sure the answer I have now is appropriate for the question I posed ten minutes ago." And so he said that in geometry we can only arrive at probability. In arithmetic that is a little easier; two plus two is four; I can work that out fairly readily. That is the sophisticated level. When he comes down to the ordinary level at the end of the book, the first book On the Treatise of Human Nature, he raised some questions. He said, "Can I be a real skeptic? Can I really deny everything?" Then he appealed to nature and instinct. He said, "Now these things do tell me that there is an abiding reality." And he was not too confident that his answer to that question of himself was completely adequate. He said maybe some abler mind will take it up, and James did. William James took it up in his Principles of Psychology, and to my knowledge James never denied the existence of a soul. He denied the fact that it could be proved merely empirically through the methodology of science.

It seems to me the basic question is, on the sophisticated level we deny certain things and question certain things, while on a real level we say, "I'm not so sure," and it comes down to the question: Was Hume right when he denied the ability of the mind to make the leap? Am I justified in saying, appealing to my own consciousness, that I am the same self that was here yesterday? On a sophisticated level we may deny it, but I think as a working definition we affirm it. Now, is this one correcting the other? Am I wrong when I think on the ordinary level? It is true we can make mistakes and more sophisticated thinking corrects this. Are we willing to admit that? I am not sure we can completely exclude our ordinary thinking. I would say, thinking on the question of myself, my own conscious, there is at least a rational invitation for me to affirm that I am the same self that was here yesterday. I admit I am not based upon the empirical data. I am making, if you will, a leap. I do not

like to call it a leap because, as always, we end up the word leap with into the blue, you see, which puts it into a derogatory sense. Well, there is a lot more I could say. but I played the fool and I propose some of these statements to Professor Northrop.

DR. NORTHROP - I thought I made it clear that Plato was a logical realist and not a naive realist, so everything you say about Plato, Augustine (I might add the Stoics, Newton, Galileo, Einstein, Planck) fits what you said. Now, the only question is Aristotle. It is true Aristotle is very close to being a radical empiricist. That is, he felt that every sense except the sense of touch left us with objects that were not objective. The bent stick, that is a visual image. Aristotle felt that with the sense of touch wet and dry, hard and soft could be differentiated. In Aristotle's physics there were four elemental scientific objects called earth, air, fire, and water. And it is well to remember that Lavoisier in 1793 was the first Western physicist to think that fire was reducible to chemical elements. Newton did not. Lavoisier was the first person to define fire away in terms of the observation of other things.

For Aristotle, fire was everything one felt that was hot, and air was anything one felt that was moist and warm. For his experiment that happened to be Mediterranean air. And water was anything you felt that was cold and wet, and you define those four elements in terms of pairs, four directly sensed qualities. It is exactly that concept of fire that Galileo questioned. He rejected the naive definition of scientific objects in terms of things sensed as wet and dry. Aristotle agreed with Hume and with the Sophists, Platonists and the Stoics on every sensed quality except those four. The others were all relative to the perceiver, and he agreed with Hume.

Let us move to Hume. Now here I am in agreement with what you said but I think it is important to make two points. The first is that Hume was correct on what the character of directly sensed knowledge is, and on this Plato agrees with him; also, the Democritians and the Stoics agree with him. That is, Plato held, as Hume and the Stoics held, that not even the sense of touch gives objective, scientific objects, no more than the sense of bent images of sticks give an objective stick. The experiment on the proof is a simple one and one which anyone can perform. That is, suppose that you bring in a bucket which has some chemicals in it, call it water on the Aristotelian definition, and suppose I have this hand on a cocktail glass, as it sometimes is, and then ask the question, what is in the bucket? Let me put my two hands in the bucket and check the Aristotelian theory. The bucket came from outside and so the water has a temperature lower than that of the room, and so to this hand coming from the cold cocktail glass, the bucket will not contain water, it will be warm and moist; it will be a bucket of Mediterranean air. Now this is, I think, a conclusive proof that the sense of touch is no more a criterion for scientific objectivity than are the images of bent sticks.

Now I think the distinction of what I called the leap is what Plato called--he put it this way--that the sense world suggests the real world but does not contain it. It suggests hypotheses, and they are not leaps in the blue in the sense that you stay up yonder. But you have to come back through deduction and to what Plato called "saving the appearances," and the logic runs from the fact of the hypothesis and not from the hypothesis.

The reason I left Whitehead for Einstein's interpretation of contemporary physics is that Whitehead tried to work the substitution of many-termed relational thinking, such as I outlined with that example of serial order, for property thinking. Aristotle thought in terms of thing properties and he had to assume naive realism to get it; he had to get some sense qualities. Aristotle held that you get to the real world from the sense world by abstraction. Whitehead tried to work the same theory. All Whitehead did was take radical empirical immediacies, describe them with a many-term relational language instead of thing-properties language and then tried to get the relativeness out by abstraction. Now the fallacy in that is this: Abstracted theory would work if the relativeness of the sense world was isomorphic with the relatedness of the objective image, but it is not. At that point I left Whitehead and went to Einstein.

I told Einstein once that I could not understand why Whitehead thinks we directly sense the simultaneity of spatially separated events. I said he is talking about immediately sensed simultaneity and that does not give you public simultaneity and that he is trying to get this out by abstraction. Because, if Whitehead works the Platonic kind of epistemology where he feels you get a gulf, you then go back in the old Cartesian dualism where you never can get the knower related to the object and you get all the insoluble problems of traditional, modern, scientific philosophy. Einstein said it would be wonderful if it was as simple as that but unfortunately it is not. The relativeness to the sense world is not an abstraction of the sensed entities. It is not isomorphic, and that is why you have to be a logical realist. Your reference to Plato means that Plato was a logical realist and not a naive one so that this epistemology is not unique.

I would like to say just a word of why one has to use technical language. (William James was a radical empiricist; he believed that everything was given naively and he thought naive language was then trustworthy in science and philosophy.) Now the reason is this. I came on this in east/west philosophy conferences when I found many different people using the word God, e.g., Hindus and Westerners. If you do not pay attention to which world of discourse you are talking in, you can make Brahman and Nirvana Buddhism look like the Hindu or any theistic divinity, and you are in trouble because it

clearly is not. You just read the text; Brahman is formalist, indeterminate; the divine divinity in the theistic religion is determinate and introduces order which brings a determinate. Now why was this? This single ordinary word (God) we use has at least three different epistemological meanings. There are a lot of others; it is more complicated than this. That is, if you think I am complicated.

Now Einstein made the point that the physicist uses technical language. The reason I respect Catholic theologians the way I do not respect most Protestants is that when I meet a Catholic I can find out what he means by the words he is using if I will stay with his definition. Now take this matter of Hume, it is just the point you made, if you realize that Hume is asking this question, "What do I know with immediacy?" Assuming this, then Hume is right when he denies the substantial self. You have to always watch which questions the philosophers ask. Hume is asking this question. If I stay with nothing but pure fact and produce no speculatively introduced inferences beyond that which I am warranted by logic, what would I believe? I could not believe in a public object. (Bishop Berkeley established this; the Hindus and the Buddhist did it centuries before Christ, as did the Greek Sophists). I can not believe in a substantial self. Now this does not prevent one from believing in a substantial self. I believe in a persisting self at least for the persistence of my lifetime, and, if I do believe in it, I have to use the word self, not in its radical empirical meaning but either naively realistic or logically realistic. I think the naive realistic interpretation will not work; that will drive you into a theory of self that no Catholic ever held. It drives you into the mental substance, modern theory of Descartes, Leibniz monads, and you get a laissez faire individual, a kind of Mr. Goldwater and Mr. Buckley of Yale who performed the great miracle of putting together the logically incompatibles of Adam Smith and the Catholic theory of property in which it is a trust and not a laissez faire right. And this is what happens if you do not know that every ordinary word we use has a radical empirical meaning. In the radical empirical meaning we see that this white table is a sequence of images different for everyone of us. In the naive realistic meaning it is a thing with the sense properties fastened to it, and that is quite different from the sense set of images. In a logically realistic meaning it is mostly empty space; it is a set of scientific object relations with certain formal properties, and the differences between the scientific entities is that the masses are a trivial part of the area. Well, that is not what they are saying. Now clearly you can not get objects out of this sense table by abstraction. They are intellectual concepts.

Now let us consider the problem of the personality of God. The word has three different meanings. If you take the word God in its logically realistic meaning you have the Buddhist theory of personality,

similar personalities in the cosmic, formless, ocean of consciousness. In the differentiated radical empirical self there is no self. This is a determinate that is not a sequence of perishing moods. In radical empiricism God is an indeterminate cosmic cause. This is what the Hindu means when he says that Brahman, which is the cosmic real object, real meaning identical for all knowers, is identical with Atman, the psyche principle in the self. What this is asking is that when I introspect what does it mean to be a person? How would you get at what a person is? You introspect. I introspect what we call feeling consciousness. Feeling consciousness is not fastened to a substance as a naive realist thinker would have it fastened. No, the feeling conscience in its formlessness embraces the whole cosmos and that part of me is timeless. This is what it means to be a person, to be the divine cosmic personality which is the same in all of us, and it is also in the inorganic. So, you get sympathy for all creatures. That is what an Oriental means when he gives you the equivalent of The Golden Rule. When I deny you, I am denying myself in part. Because the cosmic source of my conscience is the same in all of us. I am not a localized little atomic dewdrop. This is what Confucius means when he said the superior man will sometimes do one thing, he will sometimes do another, but never will he deny this cosmic feeling of identity consciousness, notwithstanding the differences in our felt demands.

When a logically realistic Platonist talks about the personality of God, and you want to know what that is, you have to go to the Plato's famous lecture on the good where he identified the male principal in the universe with that logos. That ratio is an example, and he called that the male principal in the universe. And in a Platonic interpretation of Christianity, God the father is the male principal, while the Buddhist's radical empirical timelessness Plato called the receptive and labeled it the female principal. He made an error there, but I am not going into the error. I believe that in Platonic, Catholic Christianity, Christ symbolizes the male father who transcends the sense world coming into the formlessness to create.

I have a statement from Tertullian here. It is from Sambursky, the great spectroscopist. "We assert that God is recognized first in nature and after that in His teachings, the scriptures--in nature through His creation, and in His teachings through the sermons." That is, if you want to know God and not get Him handed to you through human, ordinary, linguistic, often metaphorical statements of Him, which is what you get in the Bible, you must go to science, you must go to nature. In the humanities you have the works of sinful man as well as the works of God, and it is hard to separate the chaff, which may be the result of sinful men and their behavior in institutions, from the divine part of human history. This is the point of sin in history which is an essential part of Christian or Judaic Christian

doctrine. Sin is perfectly real for scientists, so let us give the clear scientific definition of what sin is. Sin is making a false statement about scientific fact. It is as simple as that. If I say I immediately apprehend a black patch here, when it is white, that is a clear cut example of sin. The Stoic definition of sin appears in their chapter on inductive logic in scientific method. Now to be good, if I would just say that's white, I have not progressed very far morally. Even so, it is a good way and it is that part of the question Dr. Trueblood asked yesterday. Where does ethics come in in this? What about ethics in respect to science? Evil is false statements about fact. Goodness is true statements about fact in the light of all the facts. Now it is easy enough to avoid sin in respect to this, although when a scientist fudges his evidence he does not avoid it. Politicians sometimes make factual statements when they make a simple statement that they see a white patch there (now, sometimes that takes a bit of doing; this goes for lots of other humans). You are dealing with sin when you describe factual immediacy as colors fastened to a substance. They are not related that way.

LT COLONEL ALLEN - I do want to give Dr. Scoville a chance to say something.

DR. POLLARD - Just one brief comment. You said, Professor Northrop, that there were three alternate ways to describe the personality of God which are Oriental or Platonic; it seems to me there is another alternative which is the Hebraic and in this, one speaks about the living God, the God of Abraham, Isaac and Jacob, the God a man serves, fears and loves and worships, the God who is not a philosophic principle but Who is the living God, the God Who is active in history and Who takes to Himself a people, Who reveals Himself to them, Who enters human history, and at a great dramatic climax of the revelatory process, in Christ Who enters in it to reconcile the world through Himself.

DR. NORTHROP - The Jews do not accept this part

DR. POLLARD - Yes, but it is the same kind of person as we talked about. Certainly to me God is far more than a person, a human person, but He is at least that, I would say, and that He can become known to humans and has made Himself known in the real history of a real people. He makes Himself known in activity, compassion, and aliveness, not in terms of speculative thought. I would have to add this kind of personhood of God to the others

DR. NORTHROP - Well so would I, but the question is what do you mean by personality? Does the kind of thing that intellect grasps, or the kind of thing that just sensing relates, give you a full concept of personality? The thesis, that to know God in his perfection

requires a perfect human being to come into the world makes far more sense on the logical realistic epistemology than on any of the others. On the logically realistic scheme, i.e., a Platonic or Stoic concept of personality, you will know personality best in the pure entity. This is in relational, logically realistic thought. Why? Because God is an eternal object and it is only this kind of thinking that warrants belief in the eternal object. Now this object is not in the same sense world, the logos, the intellectual logos. This being is not isomorphic, we just agreed, with the logos relativeness of the sense world. So if you are ever going to know what it means to be guided by this father, it would require a perfect human being to do it, coming into the sense world. This is not a God that you can know; this is why ordinary language is dangerous in talking about God.

I would like to make another point about this God. Ethics involves lawfulness; this is a point that Dean Eyring made. This is one of the tragedies of the present world, and this is why our country is very close to anarchy. On a radical empirical theory of law and ethics--this comes out of Hume--one asks, "What do you mean by good?" Good is anything that pleases me, that is relative to me. What pleases one person may be painful to another. Then, what does just mean? Just means what pleases the majority, and at that moment the Bill of Rights of the American Constitution becomes meaningless. It means what pleases the majority and if they do not like the fact that I was brought up a Congregationalist, and a rather tepid one, they can put me in jail. This is Hand's theory. You can not understand the American Constitution unless you have an idea of what respect for personality means in a logically realistic theory and only a Stoic version. It is the Stoics that warrant democracy. A logically realistic theory of the Platonic version always produces theocracy as does the naive realism of Christianity, the Aristotelian medieval Catholics, and the church of my ancestor, Sir Robert Filmer, The Canterburian, Church of England Episcopalianism.

The segregation issue in this country hinges around the concept of God as the Father of a race. This is a touchy subject. Naive realistic theories in religion always make God a god of a race. God of the Old Testament is a God of chosen people, and the God of the Canterburian Church of England was a God of white folk and aristocratic ones. You must appreciate this if you want to understand the desegregation question. To understand the Jeffersonian American Constitution of Democratic toleration you must read the last edition of Sir Robert Filmer's Patriarcha and Peter Lasslets' (the young English historian) introduction of that book. This dominates aristocratic Europe to the present moment. In that theory, God is thought of naively realistically and that God is a God of a first family, and people are ordered hierarchly in an ideal society. Out of this you get a God that is looking after certain people,

and then whenever you are in such a society and there are people of different races, you get a caste system. It is very interesting to know that in Sanskrit the Hindu word for caste is the Hindu word for color. And this expresses the fact that religious man was thought of as naive realistically sensed man, and if this is the truly known person, then men should not be treated equally. The southerner gives expression to this naively realistic way of thinking when he sometimes says, "If God had meant everybody to be equal he'd made them all to look alike." If you do not understand this you do not understand the American Constitution. I frankly believe that very few lawyers in this country can justify the desegregation decisions; because, they are thinking either radical empirically or naive realistically. They are not thinking logical realistically. You must think logical realistically and in a Stoic way.

The Stoic concept of the moral man is that he is a variable, he is an X in a universally quantified law, and to respect personality means to allow anybody to be substituted for you in any law you regard as just. And this is the real literal meaning of the words Roman Catholic in Roman Catholic Christianity. That is the Stoic Roman adjective they put on their Christianity. That God is not the God of sensed man, He is the Man of a logical realistically conceiving people before whom the sense person is what a mathematical physicist calls the material concept, and justice is to treat yourself as a variable. That is, for anything to be just for me it must be a universal law such that anybody could be substituted for me with respect to the content of the law. This is Kant's Categorical Imperative, but it is just a modern statement of the ethic that justifies democracy. It strips justice free from sensed, naive realistically conceived sexual differences and naively sensed colors in racial differences and makes the moral man turn around his beliefs.

LT COLONEL ALLEN - Dr. Scoville, would you like to either make a statement or ask a question?

DR. SCOVILLE - Let me just ask a question to clarify what Dr. Pollard said yesterday, since I am not quite so sure I understand after listening to the discussion this morning. But I gather that he feels, and I certainly think most scientific people would agree, that nature is statistical. He then says that you can see the hand of God best in the way he has influenced or guided the world towards exceptional or low probability type of events. Then Dr. Pollard quoted the example of evolution, where he saw the hand of God leading the world along the evolutionary path toward the creation of man in the same form as God. This raises a question in my mind, and this comes up quite often in discussion. Everybody seems to visualize God in the form of man. It is not clear to me at all why God has to be in the form of man. It seems to me God can be in a perfectly amorphous form. For me God

could be merely ethical principles. And it seems to me that you can have the Supreme Being, or the Supreme Intellect, as Dr. Eyring suggested, in a nonhuman form. I would like to know how strongly you all feel about this given form.

DR. POLLARD - I did not use the word form. I did not say God created man in His own form, but that He created him in His own image. Then I tried to say what I think is meant by this. It does not mean the physical image, certainly not. For the first time in the long creative process, starting with electrons and neutrons and single particles and so forth, where the universe is producing all kinds of creations, all kinds of creatures in a long development, man came in to occupy the universe, and for the first time an entity of created element in the universe possessed imagination, freedom, and creativity, which are many of the properties we think of as God's possessions. It is not a form; it is a matter of these deep distinctive elements, e g , rationality. All these things that are distinctively human are distinctively divine too. Now the Divine has many more; undoubtedly God is far more than man and, at least, in these elements He is the same.

You really had two questions. The first question was having to do with the miraculous, where the providence of God--His activity in creation--becomes evident. Perhaps I can make that a little bit clearer this way. Think of the laws of nature, the size of scientific discovery that is one of the great turning points of our times, where a completely new insight is opened up to us in our scientific progress. In that, something became evident in the particular decisive experiment which had not been evident before. Everybody believes, once it is discovered and fits into the total scientific picture, that it has always been that way and continues to be that way as we do other experiments and so forth. Though by and large our general observation of the course of events does not make it evident. Only if a very peculiar set of circumstances, that we call the experiment, is set up, can it be made to become evident again, but it would be farthest from our notion to suppose that only in the decisive experiment is that law operative. It is there revealed that it has been operative all along. Now in the sense of biblical providence it is exactly the same way. Most of the time God's activity in our lives and in our history is not evident. We go on trust that He is acting there. Especially when everything is running along according to expectations, let us say according to scientific predictions, although God's providential activity is just as much at work then as it is any other time. I would say, and I believe this is true biblically, only in those great turning points, the great decisive events of one's life, or the life of a nation, does it become clear and manifest that what has been operative all along is certainly there. Then you know that God is with us and has been with us all along. That is my point.

The use of the word "intervention" suggests that only occasionally does God act. God is acting just as much as natural laws are acting and at every moment of the time at every point in the universe. So are natural laws, but in science it is not evident that things are running along according to certain laws of nature. It has taken extraordinary efforts by a whole community of men to make it evident that these laws were operative. It is equally true in the case of the providential event.

DR. SCOVILLE - In other words, you see God more easily when He gets above the noise level. But He is there under the noise level too.

DR. POLLARD - Yes.

LT COLONEL ALLEN - Before addressing some of the questions which we have before us I would like to give each of the four speakers of yesterday a chance to ask questions of the other members which might have occurred to them in this discussion.

DR. EYRING - I would like to ask Professor Northrop a question. I do not know if it is a very easy question or one that he would want to answer. But I took St. Paul yesterday, for example, of a man who makes approximations, and one who gets operational. That is in science, if I am busy with theories on reaction rates and liquids and I should want to get operating, I may have to leave some things out. I think that is true often, and as one looks at people who are very intellectual they will have an approximate way of operating, likewise for people at all levels. In a religious way one has to become operational because life is here, it passes, and it is gone. If one is to get something from all of the very hard and good thinking, one has to work approximately. One just does not understand completely.

This man Paul, who was a rabid persecutor of the Christians on the basis of the things that he heard and believed, wanted to destroy them because they threatened all that he felt was good and worth saving. Then suddenly something happened to him and he completely turned around. It probably was not a completely intellectual thing, that is, the amount of intellectual thinking that he could have done during the time that he went from one complete course to another was limited. People who do approximate things but who change the world operate with what they have. I mean they make the best decisions they can on the basis of what they have. I think that is necessary. The best interpretation that I could give is the one that Paul gave: that somebody spoke to him, that something happened to him. This is God realizing Himself in this instance; this is revelation; this is what I mean by revealed religion.

Now perhaps it was simply epilepsy; perhaps it was not. I think it was not. So, my religion hinges on an interpretation of history. It is a matter of judgment. You can judge that it was an aberration. I am not saying how you should judge it, I am saying that someone could judge it as an aberration, something that did not happen, something that was entirely within Paul's mind. Or they can judge that Paul's assessment of the thing was the right one. His assessment was that he had an experience with a living God Who cared and Who set him on another course. Now that is my judgment; it marks the whole course of how I proceed. I think there are lots of people who are like that, who say that we have history to interpret. We know the lunatic asylum is filled with people who make decisions, and I am not afraid to decide that this fellow is a lunatic and that this fellow is sane. I have to make value judgments of this type.

I used the example of communism yesterday. Some people get all tangled up with the philosophical evaluation of things and they just can not come to a decision. I think they get lead away and can not see the things that I see so very clearly with only partial judgment. We have a tremendous system, and at least for operational purposes I know that our system is incomparably better than the one that denies men their freedom, no matter how much it gives them in return.

The question I have is: I think that all of us have to make judgments of history to operate and I think they are an essential part of at least practical, operational religion whether we make right decisions or otherwise; but I would be very much interested in anything that Dr. Northrop would like to say against this background that I have set for this man Paul. I have only taken him as an example; there are many others. I follow a man who to me is similar, the founder of my own religion. So when you are talking about Paul you will also be answering another question for me.

DR. NORTHROP - Well, I will talk about Paul. He is a very good one to talk about. I do not see anything that bothers the scientifically minded person in that he should have had an experience that changed his life. It is just like Poincare describing creative work in mathematics. He was wrestling with the problem, could not get the answer to it, and he felt he had it right there but it would not come. He went out to dinner, and, stepping into a trolley, it came just right out of the blue, a revelation so to speak. Now, that is a revelation from a problem in pure math, or mathematical physics. Now Paul had a certain theory of the Fatherhood of God and the meaning of Jesus. He was also trained in Roman law. He was a very well educated person, trained philosophically.

I will put it in terms of the theory I have outlined. Religion is concerned with those factors in human experience that are timeless. In the radical empirical part of human experience there is the source of our feeling consciousness, before it takes on form, and this is cosmic; it is not fastened naive realistically to an underlying substance. Now this changed my whole outlook, and it prepares one in a way in which theistic religions do not for the tragedies of life. You think of yourself as coming out of this timeless divine formless consciousness. This is a purely experimental question. The Buddhist said if your understanding of what I am pointing out to you depends in any way on your belief in me, you have missed the whole point in what I am saying. All I did was come like a pure fact-minded, radically empirical scientist, and I point out that, of course, you are aware of your sensed self, which is this flow of moods and feeling. Your one mood one day may be the opposite the next, that is, perishing particulars, and you come out of the amorphous, babe-consciousness at birth into forms and you go up to the apex of life and then you come down. Also, you are the here now, eternal, inimitable stillness of the ocean consciousness, and to live from the standpoint of that you can watch this Jamesian flow of consciousness, and you know the pleasures must not be turned into eternal objects. In Buddhist and Hindu religion, when you get the true self there is no immortality of the determinate person. Since they are radical empiricists, everything determinate is transitory; the determinate is going to die.

LT COLONEL ALLEN - Excuse me, Dr. Northrop, I am just a little bit concerned about the time. Could you come back to the question of Paul?

DR. NORTHROP - The theists put a tangent to the semi-circle of life and project it into the future, and when you learn to live from the standpoint of the ineffable formless ocean consciousness you go into an unlimited infinite emotive bliss, and it is the substitution of a personality that is in part painful, in part pleasureable, for one of infinite blissness. This is a pure experimental operational question. All you have to do is try and eliminate from your experience, this is the operational side, all differentiation.

People who have done this thing, that instead of going into nothing as a theist would suppose would happen, you pass into one of the most ineffable, unlimited, timelessness theories. Most of the time you will get this. If you have this in the background it has a chance in certain points in your experience of breaking in.

Let us go to the theistic approach and to Paul. The theistic theory by a doctrine of reminiscence says that the perfect logos of the universe is in the universe and that scientists are hunting for it.

We are only getting approximations, but, at a certain moment (and this is by the Platonic doctrine of reminiscence) we are arriving at it with finite theories that break down with time. Sooner or later fact comes up and we are shown that we do not have it, we have part of it, or we only have it in one aspect.

There is a third thing in Paul, and this is the moral side. Here I come back to Dr. Trueblood's point, the matter of sin. Morals do not come until bodies, human beings, can entertain propositional beliefs, and the soul of man is the belief part of man. Our bodies are going to die. Now, here I depart from the Aristotelian definition that the soul is the form of the living body. The soul is the moral part of man, and morals are impossible with respect to facts. Facts just are; they are not good or bad. The only thing that can be good or bad, as the Stoic saw, is the propositional belief, because that is the only thing that can be in error. There is no meaning to sin without the possibility of error. Now facts do not err; they just are whatever they happen to be.

Now if I arrive at a propositional belief that is isomorphic with the divine logos of the universe which is the intellectual and lawful nature of God; then I am immortal. This is the important part; the important part of man is not the color of his skin. This is the mistake of the naive realist, and they get a tribal God. God, to allow people to be moral creatures, had to allow them to make mistakes, to commit error. And the minute they commit error, sin is in the world, after which we are living in a world of sin with the truth in the background. This to me is the meaning of Christianity and of a Christ coming. I am putting it in this logically realistic language. God in a way is responsible since he gave us that freedom. We'd have been puppets, otherwise, instead of moral beings. The weight of sin is on us; we make errors; we utter lies--all of us do under emotional pressure. Christ symbolizes the fact that God forgives us for that. He, in a way, takes the responsibility for it, and Christ coming into the world is an expression of that. Paul then had the idea of Christianity involving Stoic Roman logos, and that by the doctrine reminiscence, the Platonic logically realistic theory, the thing that we are hunting for is in the background because we as knowers are the expression of it and if we find the truth, then we become immortal. If we identify ourselves with that truth, and if the truth is timeless, then in that sense we are immortal.

DR. EYRING - I think that I would like to go one step farther, if I might, and that is this: You presented the example of Poincare, but Paul judged that there was a response to someone who responded. It is my judgment that this is possible and that there is a God Who does that sort of thing, which reveals Himself. Is there anything

in that? Would that disturb you? That is the essence of revelation. I believe in a revealed religion, and apparently you do too.

DR. NORTHROP - Yes, but I think that when Einstein came on to the special theory of relativity there was the logos he was seeking for, you see, making sense world and saving the appearances of the phenomena, to use Platonic language, and one might say it is almost religious ecstasy. It is an intellectual religious ecstasy. Now I am not saying that it is identical with the meaning of Christ, because the meaning of Christ is tied with the moral part of the story, with the role of propositional beliefs. For us to be moral creatures we must be finite and make mistakes and errors. Christ symbolizes the fact that God does not just judge us by the absolute-ness of perfect knowledge which we do not have. That would be unfair. He forgives us for our errors because in one sense he was responsible for them when he gave us our freedom.

LT COLONEL ALLEN - It is interesting in your answer a moment ago, for the first time that I recall, the word soul has entered our discussion. That had not actually come up during our talks yesterday. Father Albertson, I think you have been the most successful in making clear operational definitions for us; would you care to venture an operational definition of the word soul?

FATHER ALBERTSON - That is a difficult question, because I have no definition ready at hand. But let me give it a try. Operationally I would say the soul is the center of a man's responsibility; it is the core in a man where he feels himself responsible; it is the source or seat of his vital concern. This is not a philosophical definition in terms of concepts or structures. It is a psychological, operational one. What do we mean then when we say--and we do say it--that sin is somehow a mark on the soul. It means, I think, that a man has failed his responsibilities; he has wounded his own inner self.

And where do our responsibilities lie? Do they lie in devotion to an abstract truth? In some of the discussion this morning sin seemed to be equated with intellectual error. I think that this is quite false. A sin is not an intellectual error. Most real and most obvious to us is the sin of denying down within ourselves, at the heart of our responsibility, our need to treat another person with the dignity due him as a person. In effect it is denying that another person has within him an inviolable core of selfhood and responsibility which demands the same respect we ask for ourselves. If one of my students, therefore, says that two plus two is five, this is intellectual error; it is not sin. If, instead of correcting the student, however, I become angry and abusive, then by failing to respect his fundamental integrity of personality I have sinned.

It is in relation, therefore, to a center of responsibility and personal self-directiveness that I would form an operational definition of the soul. Further reflection would suggest improvements, I am sure, but that seems to me to be the essential ingredient.

DR. NORTHROP - I agree with what he says.

LT COLONEL ALLEN - Does anyone else wish to add to the working definition?

DR. TRUEBLOOD - I was hoping that what Father Albertson just said would be brought out. It seems to me you have to deal with vastly more than the sin of untruths. This is sometimes a sin, especially if it is willful or if the facts are distorted to advance one's own reputation or prestige, and that is what I meant by my question yesterday, that distortion of facts would absolutely undercut science. I think the moral basis of science is a terrific thing and by no means adequately understood or recognized or stated, but I do not think this is the only sin. I agree that the greatest of all sins is the sin of failure to reverence another personality or to use another man. Reference has been made to the Categorical Imperative of Immanuel Kant, and one form of it was stated by Professor Northrop. The other form, and one of great concrete importance, is: "So act that thou doth not treat any person, either thyself, merely as a means but always as an end." Now the sins that I see are the sins of being unloving, or trying to harm, or of failure to respect. I think that the worst thing that we can do is not to treat persons as persons.

DR. EYRING - Back to the question of the soul. Father Albertson, did you want to add to your definition of the soul anything about the duration, whether it is transitory or not? Or did you want to leave that out of your operational definition?

FATHER ALBERTSON - I think we can say something about this if we expand the range of our operational relationships to include the documents considered to be depository of the revelation of God, a focus of the contact of God with man. If I believe that in some sense my life goes on after death--in other words "immortality of the soul"--I do so because of the promise I have received through God's revelation that I shall not die. Christ has said that he is the resurrection and the life and that whoever believes in him shall not die forever.

DR. EYRING - You want that added to what you said?

FATHER ALBERTSON - Yes. And by including not only our own psychological processes but also our contact with an objective message that the religious man believes comes from God, we can keep the definition operational.

FATHER ROTU - I would like to expand the definition that was given. I think it is a little too limited to talk about personal responsibility in terms of my relationship to a person, because I think a very important aspect of my responsibility, and therefore the whole operational idea of a soul, is my relationship to the world of matter. I feel as we become more timeless in our concept of God that this aspect of one's life, or his soul if you will, becomes dim, because the more timeless God becomes, the more He is taken out of time, and He could easily cease to be eminent in time. I think this has been a difficulty with (again I am playing the part of the fool here because I am talking on grounds which I am not thoroughly acquainted with) the eastern religions. They go through a process which has separated God more and more from concrete human existence and that is why it seems--and I do not know if this is a correlation or not--those countries have been less interested in human development and in the progress of science. I am convinced that there are other economic, social and territorial factors too, but I think this does have a very important part to play in our relationship to matter, and this is why the logos of St John in the beginning of John's gospel is an eminent logos, that is, because He's creative. The word was made flesh, and how we interpret the word in terms of a physical person, a god-man or in terms of God eminent in nature, the fact still remains that God is eminent in things and therefore wants man to be eminent. I am not denying Father Albertson's definition--of course I could not. But I agree with the idea of a future life, and I admit this, but I am also concerned about the present life, my commitment, my responsibility, and my moral responsibility.

LT COLONEL ALLEN - I would like to change the tone just for a moment. We have explored the subject of soul and the subject of the moral aspect of religion, and now I should like to inject something which I know is very controversial. The organized churches of the world have in recent times been accused very severely for their lack of moral leadership. I call to your attention the very controversial play "The Deputy" which caused a great deal of argument, pro and con, about the responsibility of the head of the Catholic Church during the time of the extermination of the Jews in western Europe. We have also seen many comments with regard to the inactivity of the organized churches in the south to provide moral leadership or to take firm stands on the segregation issue. The trend has changed very much lately, but the tenor of writing that one sees is very critical of the church. It accuses the church of coming only along after sociological improvements that seem to be generated outside of religious organizations. One would have thought that the church would have provided moral leadership for these things.

Now, without assessing the validity of these criticisms, or asking about these in particular, what I would like to do is ask

Dr. Scoville, because of his very deep concerns and considerations on arms control and disarmament, as to whether or not he sees a need for additional leadership from religious organizations, or whether religion can provide a moral attitude that would improve the prospects of arms control and disarmament. Or, in a general way, what do you see, Dr. Scoville, in your very practical considerations, the role of religion being?

DR. SCOVILLE - As far as the limited aspect of arms control and disarmament, I think one should recognize the objective of this is peace and that it encourages the world, the nations, and the people to get along together for a common good. In that respect religion can provide extremely useful influence and is providing a useful influence around the world. As you say, it can take a more active part than it already has. As far as arms control and disarmament itself is concerned, this is primarily a mechanism of achieving this goal of peace, while there are other mechanisms, such as armament, which are also attempting to accomplish the same thing. I think the world and lots of people here feel very strongly that by increasing one's arms one can provide peace; that is the reason all of you are involved here; that is the reason why I was working here before. Arms control is just another mechanism for accomplishing the same objective. And since it tends to be a mechanism, we do not feel that religion is an essential part of that mechanism. It is an essential part of establishing the right kind of climate in which one can work towards the same goal. Perhaps one might say religion is another mechanism of achieving the same goal. This is what we are trying to do in the arms control area.

LT COLONEL ALLEN - In some of the recent debates on over-kill and over-strength of nuclear weapons, one of the rebuttals which the military has offered the government has been to point out that it is the military's role, and perhaps the government's role, to maintain the national military strength as high as it must be maintained to give assurance. And that it is not the military's role, nor even perhaps many parts of the government, to look for the humanistic factors that will relieve the tensions. The military suggests one should look to religious circles for those things, for humanistic viewpoints, for the various factors that might tend to reduce tensions and permit some arms control or disarmaments to take place.

It is a matter of fact that the formulation of new ideas and new concepts have not been coming out of the religious community in a way that at all parallels the creation of military strength. In other words, we are in kind of an anomalous situation where we have been able to create a strength to maintain the peace, but the religious community, which has the obligation to create a humanistic atmosphere, has not progressed with the same determinism. Do you see this at all?

DR. SCOVILLE - I think that is the same thing as I was saying; religion can provide the climate.

LT COLONEL ALLEN - But do you see the leadership? Do you see the organized religions providing the humanistic atmosphere to reduce tensions?

DR. SCOVILLE - I am not conscious of it as organized, but I think there is quite a lot of it in the sense of trying to establish an understanding among people, which is basic; but it is not organized. Or is it? Maybe some of the religious people can answer that.

LT COLONEL ALLEN - Would someone care to comment on this?

FATHER ALBERTSON - I should like to comment on it if I may. It has been observed by our chairman that there is a lack of religious leadership in the discussion of certain moral aspects of national defense policies. I think this is quite true if you have in mind some statement on the matter by an organized religious body, which is intended to reflect the considered opinion of the majority of that group as to what should be done or not done in a specific instance. I think we have had very little of that. Now personally I do not feel this is a substantial loss, and I will tell you why. Most of the questions that involve national defense require an enormous factual input. You have to talk in terms of certain realities about what is possible with weapons, what is not possible with weapons, what is possible diplomatically, what is not possible diplomatically. To make a statement on the issue you have to have this factual input. Now I feel it is fairly unrealistic to assume that you can get the proper factual input into a group of religious leaders, by and large. They are not men trained in these areas; they usually do not have the leisure to do this; and so to me it is not very realistic that they should be expected to come up with a statement based on an adequate grasp of the facts.

Rather, I think religious leadership should be apparent in terms of the encouragement and cooperation which religious people give to those who are, as a matter of fact, concerned with making the relevant decisions--people within the organizations of the Defense Department, the State Department, and the Armed Forces. It should be a cooperative effort which involves both sides, rather than a statement made from the outside by a religious group. What we need--and what is taking place, if I am not completely mistaken in this instance--is a certain cooperation and co-study of these problems both by people with professional religious and ethical interests and by people with the factual knowledge who also are concerned with getting a contributory religious and ethical input from the religious communities.

There have been instances where this has in fact taken place in a most remarkable way. Individuals in the Defense Department have been responsible over a period of years for a formulation of United States defense policy which is a radical reversal from the massive-retaliation concept which was in vogue some years ago. This change of defense policy has been dictated by more than merely strategic considerations. It was not that the new attitude of controlled response was simply a better thing strategically; it was morally a better thing. The people who elaborated the spectrum-of-responses concept did not do it on strategic grounds alone. They had a moral input.

I think it is here, in this type of development, that we can look for and expect a religious contribution or a church contribution to discussions of morality and national defense. If we have not had enough of this, I say by all means let us have more. But if we want more religious contribution we should look for it on this level rather than on the level of specific statements from organized religious bodies about what is good or what is not good in national policy.

DR. TRUEBLOOD - Colonel Allen, I know the time is up, but let me just add one thing. I believe it is completely false to speak of religion in the abstract, as though it is something over yonder. Where is the religious community? It is where the people are working and thinking; it is in the Pentagon. I think we tend to suppose that religion is something besides the people. Well it is not anything besides these at all. We have them in the Defense Department, and a number of them are in this room.

DR. POLLARD - Along that line, the historian Butterfield has made quite an illuminating comment about the role of the church in European history. Most of us learn history at the level of kings and archbishops and popes and the upper class power structure of the whole of European society. Butterfield pointed out the effect on the total of European history of all the innumerable parish churches with their parish priests and the moral instruction of their people, the leaven, Sunday after Sunday, pastorally, and in all kinds of ways shaping the undergirding life of the whole of European society. Not making saints out of them; they remained sinners, yes, but imagine what European history would have been without this input. Now I see this in the south, in the churches of the south. A pastor of a congregation in the south meets the people as they are with all their prejudices. Whatever his convictions are he can not browbeat them into being completely different persons than they are; but there has been, and continues to be, as opposed to the unchurched areas of the south, a continuous confrontation with Christ and the Christian view of a person and the dignity of the person and the moral demands. This goes on.

It is a leaven. It is almost impossible to write a history of it. It is too diffuse and too undergirding to identify, but it is there, and without it, believe me we would be in a quite different situation in society. It is not the public actions and social actions of the churches in an entire organized body, it is this undergirding of moral instruction and confrontation which is variable from minister to minister. In various ways it is working its way.

LT COLONEL ALLEN - Gentlemen we have passed our time. I hate to terminate things; perhaps I could announce that anyone who feels obliged to leave can, but we have time for a comment or two.

DR. SCOVILLE - I have only one comment on Father Albertson's remark. That is, while I think it is very often true that moral factors do enter into these decisions, like one you mentioned, there is a terrible tendency to deny that there is any moral factor in the decision. There seems to be a fear, or a feeling that this is something you ought to be ashamed of, and I think this is a very bad tendency. One always seems to have to justify any decision only in dollars and cents, military effectiveness, or operational suitability. If you say you want to do this because it was morally better you could not really sell it to anybody. I think this is a great tragedy and a thing that perhaps could be corrected by establishing the right atmosphere.

LT COLONEL ALLEN - By the way, the one thing I did not mention during the introduction of Father Albertson yesterday, which I think explains his last comments and both the familiarity and interest which he had, is that he is the director of the Loyola Forum of National Affairs. This has caused him to work in very close harmony, both at Loyola and I presume elsewhere, with a number of the leaders in national affairs in the governmental departments. I think in support of what Father Albertson said in response to you, Dr. Scoville, it certainly is true that a large fraction of the Defense Department had been very concerned for the past decade with the moral dilemma which a concept of "all-or-nothing" massive retaliation provided. Whereas that seemed to be the only alternative for a while, I think, it is true that a great many people have looked earnestly to find alternatives to the massive retaliation concept and have looked for the graduated response. I do think that the moral factors have had an influence. For example, research and development systems have been designed and built to provide a flexibility which will offer alternatives which are not quite so catastrophic as the all-out, one-stroke, massive retaliation; this, I think, has been prompted as you say at least partly on moral considerations.

Open Question Period

LT COLONEL ALLEN - We have a large number of questions from the audience which obviously will not get answered today. Before we start, I have one thing I have been requested to say: Would the speakers as they respond to the questions please bring the microphones a little closer to them? The second thing is that I have here a timer, and in an attempt to get at as many different questions as we can, I thought we would limit the response in certain areas. This will permit us to go a little faster and cover more things.

I have several notes here. General White suggested after the conclusion of the discussion this morning that there is one aspect which we had not really touched on. I shall read his statement; it might spur some thoughts.

"On the question of religious and moral aspects of national defense policy and disarmament, I do not disagree with anything said just before lunch, but I do not believe enough was said. I do not believe we can properly deal with the moral aspects of defense policy and disarmament without including a consideration of the morality, or the lack thereof, of the opposition. Unless I have been badly misinformed, morals of international communism are far different than those of the free world. We must, in my opinion, include a consideration of the morals of our avowed enemy as well as our own in all determinations that shape our defense and disarmament policies. We can not afford to ignore that the Soviets have a different and in my opinion an immoral definition for that much-sought-after-objective, peace. We can not ignore that the Soviets and Chinese communists have proven time and again that they can not be trusted. They will live up to an agreement so long as it is to their advantage to do so. And it certainly is true that the communists have a different attitude about these things; they are essentially an anti-religious community."

Perhaps a way of starting this afternoon's session is to answer a couple of questions which we intended to get at this morning. Then the audience can join in as they see fit. The first question has been addressed to Dr. Albertson and has been asked in several forms and by several different people, but it is basically the following: If religions have a basic similarity (and this has been pointed out in our attempt to develop various general definitions), and it is

only in the theological questions that disagreements arise, then as one pursues an intellectual search to examine the various concepts of religion, how does one justify one religion versus another? How much of the trappings of the theological points does one resolve in his own mind? Which theological doctrines or dogma are essential to his own spiritual well-being, and which are not? This particular version of the question goes on to say that if you take the attitude that these smaller details are not particularly important, does not this throw you back to an individual concept of religion rather than a communal concept of religion?

FATHER ALBERTSON - In answer to that question, which I think is an excellent one touching a point that has occurred to many on the basis of what I said yesterday, let me add these few further comments. I would say in the first place that religion is not simply my search, my individual, personal search, for a relationship with God. Religion, as I understand and interpret my Christianity and my Catholicism, also involves God searching for me. So when it comes to a question of what type of religious belief or what type of religious body shall I adhere to, around what shall I structure my religious beliefs, I have also to ask to what extent has God already revealed himself to me. It is no longer for me to decide simply what I want or what I do not want. What has God asked of me personally? And this is where you encounter, in Catholicism certainly, the concept of Christ as the son of God Who came upon earth to bring to man his filial relationship with God the Father. God has revealed to me certain things, through Christ, that I would not have been able to understand any other way. So my response to God can not be based solely upon my own understanding, my own investigation of my psychology you might say; it can not be based solely on what I want my relationship to God to be; it must be based on what I understand God to want that relationship to be. To what extent has God asked me to commit myself to this religious way of life? On that basis, therefore, I should say that the individual is not free simply to pick and choose in the abstract among religious doctrines as he may find them spread out in a textbook on comparative religion. His first obligation, rather, is to inquire of himself, "What does God ask of me?" I interpret my own religious response to be a reaction to the precise request that God has made of me according to my own personality, my own time, my own environment. I would say this is the way a person comes to make his personal, individual decision about religious belief.

LT COLONEL ALLEN - There were several questions of that general tenor. Do those who asked from the floor have any comment?

QUESTION - That is really the question I was trying to ask yesterday, and I would like to ask Dr. Eyring to answer the same question. I believe he would basically agree with Father Albertson, and yet he arrived at vastly different conclusions.

DR. EYRING - I think I would subscribe to everything that has been said and I would think that man has open to him an avenue like the one Paul had. I keep using that example because of shortness of time; there are lots of others. There are factors besides the intellectual that come in to it. God is part of the thing. If He chooses to reveal himself to Paul on the road to Damascus, fantastic changes can take place. I think that He does (when it serves His purpose with respect to His children) intervene in his behalf. I think He loves all his children, but I think there is a best way. I think there are many good ways, but I think there is a best way. Of course, each one believes that he has found that way or if he does not he ought to be changing. I think one should use every resource. I suppose one important thing is to be teachable; one can easily get commitments that do not leave one free. I am sure that we all do that. Sometimes we do not follow the promptings and the right things because of our own willfulness and intentions to go awry. But I believe the revelation is real, and to put it the way the philosophers would, that God is eminent in the world and that He does intervene and through prayer you can find that right way and be guided by Him, by revelation, by inspiration. It is real regardless of how you say it.

LT COLONEL ALLEN - Dr. Eyring, does this also tend to answer the question?

DR. EYRING - Yes, I think the same person composed both of them.

QUESTION - One thing that has impressed me here is the unilateral arrangement of the people on the speakers stand. It is, in a way, similar to our national racial relations. That is, there are a number of people who are black and a number of people who are white who go out and throw bricks at each other and say, we got one of theirs now you get one of ours, and by this kind of fanaticism they are trying to throw us into one camp or the other. Well, I personally do not want to be black or white; I am a human being and I do not want to be in either group throwing bricks at the other one. It seems to me that the panel is divided this way, in a sense, on religion, that is, a western Christian concept as opposed to a cosmological type of religion, perhaps represented by Dr. Northrop. Since the world appears to be evolving towards a one-world government, and since in the world the majority of people are not Christians, the majority are not white, the majority are not western civilization, or western cultural thinking, the world is not realistically evolving toward one big American PX as Billy Graham and some others tend to feel, my question is, if Dr. Northrop would care to answer, where do the alternatives lie? Must I believe in a personal God, in the western Christian sense, or is there some other way we can go?

LT COLONEL ALLEN - Would you care to answer that Dr. Northrop? I think Dr. Trueblood also wanted to make a comment on this concept of a personal God.

DR. NORTHROP - First, let me say something about this idea of making God responsible for the fact that I choose Christianity. When doing this it seems to me there is a risk of blaming God for something that is culturally relative. Also, I do not see why one should not read a book on comparative religion. I do not see why it is any more unreasonable or unrealistic to find something true about the nature of the timelessly divine which incidentally I never saw in any book on Christianity and which I do see in Buddhism. In science, if we get a paper written by the Japanese, if it is a good paper, we can be guided by it. While it is true that our own culture and our tradition in part makes it inevitable that we are going to be persuaded and influenced by an indigenous religion more than that of a foreign culture, I think it is somewhat risky to identify that with God's choice for me. It is my parents choice, the circumstances of my culture's choice, but to say that it is God's, I think one needs to be a little critical at that point. Now in the analysis I gave, in the radical empirical component of the nature of the human soul, its consciousness, and in the nature of God, a factor which I never found in any one of the western religions is the timeless and emotive. It is not rationalistic. The theory of God I am giving must not be branded as I sense everybody is tending to do. It is only known emotive; it can not be said; it can not be stated. I believe there is a factor in the divine nature that the semitic religious tradition discovered. This is the way the world is drawing on both cultures. This sense is worldly.

LT COLONEL ALLEN - Dr. Trueblood.

DR. TRUEBLOOD - I am awfully glad for the question that our friend has raised back here. I have been here at Kirtland for four days and I know a great many people in this room, I am glad to say. And if I sense your mood right this is exactly the topic on which you would like to have some clarity. Since there is nothing on which I have thought harder or longer, I would like to see if I could help you. That is, I do not want people going away from here with the sense that they have heard a lot of confusing words. I believe clarity of thought is possible and especially on this topic. Now why do we say that God is personal? I believe He is; most of my colleagues here believe He is. The beginner usually supposes that this is what he calls seeing God in human terms. This is a completely false accusation. Of course we do not see God in human terms. Human terms are not good enough. If you take seriously the biblical conception, God is vastly more than what we are, our righteousness is nothing compared to His, our righteousness is filthy rags. What we mean is this, unless God

is at least as conscious as Father Perone is or as William Pollard is, then you have the most confused conception of the world imaginable. If Bill Pollard can know me and God can not, then it is difficult to avoid this logical conclusion, that there is a sense in which Bill Pollard is superior to God. Now let us get this straight: consciousness is vastly superior to unconsciousness. Take this pencil. It undoubtedly is, and Father Perone undoubtedly is, but Father Perone in some sense knows the pencil, and yet the pencil does not in any sense know Father Perone. Here is a complete imbalance.

Now let me give you three things I find absolutely conclusive about the personality of God. I understand there are people who do not believe that God is personal. I honor an aesthetist. My great teacher at Johns Hopkins, Professor Lovejoy, was undoubtedly an aesthetist and we were the very closest of friends. The person I can not honor is the person who says he believes in God but believes in Him in some hazy, abstract, impersonal sense. I would honor him more if he were an out and out atheist. Because if God is impersonal, He is abstract. I will give you three reasons for thinking He is personal. First, Christ believed so. He prayed, "I thank thee, Oh Father, Lord of heaven and earth," and if the impersonalists are right, Christ was wrong; it is that simple. In the second place, if God is not personal then you are superior to God, because you can know and have partisans. By personal, I mean having the capacity to be conscious, to care and to know. Remember that the caring is a tremendously important part; it is not merely intellectual, it is also concern and love. If God is not a being who has this capacity I will give up my religion this afternoon and I will not pay any attention to it or give it any sacrifice of any kind. First then, Christ believed that He was personal. Second, if He is not personal you are better than God. Third, if He is not personal then this is the utter absurdity that the personal has arisen out of an impersonal world. This is a stretch on credulity that I, for one, as a logical person, can not take.

LT COLONEL ALLEN - I want to make one announcement which I forgot at the beginning. Several people asked about the book we referred to in Science. The book is This View of Life by George Gaylord Simpson, Harcourt, Brace and World, New York, 1964, \$5.50. The chapter mentioned is Chapter 13 and is the one reprinted in Science magazine.

QUESTION - Yesterday Father Albertson talked about the evolution from Newtonian physics to what we have now. Yesterday and this morning Dr. Northrop inferred, as I understand it, that religion has also made an advance away from an anthropomorphic God. Dr. Pollard talked about how the Old Testament Jews believed in an actual, living God Who came down and intervened and had a hand in situations. I understand that Dr. Eyring also holds this concept of an anthropomorphic God, rather

than one evolving from an anthropomorphic description to something that we can not understand at the present time. I would like to have Dr. Eyring comment on this.

DR. EYRING - I think this has been said quite well; that is, the characterization that Dr. Trueblood gave of a personal God. I do not think I would be able to say it better. In philosophical language, I think God expressed Himself in the world; He is immanent; He enters into things, and that to pray to Him is a real thing. I am sure He intervenes as He sees fit and not merely as I might think He would want to. It may be rare or often, but the important point is that on occasion He does. One can petition Him, and that is real. In the experience of Paul, there was more than just Paul. There he touched the infinite; he touched God, and God had a part in it. That is a real thing. And now regardless of how often one speculates, this is a reality. It happened once, that is the important thing, and it can happen and will happen again, when in His wisdom it should, and not necessarily in mine.

DR. ROTH - We have been using the word anthropomorphic; I think this is dangerous when you refer it to the object about which you are talking. By doing this we anthropomorphize everything. The word anthropomorphic means human. We only know the human way, by the colors and by the measurements and so on. Of course the physicist and scientists will say it is not as it appears, but there is always a certain amount of subjectivity. I would say that as long as we do not try to project our particular framework on God, this word anthropomorphic is not a bad one. I think we must be anthropomorphic. In other words, we can not think of God except as loving and as a person. It is true that as human beings we are going to grow in our knowledge of God, just as a child grows in the knowledge of reality. We do not slap a child because he talks about dolls or Mickey Mouse. This is the context in which the child is thinking, and if we believe in evolution, as I do up to a certain point, we are really only on the threshold of our intellectual development. Some anthropologists say that such development may go on for millions of years and that we are Johnny-come-lately as a human being. I think our knowledge of God will grow, and hopefully we will screen out some of the gross aspects, the false aspects of anthropomorphic thinking. But I would hate to see love, as Dr. Trueblood has emphasized, being dismissed as anthropomorphic.

DR. TRUEBLOOD - Mr. Chairman, I hope we can stop using this wretched word, anthropomorphic. It is intentionally emotional whenever it is used. It is derogatory and therefore not fair in an intellectual discussion. It is meant to be a word of disdain. When I say I believe God is personal, I do not mean He is a big man with whiskers, not by a jug full. I mean He is at least as loving as the most

loving people I know; He may be vastly more. Do not for one minute think this concept of God is tied, as our friend here suggested, to our white, western culture. Some of the best people I know, who loved God in this way, are black. I am going to Japan next month, and there I will see some of the finest Christians in the world. This is not local by any means, and we are throwing a red herring in here when we talk about this as western. I do not uphold a western religion. I believe that the God of all the world is truly revealed in Christ, and this is universal.

QUESTION - To revert to some of the more basic concepts that we were looking at yesterday, it seems--and my view may be very prejudiced compared to those on the panel--as though the scientist feels a compulsion to apply the knowledge of his field to that of religion. Whereas I do not feel that the converse true. I think the theologian feels very well founded in his field of knowledge and feels that this is the direction in which his field of knowledge can only be directed and therefore seldom outer-directs the tools, the axioms of theology, to look at such things as science. I address this question to anyone on the panel who would attempt to clarify or to expound upon this unbalanced relationship between the scientists and theologians, and between science and religion.

DR. POLLARD - I have been spending a great deal of effort the last 10 years applying the insights of biblical faith to everything I understand about the universe as a scientist. I know of a number of other people, Dr. Eyring for instance, has done quite a bit of that. A lot depends on one's experience. I do not know so very many scientists that are applying their science to religion. There are some; there was the Star Island Conference where a few scientific people got together and theologized.

DR. TRUEBLOOD - But are you not one of these yourself?

DR. POLLARD - Yes, I think some individual theologians and scientists narrowly apply their God-given abilities to narrowly conceived problems and come out very fruitfully on that. Others take broader positions, with a great individual variation; we all have our roles to play. I think it is a false dichotomy we make here. We use whatever insight and understanding we have, hopefully to the best of our ability, in whatever range of problems we can apply it. All of us do that.

DR. EYRING - Dr. Northrop is a person who has spent his life studying physics, religion, and philosophy so that we do have people of considerable breadth who go into all fields. I think it is a wonderful thing, and we ought to have more. We can name any number of scientists who have been very religious and who have worked with it. I am sure Father Albertson is a religious man, and yet he is a practicing scientist.

So I suspect there are lots of people who are actively working in both fields. I guess the human species is very strange; they are not all alike.

LT COLONEL ALLEN - We have a question from the rear.

QUESTION - Is it true that there is a real break in the mechanistic overtones, which have been a part of the scientist and which have been his strongest thrust, changing the faith of our world and changing the thinking of men all the way down to the street level? Within the scientific community is there beginning to take place a breakaway from mechanism toward the concepts of transcendence? This is not a theoretical question I am asking.

DR. POLLARD - Yes, I certainly think there has been a break. The last half of this century has seen a very sharp difference in outlook. It has not filtered down to the man at the street level yet or even down into a lot of scientific teachings. It took the earlier version some time to gain its ascendancy, but all around you see, especially among physicists, a real awakening of a sense of mystery in the whole scheme of things, a recovery of a sense of transcendence, as you put it; this is not universal by any means, but it is a movement that is accelerating. I sense it very much. Not nearly as much among the biologists as among the physicists. But there has been a real break in this century. You sense it in discussions like this, in what Father Albertson said or what all of us said. When Henry Eyring spoke about a whole universe running down it is hard not to ask the question how did it ever get wound up. Questions like this do arise, and are arising with greater frequency.

LT COLONEL ALLEN - Dr. Northrop wished to make a comment on this question.

DR. NORTHROP - There are two very important developments. The first is cybernetics. This is now commonplace. All military concepts have feedback. And this is relevant to the problem of reconciling science and religion. In the classical theory of mechanical causality, goal-guided behavior was meaningless. At one time physicists believed that the present state of the system determines the future state and there is no meaning or purpose. Kant saw that the effect of this was to throw away morals thereby obtaining a philosophy of natural science; the first critique left morals, law, and religion meaningless. Now one reason for that was that the early instances of mechanical causation that the founders of physics studied, were those in which the mechanical sequence always remained linear. But it has been pointed out in an epic-making paper by Rosenblueth, Wiener and Bigelow called "Mechanism, Behaviorism and Teleology," that there are two species of mechanical systems, one in which the sequence remains linear and

the other in which a sequence of short, linear, mechanically causal processes returns in a circle, and this is called circular mechanical causality. When that circle goes over a stimulus or target, you get the Bofors antiaircraft gun. Now the word teleology or goal-guided systems is no longer a dirty word in physical science. On top of this McCullough and Pitts have come up with a logically realistic constructive theory of the brain and nervous system which enables it to have representatives of ideas and meanings. This makes it mechanically and naturalistically realistic to believe that a person's behavior is a function of his belief and his ideals, and it makes realistic, idealogical, and believing man not just a muscle twitch to a stimulus.

LT COLONEL ALLEN - We really have spent enough time on this. Do you have a new point?

DR. ROTH - I just want to voice a little pessimism in this enthusiasm. There have been a few books written on this subject lately. In the field of biology, for example, one such book was written by Du Nouy. If you get by his opening chapter where you laughed him off the pages and go into his theory of evolution, I think you will see him considering these ideas. Also, other examples are works of men like Sinnott who is writing on the biology of the spirit. I just have a suspicion, so I do not want to be too pessimistic. I am inclined to believe that men writing this way have already believed in these particular points and now they are using science to show that these positions are justifiable. I may just be pessimistic, but I believe this.

DR. POLLARD - Men who write the other way already believe too.

QUESTION - I direct a question to the entire panel. What about the chances of salvation for a Roman Catholic versus a Buddhist or Hindu?

LT COLONEL ALLEN - That is a good question. Of the several faiths we have represented Father Albertson, would you like to start.

DR. TRUEBLOOD - We have not used Father Perone yet; let us force him into this.

LT COLONEL ALLEN - Father Perone, would you care to comment on this?

FATHER PERONE - No, I would not. When I was younger I read somewhere that if you keep your mouth shut people will not know how stupid you are. So I am saving up what I have to say for the evening service, meanwhile letting the Jesuits carry the ball.

LT COLONEL ALLEN - Father Albertson that puts it back to you. Do the Roman Catholics have a better key to the gate than the Buddhist?

FATHER ALBERTSON - This is one fundamental question: Is a man acting according to the dictates of his own conscience? If a man is doing that which he personally feels is the best thing for him to do then he is doing the morally good thing. I would say that if the Buddhist is doing that which he as a Buddhist feels he should be doing in relation to God and his fellow men, then he is doing the right thing. He certainly has a far better chance of attaining the rewards of an upright conscience than the Catholic who fails to live up to the ideals of his religious beliefs. The important thing is the individual conscience; there is nothing that can substitute for the personal responsibility which compels each man to do what he feels is the right thing for him to do. Whether this is Roman Catholic, or Unitarian, or Quaker, or Buddhist, is irrelevant.

Why then do we have such things as missionary activity? Why do people go out to instruct others in their own religious beliefs? Is it because they feel that the person is now doing something morally wrong by believing in his present religion? No, I think the essential character of missionary activity is to instruct people in what you feel will make it easier for them to establish a right relationship between themselves and God. You feel that you have something that will help them in this, and you become a missionary. If you feel you can not help them, then you do not become a missionary.

QUESTION - Is this feeling of yours due to your scientific background?

FATHER ALBERTSON - Not substantially. If I had not become a physicist, would I have felt this way? I believe so. I know many people who are not physicists and who feel this way. But being a physicist has undoubtedly influenced the way I express this feeling.

LT COLONEL ALLEN - Dr. Northrop would you care to make a very brief statement with regard to the Buddhist's chance for salvation?

DR. NORTHROP - I think it is very good. I think they have the surest chance of anybody because the component of God's nature that they believe in is immediately apprehended and there is no speculation to doubt. Of course I believe, with Pascal, that theist religion rests on a gamble. You make an inference on immediacy, which you can not deduce. I also think that Christians have a pretty good chance.

LT COLONEL ALLEN - I think we might like to hear if the other panel members have a brief comment with regard to their denominations or faiths.

DR. EYRING - Added to what has been said, I think a person has the responsibility not only to do the best he knows, but, to know the best he can. Perhaps that is implied in what you say, Father

Albertson, but one has the responsibility to know all that he can know. Now I suppose, and I speak perhaps from my own church point of view with respect to this, that there should be a best way, which is to me the Christian way, and the New Testament Christ represents that; so I am partisan in the sense that I think that the pattern He has given, believing as I do that He is the Son of God, is that best way. He loves all of His children and none is going to be denied the opportunity. I think He certainly loves them just as much when they are Buddhist as when they are not, probably more if they do better. It is as the man in our community who one time said, "The Lord loves all of you but He loves some of you a damn sight more than others." I have said that we have responsibilities, and to me Christ is that example of God-man Who has set the best example.

LT COLONEL ALLEN - Well, I think the whole key to this is the question of truth. We all feel a responsibility to share the truth that we have been shown with other people. In science, in the sharing of western science with the rest of the world, we feel that responsibility. For instance, it is very often quite difficult to get other people, Indians say, to accept agricultural techniques, but we do not stop trying because we know the truth of this. You come to know the truth that the God of the whole universe, which means the God of religious and irreligious people alike, the God of the earth, of the galaxies, of all space and time, has in fact revealed Himself in historical events in the real history of this earth. Those who are responsible to those events, who received it, can do nothing but tell others about it, spread the news of it. It is a question of truth. If it really is true that God was in Christ, then you can not do anything else.

DR. TRUEBLOOD - I suppose our best known Quaker expression that most of you are familiar with is "Everyone is queer but me and thee, and sometimes I have doubts about thee." If there is any way in which we can help one another, as stupid as we are, we ought to do it. We are not in this world just for ourselves. Therefore, I think you can make a very rational defense of missionary activity. I have heard people deny missionary activity by the supposed dilemma, either God is going to save everybody or He is not. If he is, you do not need to go, and if not, you could not do anything about it. Well that is vastly too simple. The point is that anything we have found we are duty bound to share, and I see no rationality at all in the assumption that all religions are equally good. Not all philosophy departments are equally good, not all scientific departments are equally good. Why in the world do we think all religions are equally good? I do not think they are.

LT COLONEL ALLEN - We have a question from the floor.

QUESTION - Colonel Allen, as the interlocutor of this panel, you said that you were going to play the role of the atheist. Well, let us get with it. We heard a statement that not all religions are equally good. Yet everyone here who has a religious group affiliation believes that his is the best. Do you suppose, sir, as a practicing atheist, Air Force type, (playing the role at least) that one of the reasons why you fail to embrace any religion is that you really wish that all these people of really good will, who think their religion is the best, would slough off willingly and lovingly some of those accidents of history about which Father Albertson and Dr. Eyring spoke yesterday, and get with a true breakthrough of revelation, such as some of us think occurred to the late Pope John, and forget some of the squabbles and the ill will and the hatefulness? Would that help you to slough off your atheism?

LT COLONEL ALLEN - Well let me try to answer in the way that is consonant with the role I was trying to play. First of all, the answer as to whether the scientific atheist or cosmic religionist who denies the existence of a personal God, and how much of that is based on a dissatisfaction with existing religions and the way they display the details, I am not really sure. But I do not think it plays a dominant role. It certainly plays a role in the sense that a person may be unwilling to explore a number of alternatives of religious endeavor; because, a person of scientific training may find it objectionable to go to church, to listen to unintellectual stories of miracles and unilluminated statements about historical aspects about which there is basis to doubt.

But the role I really wanted to play is a little different than that, so I think I will respond to your request by asking a question of the panel which I think is more on the philosophy of science than religion. This question has come from a number of sources among the young people in the Laboratory, and I am badly paraphrasing a lot of the questions. A good deal has been made of the statistical nature of science, of the indeterminate nature of science, and it is that aspect of the discussion which has a certain metaphysical significance. I would like, for the moment, to propose a denial of that and say, as some investigators have said, that it is possible to construct a completely deterministic physics, a scheme in which one interprets the uncertainty of the quantum mechanics representation in terms of some hidden variable or some other lack of understanding. One in which one does not give up the complete causality or determinism of the individual happenstance. In other words, one could tell when that Iodine 131 atom of nucleus was going to decay if one only knew a number of things about which one simply does not now know. This approach poses certain fundamental limitations to one's ability to understand them now, but does not deny the fact that there are hidden variables which maybe someday one will discover. Maybe then,

having all the details about the deformation of the nucleus, one could, in principle at least, tell when that nucleus was going to decay. It is not necessary that one be able to state that I will ever do this, it is only necessary to be able to state that one, in principle, can do this. Similarly, the same applies to the questions of the statistical nature of turbulence. It is only the problem I would suggest for discussion. It may be that the problem is only too complicated to handle in a completely deterministic way, but in principle, the turbulence is deterministic and it is a matter of fact that a great deal of progress has been made in the last year or two, and some of it has been made at this Laboratory, in mechanisms for handling two-dimensional hydrodynamic flow where turbulence does develop. Carrying this on to the nature of storms or other phenomena which are so complex as to defy our capability of predicting details, the question is whether this is fundamentally so. Does that carry with it some metaphysical significance? Or is it that the problems are too complex for our comprehension? Now for this part of the question I would like to restrict it to the physical world recognizing that the biological world carries with it another set of problems. Then to follow that is it not possible to imagine that some day, in principle, one can duplicate the human mind through various techniques which allow learning, which allow various other intellectual processes to take place? Why is it impossible to duplicate, in the same way, the spiritual aspect of the human mind? Could I ask the question with regard to the physical world first?

FATHER ALBERTSON - If you want to discuss the quantum-mechanical theory of indeterminacy and recent developments by DeBroglie, Bohm and others, then I feel there is something I could contribute to the discussion. As you know, classical mechanics contained the assumption that if we knew the initial position and velocities of all particles in the universe, we could predict the future state of the universe because the laws which govern the interactions were knowable and the future state was precisely predictable. Quantum mechanics, however, developed a quite different theory of physical phenomena. And it has been shown by von Neumann that, given such a theory, there is an essential indeterminacy or statistical character to physical theory. So now it is no longer possible to predict exactly what the future state of the universe will be if we know its present state. In fact, our knowledge even of the present state is rather fuzzy at best, and given that present fuzzy state we can do no better than predict a still fuzzier state in the future. But is it possible that this present statistical theory will be superseded by another nonstatistical theory, and that eventually we shall get back to something like classical mechanisms? Yes, it is quite possible Bohm and others have asked it. There is another theory which is deterministic and which lies at a lower level than quantum mechanics (as Newtonian mechanics is the substratum of classical statistical mechanics). We deal now with this deterministic level only in the

statistical expressions of quantum mechanics, but by developing that underlying theory we could actually arrive at a deterministic picture from which could be predicted such things as nuclear decay. I think this is certainly a possibility. No one has yet done it and there are people who believe it will be extremely difficult, but it is presumptive to say that it is impossible.

Has this radically altered our concept of what is going on in physical theory? No, I do not think it has. Although we may find a deterministic theory to replace quantum mechanics, there is no reason to assume that this deterministic theory will not at some future date be replaced by still another indeterministic theory. There seems to be no limit to the possible levels on which theory may develop. I would say that among physicists and the more responsible philosophers of science, this is the present state of affairs. An unending cycle of determinism and indeterminism is quite possible.

LT COLONEL ALLEN - Dr. Eyring.

DR. EYRING - Even in the framework of classical mechanics, I agree with what has been said here, but even in the framework of classical mechanics, there is what Langmuir has called convergent and divergent phenomena. I think this is an interesting picture and, actually, one that has been touched on. That is, it is possible to have results out of all proportion to what set them off. By touching something, you might have set off the atomic bomb, which might have blown up the world. From a very small accidental thing, that somebody thinks of, something tremendously divergent can come. There are those things in the world that are very real things; for instance, you could have wars start. People who have sensitive minds worry about this kind of thing. That is, you could have an accident, a bad something that sets the world in flames. So there are things that exist quite apart from the uncertainty principle of quantum mechanics and mathematical equations which, beyond certain points, you have divergence. There are things in the world that are not simple or orderly. In the ordinary classical description you can get tremendous effects from very small differences, for instance, the raindrop which falls on one side of the Continental Divide and flows into one ocean instead of the other. I do not know what difference it makes, but, anyway, this depended on a moderately different state of whether the wind blew slightly one way or the other. So that there are many phenomena that are not orderly in the simple way and where a little bit of force will make them just go a little farther in the other direction. That is the kind of thing we like to deal with. There are a great many of these things. Divergent phenomena is the name that has been given to them, and I think it is quite a good one.

DR. POLLARD - My answer to this kind of statement is that at the moment all the laws of nature that we know, from sciences that are

at a reasonably mature stage, are statistical from top to bottom. If you want to assume that science is going to develop later so that the laws will not be statistical, it would be pretty shaky to try to build a whole system and outlook on an eventuality that you have no idea is going to take place. At the moment, this is the character of scientific law. Physics has been through two revolutions: special and general relativity, and then quantum mechanics; surely it is likely to go through another. The hope of people that make this comment is that there is another revolution around the corner that is going to return everything to the old simple, straightforward, mechanistic way. Neither of the two preceding revolutions have been of that character. Science gets weirder; the next revolution that comes along is going to add more problems on top of what we already have and not simplify or eliminate those that have come along. This is my feeling.

LT COLONEL ALLEN - If one's religion forces him to the conclusion that science is essentially indeterminate, then that would be upsetting to the scientist, I think. Similarly, turning the thing around the other way, it would completely upset one's religious principles to find out that the statistical interpretations were not the only possible interpretation. This would seem to me to be a fairly unsatisfactory state of philosophy.

DR. POLLARD - I can conceive of other ways than the statistical character of scientific law. The one thing I would maintain is the truth of the biblical picture of Divine Providence. I feel I know that truth as much as I know physical law; therefore, I feel that it is one world. So I have to try to see how it is that the world I see as a scientist can be the same world that I see as one standing fully in the Judeo-Christian tradition of the west, in which the things that go on about me and this history of which I am a part are quite clearly and inevitably the results of God's actions. Well, the world as I see it now, as all scientists see it, is of a character which makes these two quite complementary views. Now if science changes, I do not think the reality of God's actions in the world is going to change, but the way in which we understand it may have to change. That is all I could say.

LT COLONEL ALLEN- Did you want to make a comment on the subject, Dr. Northrop?

DR. NORTHROP - I think it is a little exaggerated to say every law in physics today is statistical. I do not think you can state a statistical theory without stating certain rules that are nonstatistical. Without a definition of the possibles you can not state a probability. Concretely, in die theory, if the dice do not keep their sides, you can not state a probability about what is going to come up in the throws. That is, every statistical theory involves lawful rules that are nonstatistical.

DR. POLLARD - I should qualify what I said about every law. I mean those laws that determine the sequence of events of phenomena in time, of systems, physical, chemical, and biological. There are many laws which do not determine, Lorentzian variance for instance, and which have to do with the structure or the existence of various particles, maybe their masses or charges. There is a great variety of scientific information and principles and laws that have nothing to do directly with predicting how things are going to come out in given situations in time. Now the laws that are involved in history, in the sequence of events in time, I believe, are all statistical in character.

LT COLONEL ALLEN - Since these discussions deal with very complex, many-particle systems, it is very difficult, except in a hypothetical sense, to really debate the point. I guess the next question is even more difficult. Does anyone care to comment on the possibility, in principle, of simulating the human mind in all its aspects?

DR. POLLARD - I do not know if I can comment in principle but that question reminds me of an absolutely wonderful cartoon in the New Yorker about 4 or 5 years ago. Pictured was this vast computer. It extended from floor to ceiling, and it was obviously on a night shift. There were a couple of technicians tending this monster all night, and it had suddenly put out an output tape. One technician had run around and picked this up and was studying it, and the other one asked him, "What does it say?" His answer was, "It says, 'Cogito ergo sum.'"

QUESTION - I have a question along this line. That is, we can relegate to a person who has a soul the ability to think and reason. Now in present computer technology, estimates by learned people in the field prophesy, by using sequential machine theory, that in the next couple of decades they will be able to build machines which will be able to not only turn themselves on and off, but to think, to reason, to have an emotion, and will duplicate in many aspects what we relegate to the human brain today. How does this idea affect the concept of a person having a soul? Or can only a rational being have an immortal soul?

DR. EYRING - Maybe such a fancy machine will be given a soul.

FATHER ROTH - The problem here is what do you mean by thinking, reasoning, etc? This to me is a fundamental question. If one approaches the question from a merely empirical position where one denies that there is not a human individual, i.e., anything beyond the senses or anything beyond the imagination, then man is an animal. I am using the term in a derogatory sense but I do not want to limit it to that. I think it depends on how you define a human, and how

you define reason, and how you define the intellect, and how you define willing. Somebody said, and I am talking outside my own field, that all a computer does is show the genius of the man who programs it. If that statement meant man can reason, that he has an intellect and a will in the spiritual sense, then I would deny the conclusion. This would carry me into an analysis and discussion of what the spiritual being is and how I arrive at it. That has been a fundamental problem since the rise of British empiricism. Locke, for example, talks about ideas and intellect and he means something entirely different from the whole medieval tradition.

LT COLONEL ALLEN - Dr. Scoville, did you want to comment?

DR. SCOVILLE - I would like to ask a similar question. We have stayed away from biology almost entirely in this meeting, and that seems peculiar in view of the rather close relationship between biology and religion. But I was just wondering what you people thought about the possibilities, or what would be the religious implications of some of the developments in molecular biology that we can see in the next 10, 20 or 30 years? Here is a major, new, exciting scientific field which offers potentialities, perhaps not in creating life, but certainly in some way or other of modifying life. This seems to me to have tremendous implications in a religious sense. Do you feel the same way about that as you do about computers?

FATHER ROTH - Yes, I have no difficulty with the idea of life being created in the laboratory for the simple reason that if one denies that there is in life anything beyond the biological, physical, and chemical mechanisms, the problem is quite simple. You merely set up the conditions in another framework. If from a theistic point of view, and certainly on the human level at least, I hold that there is something beyond the physical/chemical laws, then I would simply say that the scientist is simulating, or you might say producing whatever causality is required. And just as two human beings cooperate in an important and essential way in the producing of human life, one holds for a spiritual soul and a God. I was going to say God intervenes here in a very miraculous way, but that would be using Dr. Pollard's ideas. Once the conditions are set, I see no difficulty in any of the problems. I do not know if this answers the question, but I see no difficulty of life being created in a laboratory.

LT COLONEL ALLEN - Dr. Pollard, it seems to me a lot of this discussion, at least in my mind, brings me back to the interesting discussion in your little book Physicist and the Christian, in which you discussed the concept of community. I gathered from your discussion in there, and as Dr. Trueblood was discussing last

night, that a person can not be a Christian by himself or can not be a religious person by himself. This may be part of the answer to the simulation question of the spiritual aspects of a human brain. It is possible that part of the answer is that you do not have the spirit until you have the interaction of a large number of brains?

DR. POLLARD - In other words this machine thinking away would be a very lonely machine. Yes, it would, unless you built a lot of others that it could somehow be interactive with and enter into a community-- and maybe get married.

DR. TRUEBLOOD - Mr. Chairman, I wonder if we could hear from Dr. Troutman.

LT COLONEL ALLEN - All right.

LT TROUTMAN - I would like to redirect the question from the floor to Dr. Northrop, because it seems to me that people who are thinking about machine simulation are thinking naive realistically. As you were saying at lunch time, about behaviorist psychology, these people think naively, in a naive-realistic scheme rather than a logical realistic one. Would you care to comment on what he had to say?

DR. NORTHROP - I think these machines are logical realistic constructs, with a logic built into them. It seems to me they think better than humans do, if thinking is defined as a formal calculation. If this is a definition of rational thinking, then they are more accurate than humans. They do that kind of personality expression better than the humans do. They at least do it faster. It is true that you have to build a logic into the machine, but you can program a logic and I think von Neumann has proven that machines can throw off images of themselves. Norbert Weiner in his Terry Lectures at Yale used this as a meaningful articulation of God creating the world in his own image. This could be, in a way, literally true--that He, out of His logos, could throw off a determined logos, an entity that could embody that logos and reproduce itself. Thus, he said, in this sense the Judaic Old-Testament theory that God creates the world in His own image is a logically realistic, intellectual construct. For He is then just throwing off a term. Von Neumann has given a proof that this is possible. Then the talent of God's creation of the world is scientific and it is a logically realistic theory.

QUESTION - This is a rather delayed question. Starting with Father Albertson, I felt that you each believed in a revealed religion, to some degree or other, and that you each believed this was a revelation of truth. However, since you each represent a different religion, I am led to one of three conclusions: One, either there are many truths, or two, you have not yet found any truths, or three, you each have a piece of the truth. What would you say the conclusion is?

FATHER ALBERTSON - I suppose the most charitable interpretation is that we all have a piece of the truth. Part of our effort is discovering what it is that is common to us, in which areas we agree, in which areas we disagree. And as a matter of practical fact, we usually find there are many more areas of agreement than disagreement.

LT COLONEL ALLEN - Anyone else now?

QUESTION - Do you not think that religion is necessary for an individual's growth? It will take us many, many years, maybe decades, to develop to the highest point, and everybody needs a religion to help him grow. Also, as far as salvation goes, I am a believer that everyone will be saved eventually. I mean he will raise his consciousness to the Christ consciousness because Jesus said, "Ye are gods."

FATHER ROTH - Let me inject a little pessimistic note here. I tend to be pessimistic by nature; I do not agree with everything that has been said. It is true that all of us are struggling toward the truth. Not one of us is convinced that we have all of the truth. On the other hand, whenever an ecumenical discussion begins or is carried on for awhile the inevitable question will always be asked: How can a Catholic be an ecumenicist since he is committed not only to certain principles, as every religion is, but also to the principle that he believes he is right and others, though in good faith, still do not have the truth? I merely state that. I do not raise it as a question of contention by any means, but I talk about it as a pessimist and I think it should be stated. On the other hand, there is something relevant in the article that I wrote on Charles Sanders Pierce, who was an American philosopher and who is only becoming of note. He was not a Catholic. In fact, he only loosely belonged to a religion. He pleaded for the men of all faiths to put aside, as he called it, their bullying insistence of emphasizing differences. He said the great law of Christian religion and any religion was the law of love, and he hoped in time that the communities would gather together. And perhaps this will work out in terms of evolution, and there will someday be one world community. He said we should look for a catholic church. He uses the word catholic in small letters, so I did not jump on this. That is, catholic in the original sense of the word, catholic meaning, universal, all men. What that religion will be we will not know until the end of the evolutionary process. I suppose all of us would like to think it was going to be the particular religion to which he has subscribed, but I think there is something in that idea of the growth finally of the one catholic church, that is, the unity of all men; because many see that difference of religion, while healthy, also injects a device of notion. This Pierce also

lamented. He said that all of us who are united in one act of charity towards God are divided where our adherence to a belief depends upon our metaphysics.

DR. TRUEBLOOD - I would like to call your attention to a book by Charles Sanders Pierce that would be very helpful to many of you in this field. It is called Values in a World of Chance, published by the Stanford University Press. I think that his notion of the growth toward a more universal faith, in which each of us would learn more, is a very wonderful idea. Now I would not agree with what has just been said that each of us thinks that this universal faith is our own; I do not think it is mine. I do not know how big the whole church is. All I know is that it is bigger than mine. I know that we are so far from perfection that we need all the help we can get.

QUESTION - Would anyone care to comment on the possibility of arriving at Truth with a Capital T without organized religion?

LT COLONEL ALLEN - Dr. Eyring.

DR. EYRING - It is probably possible, but it is like learning scientific things without universities. It seems to me they fulfill a function. Without the organized teaching of religion you would surely lose many of the things that we get with them. Why should we not disband all of the universities and schools in the world? Surely you can reconstruct the loss. But it would be a lot harder. It seems to me that it is a device for people to work together and to pass on knowledge. Paul said, concerning the law, that it was the schoolmaster who would bring men to Christ. He did not say that of the Church. It seems to me the churches' purpose, and it is a real purpose, is much the same as the schools'. And I believe it is divinely required because of the nature of man. Christ does need that kind of help. The Church, the best one, all of them that teach truth, serve in that purpose. I think churches do harm, but they certainly do much more good.

LT COLONEL ALLEN - This is taking us back to your concept of the community, Dr. Pollard.

DR. POLLARD - It is just like asking, could you get scientific truth without organized science, without the organized scientific effort of many people devoted to cross-checking each other and so forth? Well maybe you could, maybe a man on a desert island all by himself could discover all the laws of physics, but I do not think so.

QUESTION - I have heard it stated several times that the infinite and finite have a relationship and that the eternal and the temporal also have a relationship. Could anybody give a simple relationship between an infinite and a finite thing or an eternal and a temporal thing? I believe that Father Roth made the statement that God should be brought into time, and it seems to me how you bring God into time is very important. Would anybody like to make a statement about this relationship? I did hear a Catholic priest make what I thought was a simple statement but I would rather hear from some of you.

FATHER ROTH - I believe this is in reference to what I referred to this morning. I am thinking of the early history of the Christian church where there was the influence of Platonic philosophy. In this philosophy there was a sharp contrast made between God and the world, matter and spirit, that is, dualities; therefore, there was depreciation of the material and the temporal, and the insistence was upon looking towards God and turning our backs upon the world. This early Christian church used the words "despise the world." Actually this is a bad translation. I believe it is a translation from the Latin word despicere, which does not necessarily mean despise in our sense; it means to play down, belittle, to look down upon, because we are destined for future life. But I think we have gone through a reorientation on this whole idea and it is coming from the context of the human person. How does the human person grow? How does the human person develop, even naturally? Does he cut himself off from matter, does he cut himself off from science, does he cut himself off from the world in all its aspects, or, does he grow by some sort of interaction with the world? I have derived a good deal of insight on these questions from the study of American naturalism. There is the idea that a person who cuts himself off from the world of people and the world of matter becomes an isolated individual and at that moment prevents his growth. Now I would say the same thing is true on the religious level. While I admit duality, while I admit there is a soul, a spiritual entity, I also admit there is a Good in the future life. I feel that one can only become more fully human and also more fully Christian to the degree in which he interacts with matter, immerses himself in matter, the world of science, the world of literature, the world of political and public institutions. In fact I would feel this is the only way that growth of the human personality can be continued. I do not know if that answers the question.

QUESTION - I would like to share this comment by a Catholic priest. He pointed out that the relationship between eternal and temporal things could be represented by the relationship between our weights and measures and the value of a unit. The value of a pound, for instance, must be eternal in order to make the weights and measures system

operate; because, if it is not eternal and we change it every day when we take it into the temporal world, pretty soon we have no coherence, no ability to reason with the weights and measures system. He also pointed out that the eternal is a thing that stands outside of time, like the rules of a game which are eternal because they are the same at every moment of time. They are the same from game to game. So that if you bring God into the world and put Him in time, that is a bad thing; but if you relate a finite thing to an infinite thing then the finite thing takes on value. God gives value to our finite lives as an infinite thing.

LT COLONEL ALLEN - Would anybody care to comment?

DR. TRUEBLOOD - Could I say a word about that? I think he is asking something very fundamental, and this is the whole point of the relationship between God and the world. God does not change but we do. We change in our perception of Him, we change in our comprehension of Him; but He Himself is without shadow of turning. All realities that we know are a mixture of the timely and the beyond time. We state this by the great words transcendence and eminence, and you have to have both. This is the paradox, by transcendence we mean that God was before the world, He will be when the world is gone, He is not dependent upon us, but, we are dependent upon Him. If this is not true, then we have simply created Him and He will die when we do. This is the trouble with mere naturalism. It just does not have enough strength to it. And by eminence we mean that God is always working in time, in this mixed up world in which we are right now. And the great paradox is that we have to hold the two together. We do not mean by God a set of rules. No, we mean the One who made the rules. That is a very different story. The rules have been made; we in our ignorance slowly discovered them. It is not our invention.

DR. POLLARD - And He is not changing the rules as we go along.

QUESTION - Well it seems to be quite fashionable in some scientific circles to deny the existence of the supernatural, and I would like to direct this to the panel as a whole, that is, the discussion of the existence of the supernatural, from a scientific, philosophical and lastly a religious point of view.

LT COLONEL ALLEN - We have had some discussion and some variance in views. Dr. Pollard, you discussed this yesterday.

DR. POLLARD - I have come to feel that this is a most important element, that is, the incapacity of modern man to respond to any reality transcendent to space and time and matter. I think you see it in a lot of writing, in much of Tillich and Bultmann and

in this little book by the Bishop of Worcester, Dr. Robinson, Honest to God. The thoughts behind this writing are that there is not any "out-there," there is not anything transcendent to what we see, to space and time and matter, and this is a terrible sickness; it is a kind of imprisonment because I do not think anything has happened to supernatural reality. I believe that we enter upon this existence as three-dimensional beings, and that this is the area of nature. Science, by definition, is the study of nature. The passion for the scientific enterprise has more and more concentrated all of our interests on natural objects and phenomena, things and events in three-dimensional space and time. Yet the totality of man's experience, up until this century, has always seen the natural with supernatural dimensions, where the visible and seen world simply floats in many higher dimensions. I have found, especially with young people, a liberating experience with this little book of the last century; it is a sort of parallel to Alice in Wonderland. It is by another English mathematician, Edwin Abbot. Flatland is the story about a two-dimensional universe which is visited by a three-dimensional being. It is fascinating. There you can picture a two-dimensional universe floating immersed everywhere in a higher reality. Nothing has happened to the supernatural as I see it. There are realities inaccessible, beyond, transcendent, perpendicular to, if you wish, three-dimensional space and time. Twentieth century man has almost completely lost the capacity to respond, in any meaningful way, to that aspect of external reality. This is the key sickness in much modern thought and this is modern man's trouble. Many books and thoughts are an attempt to understand the Christian faith within a purely natural context. It just can not be done.

LT COLONEL ALLEN - Does anyone else care to comment on that question?

DR. TRUEBLOOD - I would like to say a little bit about that. I think that this denial of the supernatural which you put your finger on is one of the worst evidences of lack of humility. If you think there is bigotry in religion look at the bigotry in science. Look at the people who will say in a cocky way that nothing is true unless it can be shown in a test tube. How do they know that? They do not know that. This is going very much beyond the evidence and is just sheer dogmatism. How can anybody know there is no supernatural order? We have a great deal of evidence for a supernatural order, and I am perfectly sure that the kind of religion which tries in cowardice to get rid of this, hoping thereby to be acceptable to modern man, will simply defeat itself.

LT COLONEL ALLEN - We have another question.

QUESTION - This question is directed to everybody. Aside from Hilbert's spaces and Maxwell's demons, so forth and so on, I am assuming that there is a supernatural. I wonder why the religions do not have teeth in them? By this I mean, if you read a little bit about clairvoyance and ritual-cultist and not the kind you read about in the street, but real highbrow stuff (and by stuff I mean lots of books, maybe 500), they emphasize that you should not meddle with the supernatural unless you mean it. They go so far to say do not drink, do not eat anything that moves. You see that in Gandhi and so forth. Why do they have teeth in them? Now I am not a clairvoyant, I am a scientist, so I am able to ask the question. Why is it that our religions do not have this? The Catholic representative said God is love and he will let you meddle with it. I do not know what the Protestant will claim, I do not know what the Confucian will claim, I do not know what the Buddhist will claim.

With great humility I ask this, I hope I did not throw a bomb here. Why is it that they do not have teeth, and emphasize it, so that a Negro will not be thrown out of a church. If a poor half-breed sees the Japanese going to school he asks why is it he goes to school? He does not look any better than I do, he has crooked teeth, he does not look physically better than I do, and still he goes to school. Religion in modern America will let that go on--no teeth in it; nevertheless, the clairvoyant, even in the lowest places of his territory, says do not meddle with it; it is dangerous. Will you please answer that question?

LT COLONEL ALLEN - That is going to be a little hard. Dr. Pollard, you commented on part of this with regard to some of your experiences with the churches in the south. I think maybe that is one part of the answer.

DR. POLLARD - I am still not quite sure I understood the question. At first what I thought you were saying had to do with taboos. It seems to me the biblical doctrine of dominion is that man has been in dominion over all God's creatures and there are no limits to the dominion. In exercising it he can always exercise it for a blessing or for a curse, and that has always been the way. But he can not escape that fact by setting off any particular area of the order that he has dominion over and saying, no, that is untouchable.

But then you went on to what seemed to me a criticism of the church for not educating certain types of people. Undoubtedly the church has been the institution out of which the whole of the educational systems come. Also, undoubtedly, in places and in situations, it has had little influence. But the church has always had a way of renewing itself. It certainly is wrong to deny

opportunities to people. The church and her basic theology would always say this. If in practice it is not achieved in particular social situations, that is the sin of those to whom the church has been entrusted. You can not put it any other way. But it would be misleading in the whole history of the role of the church, both in east and west, not to recognize the tremendous emphasis given by it to the educational process.

QUESTION - You put it very well, Dr. Pollard, in your very first phrases. I would like to make a couple of comments and then possibly make a suggestion that we take a different approach. Most of our talk so far has been on a rather high intellectual plane, very little of it I feel is applicable to man's everyday life. For instance, the peace problem facing us today. We have continued to have more and bigger wars. Still, other problems with us today are the population pressure, water pollution, the civil rights problems, etc. All of the discussion that we have had in the last couple of days has very little applicability to these problems, and we could probably solve them just as well, just as quickly, and maybe even more so, if we were to disregard this religious, or highfaluting philosophy. All of you at one time or another said that you knew of an atheist, and you thought that he was a good individual. From this, I deduce that regardless of whether you are a believer or not you can be a good individual. Many people I know are better because they have been able to throw off the religious doctrine that they were raised in. I would like to pose a question to the panel: How would they say that the world would be any different or any worse if we were to ignore religion and work for betterment of mankind within our social institutions, such as our universities and our governments?

LT COLONEL ALLEN - Father Roth.

FATHER ROTH - I do not think any of us here could answer that question. We can only project and speculate. I would agree that there are many excellent nonreligious men who perhaps do better things than so-called religious men. I do not think any of the statements that have been made are deniable; however, on the other hand, I wonder how long the human race, if stripped of all religion, stripped of all ideas of God, or of moral right and wrong, would be able to overcome the imminent and dominant problem of selfishness in the human individual. I think it can be said without exaggeration, at least in the western world, that the whole idea of charity was introduced by religious men; whether it has been observed is another question. Religious men do fall away from their own principles, but while there are many good men who would carry on these works of kindness, of alleviating the human estate, of overcoming poverty, without religion, the impetus, the motivation, would slowly but

surely die out, and I think we would end up with a very selfish world. True, we have made little of the world. Somebody made the statement yesterday that the world is bad enough as it is. I am afraid of what it would be like if we removed all religion, all moral restraints.

DR. POLLARD - This experiment is going on. For instance, you can go to Russia or Red China and see a society, see how it is developing without any sense of a transcendent reference, of any sense of moral controls on individual action. Let me add an interesting touch on Russia. They just announced the other day, in Pravda, about what they are going to do concerning the problem of alcoholism. They have a solution for alcoholics. All of them are to be banished to Siberia. When you get an alcoholic, that is the way you treat him, and society can keep clear of alcoholics this way. That is a perfectly possible approach.

LT COLONEL ALLEN - I am anxious to ask Dr. Scoville, since he has dealt with the Russians and has thought about their reactions, whether he has any comments on this aspect of dealing with them, that is, as an antireligious nation. Do you feel this has any bearing on the situation?

DR. SCOVILLE - First, I want to say for quite a few years I was not allowed to deal with the Russians. Let me comment on one point which you made, that is, it is not clear to me that you have to have a religion in order to have moral values and moral principles. I do not think you really intended to say that. Some people can profit more or can establish these moral principles and work by them, if they have a religion to start with. There are lots of people, as you say, who are fine individuals and who are doing a fine job for the world, but who are atheists and have no religious beliefs at all. It takes all kinds of systems to move forward in this world, and I do not think you have to say that the world necessarily would be bad if you had no religion. But on the other hand, I think there are lots of people in the world who need it, and therefore you have to have it.

DR. TRUEBLOOD - Can I say a word in addition to that? Obviously there are good people who have no faith in the living God. But if you will be historical you will realize that these people are inheriting something which they themselves did not produce. What we are in great danger of, to follow your comment, is a cut-flower civilization. These are glorious conceptions: equality before the law, due process of law, the infinite worth of the individual, and we often assume that we can keep these lovely flowers going when they are separated from their roots. Their real historical roots are more in the Bible than anywhere else in the world. And the notion that you can have a cut-flower civilization, still blooming

when you have severed them from their roots is simply not realistic. Let me give you an example. Compare the church to the ark. Did you ever think how bad the smell must have been after 40 days with all those animals? The church is like the ark; you could not stand the smell inside if it was not for the storm outside.

DR. SCOVILLE - I ducked the question a little bit on Russia, but I would just like to say one thing. I do not think that one should categorize all the Russians as immoral people. The Russians probably have just as many variations between morality and immorality as there are in religious countries. All Russians are not untrustworthy. This idea easily translates itself into the thought that you can not possibly have an agreement with the Russians because they will never abide by it. This certainly has not been true historically, and in many cases they have abided by agreements very well. Also, we have not always abided by the agreements we have signed. In the business of creating or trying to develop an atmosphere for peace (getting into the arms control area), I think that no country is going to abide by any agreement which is not in their own national interest--I mean in their overall national interest. They may be willing to abide by an agreement which gives them some temporary disadvantages if they see the overall value in maintaining this agreement. This is the kind of principle that we have to work on when dealing with the Russians. We do not necessarily trust them, but we recognize on the other hand that when the advantages are mutual, the agreement will be upheld. This is the job of the agency for which I work; we try to find areas in which there exists a mutual self interest. If we can find such areas, we feel that there is a greater opportunity to maintain peace.

LT COLONEL ALLEN - Dr. Northrop, would you like to comment on the question?

DR. NORTHROP - Yes, I would like to comment on that because I think it is connected with another word that now has become a dirty word. Apparently there are two dirty words in this conference, anthropomorphic and abstract. I think it was an English humanist who said, "There is nothing so low but that men would stoop to it to avoid the hard labor of thinking." We are living in a practical world that is guided by the most abstract theory. Without Einstein's special theory of relativity, which is abstract as the devil, you would not get the mass-energy equation and it might never have entered into people's heads that you could transfer matter into energy with this high quantitative leverage, the velocity of light. That is, we are living in a theoretically guided, practical world. Well, it is always a great temptation to say, let us get away from being careful about using words and getting them technically defined, and let us drop all this abstract business and be practical.

If you feel this way, you better get out of the military because all your gadgets have come out of a logically constructed cybernetic mechanics. If you do not know logic you can not build one of the machines.

Every economic institution in the world today is a legal construct. And it is one of the most abstract events. We are living in an abstract world, and when you try to solve your practical problems you find they are tied around abstract theories. I would like to come back to the statement by General White about the communists. When making military decisions you get involved in political decisions, and political decisions involve two things: understanding the mentality and theories guiding the possible enemy and, most of all, understanding the ideology of your own American legal and political systems. Now if you get enamored by being practical you are likely to overlook the relevance of Marxist philosophy in the behavior of a communist. And if you do this you are going to go wrong in your interpretation of how they behave. Now similarly, if you make military decisions without taking the philosophy of American culture into account I think you are making unrealistic military and political decisions. You have a problem here of conflicting secular philosophy. You must go into these factors, and every blasted one of them is abstract. To be practical today is to be excessively abstract and theoretical, both in our instruments of our technology, our industry, our military, and in our institutions. To suppose that religion is a simple-minded subject that does not involve as much abstract theory as does military planning or economics or physics, is to live in a religious fairyland.

LT COLONEL ALLEN - Thank you. There was a point that came up several times in questions submitted which I have not really brought up. Perhaps there will be some comment. The question has been phrased in different ways but it generally deals with the separation of church and state. I do not know a way to phrase the question in a meaningful way, but perhaps some member of the panel would provide a fairly concise statement about feelings concerning the separation of church and state and how it relates to the kinds of things we have been discussing.

DR. TRUEBLOOD - This is obviously a complex subject. Anybody who thinks that the simple answers are the right answers just has not thought the thing through. We clearly do not want any one church to dominate our nation. This is what we all stand for; we do not want an established church or anything of the kind. By the same token, it would be a horrible mistake if we had an established secularism, and this is the real danger of our times. I am glad that we have chaplains in the Armed Forces,

including the men that we see in front of us right here, and I am very glad that we can have a situation in which it is possible to have a prayer service in the national Capitol. I am very close to Mr. Hoover. He was 90 on Monday. And when he dies (which will not be long because of his cancer) we will take his body to the Capitol, and we will have a service of worship in the rotunda. There are many countries in which that could not be possible. I thank God that it is still possible here. I believe that anybody who does not understand the degree to which the Judaic-Christian conceptions underlay our whole system, including the Declaration of Independence, just has not thought about the matter seriously at all. The notion that they can all be ruled out is a false idea. We see right here the most vivid example of a successful audience. The whole effort of this conference, which is highly helpful religiously, comes from men who are employed by our Government. And I thank God that they are free to do it

LT COLONEL ALLEN - I believe it is about time to terminate. I would like to ask if there are any final topics. I had intended to give a 30 minute summary of all of the key subjects that we have discussed over the last two days, but I will forego that. It would be very difficult to summarize what has transpired. I had even considered going around the panel and asking that everyone give his own impressions of the key topics that we discussed, but I feel that it is not a particularly useful thing to do. All of us have gained different concepts, different ideas about the things that have been discussed over the last two days. It is very hard for me to imagine that the various ideas that have been explored here have not caused anyone of us to be substantially broadened in our outlooks, and if that is so, if it taught us a more intelligent way to search for equanimity of spirit, which we started out by saying that very few in the scientific world were fortunate enough to have, then certainly this meeting has been successful. In opening, Father Albertson said that this was only the beginning, and if that is so we are now at the end of the beginning and no farther. Personally, I thank all of you once again for my being allowed to participate with you. I trust that it has been useful. I wish to extend my personal thanks to all of the members of the panel. General White did you wish to say something?

GENERAL WHITE - Just a word. On behalf of all of us at Kirtland, both those in uniform and civilians, I certainly want to extend our appreciation for having given us your time and stimulated our thoughts as you have done here today. You have reminded me of a story--it will take just 30 seconds--about a doctor, a lawyer, and a scientist who were discussing which of their professions might be the oldest. They were at a bar, and after

a couple of drinks the doctor waded in by saying, "Well, I think the medical profession is the oldest, for if you go back into the Scriptures you will find that a rib was removed from Adam, and Eve was created, and it must be obvious that there was some kind of medical profession around." They had another drink and then the lawyer said, "Let's go back even further in the Scriptures and you'll find that Order was created out of Chaos, and for that to have happened there must have been a legal mind of some kind around, making laws, rules and regulations." So, after another round they both turned to the scientist. His comment was, "Who the devil do you think created the chaos!"

LT COLONEL ALLEN - And on that chaotic note we stand adjourned.