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"The fear of the Lord is the beginning of Widsom." Psalm 111:10

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JOURNAL OF THE AMERICAN SCIENTIFIC AFFILIATION

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DETERMINISM, DEGREES OF FREEDOM, AND THE CHRISTIAN

(A HEURISTIC APPROACH)

JAMES R. DOLBY*

The knowledgeable Christian world must come to understand and deal with theoretical and metaphysical determinism. Because this theory has permeated our conceptual styles it is difficult to think in terms of alternatives. It is this author's belief that the hypothesis of determinism should be labeled for what it is—just an hypothesis. Some suggested alternatives, which may facilitate further discussion and inquiry into the topic, are presented.

One of the most pressing problems confronting the Christian today, on a theoretical level, is the question of determinism in its various forms. Determinism is an underlying assumption in the natural and behavioral sciences and influences, explicitly or implicitly, our world-life view. As a Christian clinical psychologist, it presents a difficult theoretical problem, and it also influences in a practical way my professional contacts with those who are in need of help. To the college student, it often appears an insurmountable world-life view as it necessarily must influence the very core assumptions we make about ourselves and the world around us. Paul Meehl, in his excellent discussion of the problem, states: "Scientific naturalism (philosophically underpinned by logical empiricism), often in an unquestioned and even unstated form, is today the strongest intellectual enemy of the church and among educated people gives the most powerful no to the church's proclamation."[1] Continuing his discussion on this topic, he goes on to say: "Determinism and its (seeming) implications constitute for the psychologist both a scientific stumbling block in respect to miracles, conversion, and the action of God in history, and a moral stumbling block in regard to responsibility, choice, 'freedom,' election, and related concepts."[2]

Determinism either social, psychological, or physical, implies that for any event there are antecedent causes. One can explain the movement of billiard balls on a table in terms of the energy used to set off the chain of events. In like manner the psychologist tries to explain human behavior in terms of lawful relationships between the past and present. Claustrophobia, a fear of small enclosed places, may be related to a psychic trauma in youth, e.g., being locked in a closet by accident. Most psychologists and individuals in the

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1. *What, Then, Is Man?* A Symposium of Theology, Psychology, and Psychiatry. Concordia Publishing House, St. Louis, Missouri. 1958, p. 173.
2. Ibid, p. 174.

social sciences presuppose that past experiences influence and often dictate what behavior will transpire in the future. The only reason that one cannot predict human behavior with 100 per cent accuracy, the social scientist often states, is because all the laws which govern human behavior have not been discovered. Also, at this stage in our understanding of man, even if the laws were known, there is no one knowledgeable enough to assemble the information into a conceptual package which matches man's complexity. This does not imply that the social scientists cannot predict human behavior, but the prognostications are usually framed in terms of probability statements.

The clinical psychologist, psychiatrist, social worker, and educator, often make predictions about human behavior in light of current and past knowledge of an individual. This is commonly accepted; but the assumption underlying such predictions is seldom challenged, i.e., psychological determinism. The clinical psychologist predicts what will happen to a patient if placed back into the environment which caused the abnormal reaction. The educator predicts academic success from academic records, teacher's evaluations, test findings, etc.

The poignant question which the Christian must ask is: "Is this true of religious experience also?" If it is, then one might assert that the experiences which one has had and has labeled as uniquely Christian might not be of supernatural origin but a by-product of the environmental influences at a particular moment. Therefore, many college students discuss their Christian experiences in terms of "being psyched out." Regretably to many, prayer, conversion, meditation, and worship become just another example of the overwhelming influence of the moment—an emotional chain reaction produced by the psychic machine. "Why include a supernatural element into the process?", they retort. While the lawful psychological influences in religious experiences cannot be casually dismissed, the spiritual dimension must not be eliminated *a priori* in favor of a fatalistic determinism.

The deterministic assumption, underlying all of science, is so ingrained into our culture that it is difficult for us to conceptualize differently. For instance, when we meditate on the problems of the inner city we think of the causes which precipitated them. We often hear of poverty, the lack of male models, lack of adequate education, or inadequate work opportunities as causes for the riots and despair which have torn and plagued our country. Is not this determinism in a practical context? It is stated that if these people in the inner city are to become productive citizens with personal dignity, their environment must change. Therefore, proposals for better schools, opportunities for employment, etc., are suggested. Change the causes and the behavior will also change is the underlying assumption.

Determinism is *only an assumption* and should be accepted as such. One would have to admit that it is a highly productive assumption as the history of the natural and behavioral sciences is reviewed, but it must be accepted that it is a hypothesis which is open for criticism and change if necessary, as is any theory. It is subject to review and change in light of further information. The problem which is often faced in intellectual circles is that this hypothesis becomes a metaphysical truism and many have built a world-life view around it and have defended it as tenaciously as a Christian would defend the deity of Christ. This, of course, makes the task of critical evaluation much more difficult; but one must appreciate the high regard with which many hold this hypothesis.

Sigmund Freud, one of the most ardent and complete determinists, is an example of one who holds determinism in such high regard. To Freud, anything which suggests freedom is only an illusion. A slip of the tongue, the act of forgetting, dreams, accidents, are all meaningful in light of past experience and can be understood when these past influences are brought into consciousness. Freud extended this deterministic principle to religious behavior in such books as *Totem and Taboo* and *The Future of an Illusion.*

In contrast, the existentialist position states as a hypothesis that freedom to choose against one's past is crucial in understanding the nature of man. It states that man makes choices, is free to make these choices against the past, and is in control of the choice-making process. He, therefore, is responsible for his behavior and is the master of his life. The awareness of this choice making and its counterpart, man's sense of responsibility, is one of the basic ingredients in man's humanness, the existentialists claim. To relegate man to the model of a deterministic machine is to make him an object and to dehumanize him. The person propounding the existential viewpoint takes the other horn of the dilemma and pushes determinism aside as incorrect and perhaps irrelevant. The conflict which exists between the two positions has lasted for many centuries and will probably continue for many more. Almost all psychologists pragmatically or theoretically perceive the existentialists' assumption to be incongruous with the facts which support the deterministic presupposition.

Psychologists assume that man functions lawfully and that their task is to discover these laws and apply them to practical situations. When these laws are discovered and methods of measurement have been developed to measure the variables, man's behavior can be predicted and, therefore, controlled. The industrial psychologist is an example of those presently involved in this predictive process. The task of minimizing the number of misfits for certain jobs has saved business concerns large sums of money. The educator, clinical psychologist, social worker, psychiatrist, and researchers in human and animal behavior support the hypothesis that man functions systematically and is, therefore, predictable. Even though success in prediction is not completely possible, it is the claim of the determinist that it is the fault of the measuring instruments or lack of knowledge of the variables; it is not a function of man's ability to live above or outside the context of lawfulness.

There are various forms of the deterministic hypothesis and every Christian should be aware of the alternatives. The following ones are not meant to be inclusive but are to help clarify what frequently is unclear or at least unstated.

The first, and most obvious position, is that of complete determinism. This basically states that man is a creature of law and always will function within this lawful framework. His environment and heredity determine his choice which his past dictates. This is true even though he has an awareness of "freedom" in the cognitive choice-making process. This assumes the mechanistic, scientific model about man and this assumption is frequently rejected by Christians. They claim that it reduces man to a machine and encourages fatalism. It is my belief that most of our social scientists accept this view and espouse it in the classroom as "truth." A deist could accept this position by stating that God made the world to function lawfully and remains detached from His handiwork. A theist who believes that God is actively involved in the affairs of man frequently finds this form of the hypothesis offensive because it allows no freedom for God's intervention and interaction with man and allows no room for human responsibility. A few Christians appear to live harmoniously with this hypothesis but they usually are Calvinistic in theology and rest heavily on God's sovereignty, providential care, and stress education as a method of bringing a person to salvation in Christ. They tend to stress the determinism which is present in Scripture. Such verses as "Bring up a child in the way he should go and he will not depart from it," or "Whatsoever a man sows that shall he reap" and others are used to stress both theistic and psychic determinism. Perhaps it is for this reason that psychology, psychiatry, and mental health facilities have been stressed by the groups heavily influenced by Calvin's theology.

The second form of the hypothesis is a pragmatic determinism held by many. This hypothesis states that it is helpful in research and theory but it may not be the whole picture. Because it has been functional in our investigation of man we will continue to assume it, but such persons will not be pressed into a complete deterministic position. They would state that man is too complex to finalize such a hypothesis and perhaps indeterminacy will be proven to exist. This is a wise, scientific attitude, but frequently it is held because the individuals espousing it have not taken the time and energy to think through the whole problem of the nature of man. The Christian can hold to this hypothesis and conduct productive, creative, research, but the difficulty which must be confronted is the pragmatic problems of dealing with the individual in the classroom or in the counseling chamber. Is man treated as a responsible choice-making person or as a victim of deterministic forces? Traditional psychoanalysis and much of the therapeutic world assumes the deterministic model. One can assume this form of the hypothesis for research purposes but it becomes a significant and pressing issue in the therapeutic encounter and must be faced in more depth.

A third form of the hypothesis is proposed by Paul Tournier in his book *The Person Reborn*. It is his contention that determinism and freedom are not opposites and they are both true at the same time. It is like looking at the proverbial elephant from two different vantage points. Man is obviously determined by his past but at the same time he has the awareness of freedom to choose. Tournier claims that there are just two different ways of looking at the same behavior. This is appealing because it appears that one can hold to both positions and not have conflict in choosing between them. Perhaps at this stage of our knowledge it is a healthy position for a Christian to take, but it could be just shoving a complex problem into the category of "unsolvable" and dropping the issue.

A fourth position is that man has freedom to choose against his past and man is also determined but the degree of determinism and freedom will vary from person to person. A person in the mental health professions could say that the healthy person has more potential freedom than the unhealthy and this varies on a continuum. The neurotic has more freedom than the psychotic and the mentally healthy person more freedom than both. To phrase it another way, the more a man is motivated by the unconscious the less freedom he has to choose against his past because he is less aware of the factors impinging on him at any choice point. This appears to be a view which represents reality to those working with the emotionally disturbed.

A fifth view, which could possibly be assigned to one of the other views, is the habit-freedom hypothesis. This view proposes that man is determined by his past experiences but could depart from this pattern if he so chooses. Most people, however, do not choose to change the habit patterns and conceptual style which their past pressed upon them. They become creatures of habit and choose not to challenge the deterministic factors which dictate their behavior. They are, therefore, quite predictable until they decide to reevaluate their past and possibly choose another course of action. This, say some, is a picture of most humanity—victims of their culture and environment, choosing to passively respond to its pressure without a struggle. This may be a pathetic picture of humanity, but it probably represents most of the human species.

Many Christians tend to identify with the existential position in regard to the problem of determinism and consider phychic determinism a threat to a historic, theistic view. I would like to suggest that determinism as an explanatory hypothesis is not incompatible with a Biblical view of man. In my opinion, any of the afore mentioned theoretical options within a deterministic framework could be maintained by a Christian depending in part upon the theological framework from within which he works. The most difficult position would be that of complete determinism, but it is possible to believe this if one is strongly convinced of theistic determinism which stresses God's sovereignty.

The deterministic-freedom problem in some respects sounds like the predestination-freedom problem which has plagued the church since its conception. From my vantage point, to disregard the deterministic position is to alienate oneself from the stream of intellectual investigation which has captured the minds of men and characterizes much of the research in the social sciences. The Christian must face the issue and consider the options within the theoretical framework. To suggest that determinism in the affairs of man is not a powerful factor is to ignore the mass of data the social scientist has amassed during the past five or six decades.

Evaluation by Leif Torjesen*

The difficulty with the discussion of freedom and determinism as Dr. Dolby has tried to suggest it, is it has no specifiable meaning in relation to the general model of scientific activity. The scientist is seeking within the realm of all possible existing relationships, one type of general relationship, the relationship of independent/dependent variation between or within physically specifiable field (A) and (B). He expresses these relationships in mathematical or statistical quantities in addition to purely logical symbols. He progresses in his search for such relationships through theory creation. Here there is no causation, no teleology, no value-meanings. Absolute meanings or essences give way to provisional operationally specified definitions. There are no incorrigible starting points and no final conclusions. Science is a continuing activity of experimental discovery, theory creation and falsification by further experiments. The possibility of falsification by experiment is the only meaning constant in scientific activity according to Karl Popper in his *Logic of Scientific Discovery*.

From the point of view of such scientific procedure neither 'freedom' nor 'determinism' are presupposed or rejected. They are irrelevant, adding no functional meaning to the work of the scientist. His conclusions represent neither 'freedom' nor 'determinism'. They represent the continual discovery of independent/dependent physical variation relationships, specified according to space-time co-ordinates and mathematical, statistical and logical symbols. The question of 'freedom' or 'determinism' is a question about the total causal process. But the scientist does not deal with the total causal process. He is interested in physical relationships of independent/dependent variation which reflect the total causal process, but hardly exhaust it.

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A Response to Mr. Torjesen:

As I understand Mr. Torjesen's objection it is that science cannot, or at least should not, make a metaphysical statement of causality, but should be content to hypothesize and judge the hypothesis in terms of some operationally defined experiment. As a scientist, I whole-heartedly support this viewpoint and must remind myself of it often.

There are three observations I would like to make, not in refutation, but as practical difficulties which seem to make this problem more complicated than it may appear in theory. First, even though determinism is a metaphysical assumption, it is also a useful functional hypothesis. It assumes that the universe is in some way lawful and that a cause and effect explanation seems to help in the descriptive process and it also adds an impetus for further research. The cause and effect model has encouraged men to ferret out experimentally the nature of the relationships which appear causal. To be sure, one cannot say that A caused B, but there is a reaffirmation that the universe is lawful and one is encouraged to press on.

The second observation is that the functional hypothesis has produced research which has enabled man to predict both the behavior of billiard balls, children's value systems, and the product of chemical mixtures. This ability to predict from past experimental data would appear to support the cause and effect model. Since there are no other alternative explanations of which I am aware which compete as legitimate options to the causal model, one is prone to make the jump from a functional hypothesis to a metaphysical statement. Incorrect or inappropriate though it may be, it is difficult not to make the jump.

Another problem which the scientist has is the one of changing roles. As a human being he lives with certain explicit or implicit metaphysical assumptions. I make the assumption that my interaction with my children influences their lives. When I reward them for certain deeds I expect that this rewarded behavior will tend to continue and when I punish for other deeds I expect that this behavior will tend not to occur. In other words, as a parent or a psychotherapist, I function as if determinism is a metaphysical reality. It is my contention that it is difficult, if not impossible, for at least the social scientist to change hats when entering into the laboratory or the program of social research. How does one neatly bifurcate the research role from the role of everyday living? I contend that it cannot be done neatly, if it can be done at all.

Response by Leif Torjesen:

The basic difficulty here remains the underlying confusion of consistency, lawfulness, predictability and interaction with 'causation.' We certainly all believe that consistency, lawfulness, predictability and interaction are fundamental reflections of causal process. But they are not themselves causation. They are functional criteria which allows us to separate causally related from causally unrelated processes—but they do not give us causation. To say that A and B vary consistently with each other is to say that there is some causal process (C) to which A and B are related in such a way that they vary consistently with each other. But it does not give us (C). The total causal process

(*continued on p. 47*)

MATHEMATICAL THINKING AND CHRISTIAN THEOLOGY

BY C. RALPH VERNO*

Many people have misconceptions about the nature of mathematics and mathematical thinking. Such thinking, called postulational reasoning, involves reasoning deductively from assumptions containing undefined terms. A sound Christian apologetic must make use of this type of thinking; we cannot logically prove the Christian faith true and we should not try. We acknowledge our presuppositions which we have by reason of God's work on our souls.

This thinking is also important for doctrinal discussion and exposition. We should state undefined terms and postulates, and precisely define other terms. Christian doctrines, even "mysterious" ones, do not involve contradiction but are rejected due to unscriptural assumptions.

To many people the thought of mathematics suggests some mysterious collection of devices and tricks used to calculate with numbers and to solve certain kinds of problems. Those who have such a view of mathematics fail to understand its nature. At its core mathematics involves a way of thinking. It is not until a person begins to understand and appreciate this way of thinking, which we call postulational thinking, that he can begin to see the structure, the system, the significance, indeed the beauty of mathematics. Only then can one begin to appreciate the marvellous creativity involved in pure mathematics. It is failure to appreciate the nature of mathematics and mathematical thinking which causes many people to react negatively to the ideas of contemporary mathematics. Too often uninformed people, not knowing what is involved in mathematical thinking, prejudicially reject so-called modern mathematics. Such people (and there are sadly too many), content with what they learned in school, not only fail to understand what mathematics is but often are not interested in finding out.

Postulational thinking is not only at the heart of mathematics; it can also be of great value in other areas of life and thought. We as individuals and members of society would be able to act more rationally and live together more congenially if we could and would apply the mathematical way of thinking to matters involving various human relations. Moreover, postulational thinking is vital to a sound Christian apologetic and to intelligent and rational theological discussion. It is the purpose of this paper to explain the nature of postulational reasoning and to indicate its significance for Christian apologetics and theological discussion involving matters of doctrine.

The first fundamental element of an abstract mathematical system is a set of undefined terms. Certain terms must necessarily be left undefined simply because we cannot define everything. Any good definition must use terms previously understood. If we have no undefined terms, then the terms in our definition must be previously defined using terms which are previously defined. Since we cannot continue this indefinitely, we will ultimately be guilty of circular definition, i.e. defining something in terms of itself. To define lines in terms of points and points in terms of lines is to say nothing about either. Evidently the dictionary in trying to define everything is attempting what is impossible. So we must have some undefined terms.

Secondly a mathematical system contains good definitions which, of course, make use of undefined terms (and ordinary connectives of our language). A good definition is far more than a partial description. The essentials of a good definition are as follows:

1. It names the term being defined and places it in a set or category to which it belongs.
2. It distinguishes this term from the other members of that set.
3. It is reversible, containing no unnecessary qualifications.
4. It uses no terms not previously defined or accepted.

Thus "A square is a geometric figure having four sides" is not a good definition. Nor is "God is love" notwithstanding what some preachers may say. (Is "God" a term which we as Christians can adequately define, or is it a term which we should technically leave undefined and then only give partial descriptions given in Scripture?) We should note that definitions are not essential in a mathematical system but are used for the sake of efficiency and conciseness. For every time we wanted to refer to a circle we could instead refer to the set of all points in a plane, and only those points, which are equidistant from a given point; this is in effect to repeat a definition of circle. When mathematicians introduce a term that is not left undefined,

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they clearly and precisely define it so that there is no reason for doubt as to what they mean.

Another essential of a mathematical system is a set of axioms or postulates. We use these terms synonymously to mean assumptions or presuppositions; they are statements or propositions which we accept without proof, which we assume. Now these are absolutely essential. Everyone has axioms in every subject for thought even though he may not be aware of nor openly acknowledge the assumptions. When we endeavor to logically prove some conclusion to someone, we do so by citing previously agreed upon statements as the reasons for the necessary conclusion. If these reasons were in turn previously proven, then they were based on other statements which implied them. Again we cannot continue indefinitely and prove everything. We must have certain statements we assume without proof or we will surely be guilty of circular reasoning; and when we engage in the all-too-common practice of circular reasoning we are in effect saying that something is so because it is so. An example of a mathematical axiom would be what we call the commutative property of addition of counting numbers (called natural numbers), namely, that when we add two such numbers the order of the terms does not matter.

From this set of axioms (which contain undefined terms) we then draw necessary conclusions using deductive logic, i.e. we prove theorems. In proving theorems we may use previously proven theorems, but since these previously proven theorems are derived from our set of axioms it should be clear that every theorem in our system ultimately rests upon the set of postulates. Deductive logic is the means by which we prove theorems. In deductive logic the conclusion is inescapable, i.e., it would be impossible for the hypotheses to be true and the conclusion false. Deductive reasoning is "If . . ., then . . ." kind of reasoning. We must very clearly distinguish this from what is called inductive reasoning. When using inductive reasoning one comes to a conclusion about things not yet observed on the basis of a common characteristic already observed in many cases. Inductive reasoning is indeed important in providing conjectures or hypotheses in science or mathematics, but it is not proof. The conclusion in inductive reasoning is never more than probable at best. Although it is sometimes called inductive logic, it seems preferable not to call it logic; by logic we refer to deductive reasoning, or what is also called necessary inference.

Postulational thinking, then, is simply reasoning deductively from a set of axioms which use undefined terms, drawing necessary conclusions from postulates. If the axioms are accepted, then the conclusions which are deduced must be accepted. Postulational thinking is drawing valid conclusions from assumptions; a valid conclusion is one that necessarily follows. We must be careful to distinguish between validity which is a property of an argument (although we may refer to the conclusion of a valid argument as a valid conclusion) and truth which is the property of a proposition. For example, if we accept the hypotheses "All Pennsylvanians are Californians" and "All Californians are Russians", then we must necessarily conclude that all Pennsylvanians are Russians. This conclusion is not as a matter of fact true, but it is a necessary conclusion of a valid argument. Proof always requires hypotheses whose acceptance forces the acceptance of the conclusion. When we realize the tremendous role of this reasoning in mathematics, it is not presumptuous to say that postulational thinking is mathematical thinking.

Now how is this mathematical way of thinking, this postulational reasoning, related to Christian apologetics? The answer of many theologians would be that it is not. Failing to understand postulational thinking or its relation to the Christian faith, they endeavor to do what cannot be done, namely, to logically prove to the unbeliever that the Christian faith is true. They try to present a presumably logical argument to prove that the Bible is the Word of God or that the Christian view of God and the universe is the true one. The reason why this cannot be done is simple enough. In order to logically prove to the unbeliever that the Christian faith is true, the Christian must agree with the unbeliever upon the propositions which are the hypotheses requiring the conclusion. Nobody can be forced to accept the conclusion of a valid argument unless he agrees to the hypotheses. Now if these hypotheses were conclusions to previous arguments, then they in turn depend upon previously agreed upon statements. To avoid circular reasoning we must ultimately derive the conclusion to the first argument from axioms or presuppositions. As mentioned above, we cannot prove everything; something must be assumed at the start. Now what ultimate philosophical or theological presuppositions are there about the universe, God, life, man, etc. upon which we agree with the unbeliever? The simple answer to that question is that there are none. To prove conclusions we need axioms and we do not have any axioms in common with unbelief. Thus any effort to prove the Christian faith true is hopeless and impossible.

Our presentation of, or apologetic for the Christian faith must therefore be axiomatic or presuppositional. We must openly acknowledge that we have postulates or presuppositions to begin with. (It is not the purpose of this paper to deal with the most desirable list of propositions which we should presuppose; in short, we might speak of presupposing the Triune God of the Bible who has infallibly revealed himself therein.) The main point is that our axioms are not arbitrary nor invented by us, but come from our experience of God's work on our souls; we presuppose what God has made known to us, not that which we have created. The Christian apologetic must be postulational or presuppositional. Any other so-called apologetic is not worth the effort. Incidentally, we should point out that even if we agreed with the unbeliever on certain primitive propositions by means of which we could logically prove that Christianity is true, our system would still be axiomatic. We cannot avoid having assumptions as

starting points. The simple fact is that we do not, as mentioned above, have philosophical axioms in common with unbelief. We presuppose the truth of the Christian faith.

This apologetic approach must make clear that these presuppositions are the only ones which meaningfully explain the universe, its "disorderliness" as well as its coherence and the uniformity of the natural world which provide the basis for scientific pursuit. These alone are the axioms which explain man as he is, his ability to think, to reflect, to relate, to know, and the world as he finds it. (Something analogous to this occurs in certain areas of mathematical creativity. The mathematician is free to assume whatever axioms he wishes, but he uses his freedom wisely and responsibly. He is free to choose any axioms for the set of counting numbers; why, then, does he assume the commutative property mentioned above, as well as the other properties of these natural numbers? He does so because this is the way the natural numbers "behave" in the world in which he lives.)

Since we cannot prove the Christian faith to be true by a logical argument, we should not even try. The unbeliever can come to accept its truth as a result of God's use of our witness to open his eyes, to renew him and enable him to believe and thus accept the axioms with which he had not agreed. The "conclusions" we want the unbeliever to accept are really our presuppositions. In saying that we must acknowledge our presuppositions as well as the presuppositions of those who disagree with us, we must emphasize that we are *not* engaging in circular reasoning. In logic or mathematics circular reasoning is the worst of "sins"; when one commits the mistake of circular reasoning, he makes use of or assumes the very thing he is trying to prove by a logical argument. This is not what we do when we have a presuppositional Christian apologetic, because we are *not* trying to logically prove the Christian faith to be true. The effort to lead the unbeliever to accept the Christian faith is not one of logical deduction. Rather, we presuppose the Triune God of the Bible in his relation to the created universe, we point out the unbeliever's own presuppositions, and we also point out the meaninglessness of his axioms, meanwhile praying that the sovereign God will open his eyes and bring him to faith.

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Now what relevance does the mathematical way of thinking have for theological discussion, for matters pertaining to doctrines of the Bible? For one thing, as indicated above, we should in our discussion, whether with unbeliever or believer, acknowledge our assumptions at the start. Discussions would be less heated and more intelligent, less emotional and more rational, if we were to state clearly not only our own assumptions but also those of the people with whom we deal. In mathematics we state our axioms clearly and precisely before we use them. If we were to do this in theological discussion, our dialogue would be more fruitful and amicable, even if it were not to end in agreement.

Another desirable aspect of theological discussion is to acknowledge the use of undefined terms, realizing that we cannot define everything. It is not our purpose here to determine a precise list of terms to be left undefined; perhaps we should not define such words as "God", "reality", "existence", "universe". Moreover, when we define words, we should do so clearly and precisely before we use them as does the mathematician. What point is there in discussing religion, theology or doctrine (or anything else, for that matter), and perhaps getting angry, when we use the same words (such as "revelation", "creation", "inspiration", "sin", "liberty", "foreknowledge", "faith", etc.) but mean different things by them? Intelligent theological discussion will openly state the meanings of terms and phrases used.

In much discussion of Christian doctrine certain "mysterious" doctrines (such as the Trinity, the person of Christ and predestination) are often said to be contrary to human logic. On the one hand this is stated by unbelieving philosophers and theologians whose position is based on the assumption of the autonomy of the human mind and who consequently reject these doctrines. On the other hand such statements are often made by believing theologians and preachers while setting forth the mysteriousness of these doctrines which should be believed. They in effect say that these doctrines involve contradictory propositions but we nevertheless take them by faith. Now this is simply not so. These doctrines are not contrary to logic. They do not involve contradictory propositions. God does not reason deductively in a manner different than we do. God deduces as we do; rather, we deduce as God does, for in thinking logically we are using our God-given minds properly. Suppose we give God the premises "All M is N" and "All N is P"; will God deduce something different than "All M is P"? Of course not. To think logically is to think in an orderly fashion with minds made by the God of order.

When a person who is liberal, neo-liberal, cultist or otherwise, rejects the doctrine of the Trinity or the doctrine of the person of Christ as historically held by the church to be scriptural, or when an Arminian rejects the central doctrine of Calvinism, such rejection is not based on logic but on a different set of axioms. A person who rejects the doctrine of the Trinity really reasons as follows on the basis of his assumed hypotheses:

Hypothesis 1: If God is one, he cannot have a plurality of persons.
Hypothesis 2: God is one (clearly taught in the Bible).
Conclusion: Therefore God cannot have a plurality of persons.

The person who rejects the orthodox doctrine of the person of Christ also has assumptions and reasons as follows:

Hypothesis 1: If a person is human he cannot be divine.
Hypothesis 2: Jesus is human (clearly taught in the Bible).
Conclusion: Therefore Jesus is not divine.

He who rejects the heart of Calvinism reasons from his hypotheses as follows:

Hypothesis 1: If a human act is foreordained by God, then the human cannot be responsible for it.

Hypothesis 2: We are responsible for all our acts (clearly taught in the Bible).

Conclusion: Therefore our acts are not foreordained by God.

The first hypothesis in each of the above arguments is *assumed,* contrary to the teaching of Scripture. Such a person does not come to the Bible to see what it teaches, but comes already begging the question by assuming that the Bible cannot teach such a doctrine. These doctrines do not involve logical contradiction; they are rejected because the persons doing so have faulty, i.e. unscriptural, axioms.

The Bible does *not* say that God is Triune and also that God is not Triune. The Bible does *not* say that Jesus Christ is one person with two natures and also that he is not one person with two natures. The Bible does *not* say that God foreordains whatsoever comes to pass and also that God does not foreordain whatsoever comes to pass. Those who deny the Trinity *assume* that the assertion of the unity of God is a denial of threeness of personality. Those who deny the doctrine of the person of Christ *assume* that humanity precludes deity. Those who deny God's absolute sovereignty *assume* that human responsibility precludes foreordination. The Bible does not teach contradictory propositions. The assertion that God has three persons does not contradict, i.e. is not the negation of, the assertion that God is one. The contradiction of the assertion that God is one is that God is not one. The assertion that Christ is God is not the negation of the assertion that Christ is man. The contradiction of the proposition that Christ is man is that Christ is not man. The assertion of God's foreordination of whatsoever comes to pass does not contradict the assertion of human responsibility. The contradiction of the assertion that man is responsible for his acts is that man is not responsible for his acts. The Bible does not make contradictory assertions simply because the Bible itself tells us that God, who speaks therein, cannot lie. God cannot assert proposition "P" and also proposition "not P" for God does not contradict himself. This is at the very heart of the precious doctrine of God's unchanging covenant faithfulness.

It should be noted that we did not speak of the doctrine of the sovereignty of God involving foreordination and human freedom, but rather of foreordination with human responsibility. Some people try to "resolve" the debate between the Calvinist and the Arminian by saying that both are extremists, and that the Bible teaches both God's sovereignty and man's freedom. Some Calvinists in stating the doctrine say that God foreordains all things but that man is free, that we believe in two seemingly contradictory truths. Now perhaps the Bible teaches that man, even sinful man, has some kind of freedom which even Reformed theologians refer to as moral freedom or free agency or even freedom of the will; by this they mean rational self-determination through which man acts in a manner consistent with his nature. (The explanation of even the very capable Reformed theologian Louis Berkhof is not completely satisfying to this writer.[1] Why must what is called free agency by theologians be so called? This is not the language of Scripture for man's rational self-determination in accord with his disposition. Use of such language confuses the issue.) This, however, is not what the ordinary believer (or unbeliever) thinks of when he thinks of freedom or free will. The Arminian view of freedom is that of man with an autonomous will which is the sole cause of what he does, which could resist what God might wish to come to pass. The Bible does not teach this kind of freedom, and so it does not assert both foreordination and freedom in this sense. If it did, it would be asserting both a statement and its overt contradiction or negation which, as we noted above, God cannot do. Because of widespread misconceptions about freedom, it is better to speak of the Bible as teaching both God's foreordination of whatsoever comes to pass and man's responsibility. If we do use the word "freedom", we should, as stated above, clearly define it in distinction from the Arminian view.

The trouble people have with these doctrines, then, is not a matter of logic but rather a matter of assumptions. Those who disbelieve need better hypotheses which are based on Scripture, rather than their own assumptions. Scripture teaches that God does have unity and also exists in three persons, that Christ is both God and man, and that God foreordains acts for which man is responsible. These mysterious doctrines of the Bible do not run counter to human logic, but to human assumptions that there is a contradiction when there is not. We must reject such assumptions and base our hypotheses on the teaching of Scripture. These hypotheses based on the Bible may still be mysterious to us, but they do not involve, and we do not believe in, contradictory propositions.

The proper understanding of the mathematical way of thinking and its application can contribute to a better presentation and understanding of the Christian faith. To many people the subjects of mathematics and theology are far removed from each other. It is not so and need not be so in the minds of thoughtful people. (Perhaps it is not insignificant that a number of mathematicians of history have been theologians or clergymen). Strange as it may sound, we suggest that some effective study of mathematics and mathematical thinking would better prepare ministers and theologians for the understanding, defense and exposition of the Christian faith. The study of mathematics is the best training one can get in logical reasoning or postulational thinking, better than the study of logic *per se.* Whether we acknowledge it or not, a sound approach to Christian apologetics and biblical exposition must use mathematical or postulational thinking.

REFERENCE

1. Berkhof, L., *Systematic Theology,* Grand Rapids, 1941, pp. 106, 248.

AN EXAMINATION OF A PROPOSED NEW RELIGION BASED ON SCIENCE

BY GILBERT WEAVER*

The authors of Science Ponders Religion *consider the practical achievements of science a sufficient basis for constructing a new religion by means of the scientific method. They view man as an evolutionary product who is now qualified to take over direction of the process of evolution. Their god is a pantheistic deity who as the cosmic soul is patterned after* man's *image. Salvation is to be provided by the new "messiah" Science, which will usher in a utopian "Golden Age" if the ethical problems relating to man's survival can be worked out on a scientific basis. Several of the authors express the intention to inhibit conservative, Bible-believing Christianity wherever possible, either by infiltrating existing groups to modify their beliefs and practices away from belief in literal teachings of the Bible, or by decreasing the influence and power of conservatives to propagate themselves.*

The book *Science Ponders Religion* is a symposium edited by Harlow Shapley, and published in 1960 by Appleton-Century-Crofts, Incorporated, of New York. This book, according to the jacket, is by "a group of the country's most eminent scientists, who examine a problem which has puzzled and enthralled mankind, in the light of the most recent scientific knowledge." The jacket further explains:

> Since the first fumbling steps toward scientific knowledge, there has been a continuing war, sometimes hot and sometimes cold, between science and religion. It has involved the most sophisticated as well as the most uneducated minds. Its martyrs have been many. Yet it may well be that science will become the revealer, and not the antogonist, of religion; that religion will be redefined in such a way that its God is the natural and not the supernatural Creator; and that these concepts will constitute the basis of a world religion of the future.

A reading of the book indicates that the blurb is accurate. The symposium writers indeed suggest that a "new religion" is to be developed on the foundations of science, and they are in the vanguard of that movement. This writer feels that their comments provide enough breadth of scope that a "systematic theology" of this "scientific religion" could be traced, at least in outline. This study is an attempt to do this.

Such a study as this is clearly justified by the nature of Christian apologetics. It is part of the function of the apologete to "scout out" or explore opposing religious systems. Christianity is best defended from attacks by philosophical and religious systems if these are clearly understood. This study is thus an attempt to understand a religion which is intended by its founders to rival and eventually supersede true Christianity.

The study is organized along the lines of traditional theological categories, with a few exceptions. The general content of the sections is as follows: Section one discusses the views of the writers of *Science Ponders Religion* on the question of religious authority, comparable to Bibliology in the Christian system. Section two deals with their views of man and Section three their views of God, reversing the order of Christian theology, since Christian systematics is theocentric, while their view is anthropocentric. God is created in man's image, instead of vice versa.

Section four combines the writers' views on Soteriology and Eschatology. It is science that is to be man's savior. Science's messianic function will bring in a utopian "golden age." Such a "salvation" requires an ethical system, of course, and this will be developed on naturalistic grounds, to replace theistically oriented ethics. It also requires the modifications of existing religions to make them "compatible" with science. Conservative Christianity is duly put on notice that it is to be impeded wherever possible.

Due to the nature of the subject this writer has let the eighteen symposium authors "speak for themselves" wherever possible. This accounts for the large number of quotations in this study.

Note should be taken of one writer whose paper struck a note quite different from the theme all the others propound. Edwin C. Kemble, in "Faith and the Teaching of Science" warns against building too much on the claims of scientific materialism, calling these claims "an unproved and dubious extrapolation of the legitimate conclusions of science" (p. 246). Apparently, however, the other authors of the book ignore Kemble's wise counsel as we shall now see.

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I. AUTHORITY

The work *Science Ponders Religion* reveals a conscious or unconscious attitude toward the source of authority in constructing a new religion based on science on the part of its authors. This view of religious authority is set forth in four ways: 1) The basic assumptions which are the starting point in their thinking. 2) Their attitudes toward supernatural revelation in general and the Bible in particular. 3) Their recognition, tacit or otherwise, of the limitations of science as a source of truth. 4) Their expressed aim to use science as a means to construct a new religion.

Basic Assumptions

Any system of thought requires something to be assumed at the start, as mere logic is only a tool, which must have something to work upon to produce anything. In spite of professions of scientists to rely only upon inductive study of experience in a strict empirical approach (p. 268), the choice of what experience to study always comes by deduction from some *a priori* chosen position or principle. Thus certain presuppositions by necessity lie behind this proposed religion under study. These basic assumptions which serve as the starting point for the symposium writers are usually unconsciously revealed, but their unavoidability is admitted. Paul E. Sabine in his chapter "Religion and (or) Science," admits that having presuppositions is unavoidable: "Neither a radical skepticism nor a positive religious faith is based on wholly rational grounds. Both involve a "will to believe." The difference lies in what one choose to believe" (p. 283). Ian G. Barbour similarly says, "Every philosophy of life selects some aspect of experience as the key organizing principle, as the most significant category of interpretation . . ." (p. 200).

In spite of these admissions, the nature of the assumptions these scientists begin with is usually not explicitly set forth. Instead they appear to be unconsciously held, and their nature must be deduced from various statements made in other connections. The following are some of their assumptions:

1) Matter is self-existent and eternal, and natural law is self-existent, eternal, and universal.

Harlow Shapley, in "Stars, Ethics, and Survival," writes: "Ordinary physics and astronomy suggest that if several billions of our years ago we had all that hydrogen and the natural physical laws, what we now see would have followed without the intervention of miracles and without supernatural intercession" (p. 3). But Shapley does not suggest either where the hydrogen came from, or what made and still makes the laws operate. Instead, he simply *assumes* that, in his words, "In the beginning was . . . hydrogen gas" (p. 3). Shapley writes again, "The physical laws seem to be universal" (p. 11). This also is an unprovable assumption which seems to conflict with the scientist's own doctrine that chance is ultimate. John C. Greene in "Darwin and Religion" records Charles Darwin's struggle with this problem (p. 273).

That there are natural laws at all, and the utter simplicity of those known, is a source of amazement to many scientists. Henry Margenau, in relating the scientist's surprise that "our experiences are not a chaotic welter but display . . . order and consistency," and in his considering the order in nature the "one supreme miracle," tacitly reveals the tension between the place scientists give to chance in the scheme of things, and their findings of regularity and simplicity in nature (p. 111).

2) There is no supernatural.

C. Judson Herrick indicates these scientists' attitude toward the supernatural. "Any arbitrary 'supernatural' interferences with natural processes must be ruled out," he writes, "and any apparent evidence of such miraculous events must be due to imperfections in our knowledge of natural law" (p. 30). Here is seen the "heads I win tails you lose" nature of the scientist's faith. Any evidence of the supernatural is pre-judged as only apparent, and as ultimately explainable on naturalistic grounds.

The same author reveals another common method of disposing of the supernatural—by way of definition. If the natural is defined as that which is within the range of human experience, actual or possible, then the supernatural is the realm of the unknowable and unexperienceable (p. 303). The supernatural cannot, by definition, come within our experiences, so the God of the Bible need not be bothered with!

Attitude of Science Toward Supernatural Revelation

What amounts to a third major presupposition is the attitude of these scientists toward the possibility of divine revelation in general, and the Bible in particular. This attitude is negative, growing out of the asumption that there is no supernatural *per se*. If, in Herrick's view, the natural is all that can be known or experienced by man, then the possibility of a supernatural Being entering man's circle of experience to communicate with him any valid knowledge is ruled out. Herrick on one occasion writes, "It is legitimate to extrapolate from the known facts into the unknown, but not to reverse the procedure" (p. 303). This statement is true, of course, but a loaded one if the possibility of divine revelation as a source of "known facts" is arbitrarily excluded.

Hudson Hoagland, author of the chapter "Some Reflections on Science and Religion," also shows his bias: "The scientist cannot accept supernatural revelation as a way to knowledge. Revelation based on either secular or theological authority is alien to his way of life and thought" (p. 21). Again he says, ". . . to many scientists the concept of revelation is intrinsically unacceptable" (p. 27). He considers divine revelation as only mysticism—"indefinable and unsharable ways to a superior knowledge of God" which "it is impossible for some of us to accept" (p. 20).

R. W. Gerard traces the physical ways knowledge may be transmitted by the nerves to the brain, and concludes that there are no other possible ways than those he names.

> Well, then, (he says) this leaves inspiration, or whatever word you prefer, as a kind of clicking into place of the activities of groups of nerve cells. We know this happens, and with it comes insight. If this is what is meant by "revelation," all right; but I see no other avenue to knowledge, even of God, or any other path to action (p. 92).

Concerning the Bible itself, these men welcome the theories of the radical higher critics concerning the origins of Scripture. Kirtley F. Mather simply assumes the truth of the Graf-Wellhausen theory regarding Genesis one to three, that there are two "quite different accounts of creation" in these chapters written by at least two different authors (p. 36). Mather considers the Genesis record as simply an "ancient attempt to deal with the concept of creation . . ." (p. 37). Hoagland attempts to explain "scientifically" how the writers of Scripture might come to construct such a theological account of nature (pp. 23, 24). In another place he puts it,

> Thus logical proofs of the existence of a beneficent personal God are to most scientists meaningless because they cannot accept the assumptions upon which the logic operates. The historical bases of divine revelation are devoid of the evidential qualities essential for conclusions. Psychological interpretations of religious experience offer to many a more probable foundation for these phenomena than do the interpretations of the theologian (p. 19).

Henry A. Murray in "Two Versions of Man" gives an extended critique of the Old Testament prophet. He concludes that what the prophet presented was merely human creativity; his sin was pride—the pride of claiming to be God's "only select spokesman;" the nemesis of the majesty of the Bible is this: "Deity . . . imprisoned there and silenced" (pp. 174-176). "Religion, by sitting pat in its citadel of solidified infallibilities, repelled the lovely goose that lays the golden eggs—the creativity in man . . ." (pp. 175-176).

The scientist leaps one step further, into the realm of hermeneutics. Since the Bible seems to conflict with scientific dogma, its statements must be shorn of literal force by being considered merely *poetic* or *symbolic*. Failure to recognize the Bible as poetry, says Murray, "has gone hand in hand with the playing up of its factual dependability" (p. 176). John L. Fischer holds that "the tendency to behave as if symbolic religious statements and representations are literally true, is one important source of conflict between science and religion" (p. 233). His own presuppositions are apparent from the statement which follows: "Most of us would agree that when religious dogma clearly conflicts with scientific findings about the nature of the universe, we should modify our religion" (p. 233).

The Limitations of Science as a Source of Truth

The attitude of scientists toward their own method appears in this symposium. Murray relates their attitude toward scientific laws: they are "laws which announce only that which is statistically most probable as determined by recordings of past events" (p. 172). Herrick expands on this concept of scientific truth as being only probabilities. "Science knows no absolutes of truth, of perfection, of right, or of anything else. These are the ideals toward which we work, but in actual practice these values are all relative . . ." (p. 295).

The limitations of the scientific method are also admitted. Barbour concedes, "A scientific theory is never proven true; at best it is seen to be more fruitful, consistent, comprehensive, and simple than the alternative theories currently available" (p. 205). Hoagland recognizes this but takes a step further. "Absolute and final truth is not within its province. But science can ultimately yield so high a degree of probability as to become certainty for all practical purposes" (p. 24). This presumed certainty becomes the basis for an excursion of these scientists into the field of religion.

The Use of Science to Construct a New Religion

"The study of 'the God of history made manifest in his works' is incomplete if 'history' is limited to the last few thousand years; it should be the history of all life, indeed of the universe as a whole" (p. 39). With this outlook, a new "theology" may be constructed to suit the taste of the naturalist. Holton applauds those who have come to what John C. Whitcomb calls a "Double-Revelation Theory" (see his *Origin of the Solar System*) in these words: "God has revealed himself in different ways to the scientist and to the theologian" (p. 64). The same author cites Galileo's position as that "science is one of the legitimate ways of reaching out toward God" (p. 58). Ralph W. Burhoe feels that "Science provides the basis for a new testament, a new scripture of truth about man and his destiny" (p. 77). He therefore goes on to provide some "speculative transformations of religious doctrines to better fit the realities established by the sciences" (p. 85). The transformed doctrines will be the work of the "new scientific theologians" (p. 82). A sketch of some of these will appear on the following pages.

II. ANTHROPOLOGY

The new religion based on science begins logically with an interpretation of Man. Without him there would be neither science nor religion. Indeed, the new religion which is to be compatible with science is anthropocentric in nature, a religious humanism.

The views of the authors of *Science Ponders Religion* on man and his place may be conveniently grouped in four categories: Man's source, his nature, his work, and his future.

Man's Source

If there is one idea that all the writers agree on, it seems to be that "man is a product of the progress of evolution" (p. 35). Man, says Murray, has been created from within and below, not from without and above (p. 178). This story of man's supposed humble origin begins several billions of years ago with countless anonymous hydrogen atoms, so that, as Shapley puts it, "Man himself . . . is one of the late products of that hydrogen mutation deep in the sun . . ." (p. 2). In fact, "man is descended from the very humblest of parents, a purely fortuitous combination of chemical elements . . ." (pp. 154-155). Nor is there any evidence

of "consciousness of goal in any of the structurations which led to the human species" (p. 156). Life simply emerges automatically when conditions are right, says Shapley: evolution "evidently did happen . . . for here we are!" (p. 9). Mather seeks to trace the last stage in man's rise. Modern man "may be traced from generalized primates who lived sixty million years ago" (p. 44). He spells out necessary changes in anatomy, but sees as especially important "the evolution of the cerebral cortex until it was capable of imaginative reasoning and rational thought," followed by behavioral and cultural changes which elevated the human spirit (p. 44).

Man's Nature

Man. we are told, has a common biological ancestry with the animals. Gerard tells us that the main difference between the animal and human brain is the number of nerve cells (p. 91).

But in spite of this similarity, man is a scientific problem to himself. How the vast differences between himself and the "other animals" arose is difficult to show. Theodosius Dobzhansky attempts to show in his chapter, "Man Consorting with Things Eternal," how some of these differences arose. Given the endowment by natural selection upon man of "the possibilities of symbolic abstract and generalizing thought, "the steps which naturally follow are attainment of languages and self-awareness, followed by feelings of accountability, guilt and shame" (pp. 128-132). Dobzhansky seems aware of the difficulties of his thesis.

> In a sense, (he writes) human self-awareness and consciousness are not legitimate products of adaptive evolution. They came, as it were, through a back door of the evolutionary process. The hypothesis that they are products of biological evolution may easily be challenged, and it is incumbent upon us to consider whether this hypothesis can be sustained on purely biological grounds p. 129).

He attempts to solve this problem by making these feelings the by-products of other, more useful traits.

Sabine similarly discusses the "free and conditioned" aspects of human personality, holding that "that sense of incompleteness with a feeling of guilt that theologians ascribe to 'original sin,' stems from the tension between these two elements of conscious personality" (p. 285). A. G. Huntsman's chapter title pictures man as "Poised Between the Dictates of Nature and a Peculiar Freedom." One cannot help being reminded of certain neo-orthodox theologians who find man "in the tension of the dialectic."

Another aspect of man's nature dealt with is the problem of personal immortality. Burhoe, in a chapter "Salvation in the Twentieth Century" holds that there is ultimately no real personal identity of individuals, and therefore no personal immortality. Man's true "spiritual" being or "soul" is bound up inextricably to the whole of the cosmos and one's fellow beings. Thus there is immortality, but not personal. One lives on in the group, just as he has pre-existed in the "genotype." "The core or soul of my being," he declares, "the sciences reveal, is older than the hills, a growth of hundreds of millions of years, still conserved as living values in my genotype" (p. 83).

Whatever the speculations concerning man, his origin and future, the fact remains that his real nature is still not understood. Greene laments, "Whatever his origin, man is a very peculiar creature, whose inmost being eludes the abstractions of science" (p. 126). Dobzhansky, in pondering the inevitable problem of human knowledge, states, "The problem of the origin of human understanding has, it must be admitted, thus far eluded a satisfactory and satisfying solution in evolutionary terms" (p. 126). Man is, then, as far as his nature is concerned, an unsolved problem to himself.

Man's Work

But although man cannot understand himself on naturalistic grounds, his recognized place at the summit of evolution so far gives him vast prerogatives to exercise. Since the nature which produced him is his "lord and master," as Burhoe puts it, man becomes the servant of the laws of nature. "Man can most properly conceive of himself as a local agent and servant of the creative process of the universe" (p. 81). Man becomes, as it were, the high priest of the pantheistic deity which has produced him through evolution, and takes charge, to the measure he becomes able to do so, of its future evolutionary progress.

Mans Future

Kirtley F. Mather concludes his chapter on "Creation and Evolution" with both a warning and a promise concerning man's future. "Man may or may not fulfill" "the purpose of the administration [impersonal] of the universe."

> If man fails, whether he "goes out with a bang or with a whimper," somewhere else . . . the creative processes may be more successful. The final chapter in cosmic history is not being written by twentieth-century man. On the other hand, if man, with his particular anatomical and spiritual characteristics, fulfills the specifications, all's well and good—for man as well as for the administration (p. 45).

III. THEOLOGY PROPER

The work *Science Ponders Religion* reveals a conscious shift of thought concerning the existence and nature of God. This shift begins with the rejection of the God of Scripture and ends in a naturalistic pantheism. Five distinct steps comprise this process of thought: 1) Rational arguments for the existence of God are rejected. 2) Belief in God is explained as only the result of a human drive. 3) The scientific picture does not need God to complete it. 4) Natural laws exist by themselves. 5) God and the universe are identified.

Rejection of Rational Arguments for God's Existence

While evangelicals of the Calvinistic persuasion have generally not emphasized the value of the so-called theistic arguments as compelling acknowledgement of God's existence, Roman Catholic theologians and Protestants of the more Arminian alignment have placed great stress on these arguments. The scientists

who comprise the authorship of this symposium, however, are not persuaded. They simply do not accept such methods of proof, showing that the real isssue lies much deeper than experience and logic, on the level of presuppositions and assumptions. Hoagland's words attest this: "The existence of God can neither be proved nor disproved by methods acceptable to most scientists . . ." (p. 27). They simply say to the Romanist and Arminian, in effect, "I don't accept this method of proof." Kemble goes further: "As a scientist I am instinctively an empiricist, with a healthy skepticism regarding *a priori* arguments that start with a postulate to be accepted because its converse is inconceivable" (p. 244).

Explanation of Theistic Beliefs as Merely Human Drive

The second step fits logically with the first. Those who disbelieve personally must explain the empirical fact that others believe. Hoagland's approach to this problem is to cite the ability of nervous systems "to coordinate response to the organism as a whole in terms of the total environment" (pp. 20-21). This ability, which has "great biological survival value" becomes the supposed basis for man's inventing belief in God. "Thus the drive for a monotheistic god may be an attempt on our part to close a Gestalt and to unify our universe" (pp. 20-21). Perhaps the same could be said concerning the theory of evolution.

Elimination of God as Necessary to Scientific Explanation

Gerald Holton pictures in his "Notes on the Religious Orientation of Scientists" a view of God's relationship to the universe which was ostensibly held by Isaac Newton. This view is often referred to in contemporary discussions as the "God of the Gaps" Theory. By this theory, God's activity is confined to those areas of nature which scientists are not able to explain by "natural law" (p. 135). The outcome is, as Holton puts it, "As science has pushed back the frontiers of the unknown, it has made untenable the position of the theologians who argued as Newton did, and has left fewer and fewer chores for the Deity in the everyday function of the world" (p. 60). Thus God is unneeded because "natural laws" do what God was formerly thought needed to accomplish. The failure of Newton and other real Christians, as well as the modern naturalist scientists, is in not seeing that natural laws are not self-operating, and that God upholds and sustains the *known* operations of His universe as well as the unknown.

Consideration of Natural Laws as Self-Existent

The fourth step in the scientist's reasoning about God is thus anticipated in the third step. Since God's sphere is reckoned to be the unknown, that which gradually supplants Him is the scientist's understanding of natural laws. These are held to be eternal, immutable, universal, and self-existent. "The rules for stable configurations and for energy transformations," believes Burhoe, "have presumably remained the same for billions of years . . ." (p. 80). Again, these rules "are presumed to be essentially universal and invariant laws of operation" (p. 80).

And yet, with all his flair for inductive study, the "empiricist" finds it necessary at this juncture to venture into the world of deduction. Mather takes the first faltering steps. A world of law and order, he relates, "is a world obedient to administrative regulations. An orderly, law-abiding and therefore comprehensive process, such as evolution appears to be demands the recognition of an administration of some kind" (p. 39). So far so good. He even suggests that the nature of the "something" which "governs" the universe should be "left wide open for further study" (p. 40). But the open door soon closes: "Specifically, theologians should note that 'administration' is not synonymous with 'administrator.' The latter term has connotations that are not necessarily ruled out of consideration in connection with the former, but they are definitely not implied when the former term is used in a scientific context" (p. 40). But is not administration *that which an administrator does?* Can one really have the former without the work of the latter? The naturalistic scientist seems to believe so. Indeed, he recognizes that this administration is capable of organization, and "seems to be permissive rather than coercive" (p. 42). Apparently, logic fails in the face of the antitheistic faith of the scientist.

Acceptance of Pantheism

The last step is therefore quite easy. Burhoe takes it in stride. "God" is recognized in the unity, universality, and orderliness of the laws of nature (pp. 80-83). Murray affirms this faith: "The great God of creativity has been from the start and is today immanent in nature and immanent in us" (p. 178). Dobzhansky worships the god of science, "the God who includes Creation in His divine being" (p. 135).

IV. SOTERIOLOGY AND ESCHATOLOGY

On the basis of the scientific method as an authority, with their view of man as an autonomous evolutionary product, with their god the cosmic soul patterned after man's image, the writers of *Science Ponders Religion* set forth their view of the new religion to be constructed upon these foundations. This section will examine the nature of the salvation this religion is to provide for them and the utopia it will construct for all men.

That at least an attempt will be made to do this seems to be the unanimous conclusion of the symposium's writers. Margenau speaks of a "science" of religion to be developed, although he feels that its pattern of development is as yet hard to predict (p. 115). Murray's conviction is that "Whatever may be the nature of this religion of the future, a good many of us believe that it will have to be compatible with science" (p. 151). New conditions of life brought in by science make such a "scientific religion" mandatory, believes Burhoe (pp. 66,67).

The means of constructing this new religion is through the sciences of man: anthropology, the social sciences, and the humanities. Herrick bids us heed the warning by a Professor Haydon that "by too much faith in gods and other worlds and too little faith in man, a practical program of vital religion has been all too long delayed" (pp. 305,306). Herrick goes on to tell, "The sciences of man provide us with our most powerful implements of cultural development" (pp. 305,306).

For the task the "sciences of man" are to accomplish, a special definition of religion is necessary. Burhoe submits that religions "are the organs or institutions whose function it is to engender attitudes and behavior that tend to adapt man to the conditions of his total environment in such a way as to optimize his prime values" (p. 67). While the above is probably a worthy attempt to define a nearly indefinable subject, Burhoe has surely not excluded from the limits of his definition such procedures as going to the dentist, or, if the subject is appropriately modified, the wandering of wolves in packs in search of food. Gordon H. Clark, in his *Religion, Reason, and Revelation,* builds a good case for the impossibility of defining *religion* as a general term.

Another attempt is a little more specific, yet still seems to fail. Fischer considers religion to be "the ritual cultivation of socially approved values" (p. 219). By this definition even a baseball game becomes a religious event. Its procedures are clearly ritualistic and its social approval and value is undeniable.

In spite of problems of definition our authors give religion a definite role to be played in the future. It is "to create an atmosphere in which the efforts of others will have greater success," which means that it is to provide the conditions of good morals, freedom, education, and material well-being as its legitimate function in society (p. 51).

The procedure to be followed in reforming and redirecting religion for these purposes is clearly set forth. Since, as Gerard points out, most people will not be appealed to and influenced by a purely rational religion, something with more emotional appeal is necessary (p. 98). Fischer holds that the new religion is not merely "the science of values, but rather an art of cultivating values" (p. 259). What is deemed needed is "purified ritual and symbolism." By an eclectic process useful rituals may be gathered from many sources. ". . . Symbols and rituals of universal value and significance can be found in many religions throughout the world, and if we judge them by their literal cognitive content, there is strong reason for us to adopt them" (p. 241). One wonders how lasting and valid would be actions based on temporary "evocations of emotion" if all "literal cognitive content" were stripped away.

One of the means of "evocation of emotion" to be used is the sex drive. Murray unabashedly suggests that "mutual erotic love, erotic adoration, is the most natural religion, far stronger and more natural than a son's adoration for his father, the father-son relationship (with mother and daughter omitted) having been from the beginning the mythic paradigm of Christianity" (p. 178). And this "mutual erotic love" is not necessarily within the marriage relationship. Murray prefaces the above remarks with the view: ". . . perfect chastity does not stand out as the highest ideal for our time" (p. 178). Apparently the new religion is not so new, but may be a re-incarnation of the abomination of the Canaanites which led to their extermination from the earth.

Another means of controlling the religious future of mankind is through the application of drugs upon the chemistry of the brain. Hoagland speaks of "experiences of trancendent mysticism" produced in individuals by the action of drugs upon the brain (p. 20). Gerard thinks that a "St. Francis" might be produced in this manner out of an ordinary man, even as certain brain operations have made wildcats into docile animals (p. 90 cf. p. 98).

The result of these procedures by scientists, it is hoped, will be a utopia. "The golden age for man—if any—is in the future, not in the past," due to the continuing processes of evolution. And the "Messiah" to usher this age in will be science.

Surprisingly, at least so to this writer, the "last enemy" is not to be "put away" by this messiah. Death is not envisioned as being overcome for the individual; at least none of the writers express such an expectation. On the contrary, "death is explained by science as a necessary element in the developing of any genotype, including man's" (p. 84). Instead of hope of eternal life, self-sacrifice for the whole is "the order of the day." Huntsman puts it so:

> . . . if, in the ceaseless change that forms time, we seem to pass away from this life just as we came into it, we will never-the-less in some forms or ways share in the eternal future even as we are products of the eternal past. We have been created by the whole and we share in future creation (p. 184).

But whether or not death for the individual is certain, the future of the human race is seen as in jeopardy. Shapley foresees an ethical crisis in human society.

> If atomic war tools are available to angry and vain and stupid men, and are used—then a grim final curtain will close the human play on this planet. It will truly be a judgment day —a day of our own bad judgment. The galaxies will continue to rotate, without concern for little Planet No. 3 and its highest life (which is not quite high enough). The sun will bountifully pour its energy into space, but not for Homo. He will be through because he has not learned to live with himself (p. 12).

Shapley thus sees two alternatives for man with regard to nuclear energy: he "can extinguish himself and others," or he "can peacefully use that nuclear energy for the enrichment of human culture" (p. 2). Which he does depends on the ethics he develops. "We need an ethical system for now—for this atomic age—rather than for the human society of two thousand years ago. Cautiously we must modernize, but certainly" (pp. 11, 12).

Hoagland wrestles with the problem of ethics without divine standards. "Loss of traditional religious faith," he believes, "does not in itself imply the analo-

gy of a rudderless ship or a collapse of ethics . . . the values by which men live are not contingent upon supernatural sanctions" (pp. 17, 18). He pictures supernaturalism as the historic scaffolding of values of ethical conduct—the scaffolding may now be torn down (p. 27). But the choice of metaphor is subject to question. Scripture presents supernatural sanctions as *foundational to* ethics; when the building is completed the foundation cannot safely be removed. Hoagland's answer to this would be that "in practice the agnostic scientist is an ethical person" (p. 25). But the suspicion remains that he simply adopted his ethics second hand from the Christian society around him. Philosophically, the establishment of an ethical system on a naturalistic basis has been a difficult task. Hoagland mentions this objection to his view in the subsequent discussion but sidesteps rather than answers the charge (p. 26).

In spite of this, the symposium writers call for a new, scientifically-based ethic. The basis is not theistic, but socialistic. We must, they say, frankly "assume as a working hypothesis that good and evil are purely products of man and his relation to his environment, particularly to his social environment" (p. 24). On an evolutionary basis, "Good is anything that promotes advance, evil anything that retards advance, and religion is man's effort to promote advance" (p. 47).

In light of this proposed religion, a new attitude toward the existing religions must be broached. Herrick writes,

> Since we have to live with religion whether we like it or not, it must be recognized that its abolition is neither practicable nor desirable. What we should do is to try in every possible way to *redirect all religious thought and practice* away from its evil perversions, and toward those true values that come to expression in refined standards of personal morality and social responsibility (underlining mine, pp. 306,307).

Thus the "manifesto" of the new religion calls for a "subversion" of existing religions into the new mold. There is to be a "stripping" process to be applied to them before "co-existence" is achieved: a "rigorously mechanistic science may *keep the peace with a rational supernaturalism stripped of the crude mythologies and traditional dogma* with which it is usually garnished" (underlining mine, p. 290).

We close this study with the glimpse of the future afforded us by Fischer, to be realized by the infiltration of existing religious groups in order to pattern their beliefs after the "scientific" image. Conservative groups especially should be warned of this clear threat to their freedom to propagate:

> . . . I wish to make a few predictions about the future of religion in our society. It seems clear that barring major catastrophes scientific knowledge of the universe and man's place in it will continue to grow rapidly in the foreseeable future. This growth of science can only have the long-run effect of tending toward the elimination of all magical and pseudoscientific traits from religion; that is, the elimination of all claims of religion to have any direct control of, or to serve as a primary source of information about anything other than the evaluative aspect of the mind of man. *This state may be approached through progressive modifications in the beliefs and practices of existing sects or by an increase in the influence of sects which have already largely rid themselves of such traits at the expense of more conservative sects, or in both ways* (underlining mine, pp. 238,239).

(*cont. from p.* 36)

(C) is a metaphysical notion—it includes all possible existing relationships which have an effect on some A or B. The scientist is interested in physically specifiable relationships alone. These can never exhaust the total causal process underlying any A or B. And one does not have to be a monistic materialist to do science. One simply recognizes that the scientific model in a functional one, which can be fruitful only by restricting itself to physical space-time co-ordinates. There are other models. And Being does transcend physical space-time co-ordinates.

The question of freedom is related to just such a model which transcends the physical space-time model of the practicing scientist. The consistency and predictability of much human behavior is related to the model of personhood, treated not within the frame of reference of physically specifiable objects or behavior configurations, but considered within the frame of reference of the physically unspecifiable, time and space transcending subject. The subject who is actively conscious, placing values, retrieving meanings, giving concern, realizing wrong, accepting love and so on. A person can be studied scientifically by bracketing the subject and considering the events of consciousness in terms of mental objects (introspection) or in terms of relationship to specifiable overt behavior (behaviorism). Such approaches are extremely fruitful and have revolutionized part of our understanding of man. But they cannot settle the metaphysical questions of the subject underlying all of this objective activity. Here is where the question of freedom properly arises. Dr. Dolby's children behave well not only because they are lawful physical-chemical mechanisms, but because they are unified, healthy persons who have deep personal ties to their father which gives a fundamental definition to their own personhood. Consistency and lawfulness were first of all possessions of the subject. In creation the Absolute Subject bequeathed them to the whole universe of objects—which men now study.

Help Wanted:

Your help in sending articles, reviews and Letters to the Editor is much appreciated. They will be especially desired in the future because we are nearly up-to-date in publishing the papers presented at our annual conventions. So don't hesitate to assemble your ideas and mail them to me.

It is never assumed that any article can go unchallenged. I occasionally publish an idea to which I heartily disagree, hoping you will react to it. Please do.

Error

Probably I alone am responsible for the error in the title of the article by Robert B. Fischer in the December 1967 issue of the *Journal of the A.S.A.* It should have been "The Presuppositions in Science and Theology" and it came out "Suppositions". My apology.

If you see anything else in error I shall be glad to correct it.

MY PHILOSOPHY AND EXPERIENCE CONCERNING THE PRACTICAL APPLICATION OF CHRISTIAN FUNDAMENTALS IN PSYCHOLOGY

RICHARD LEE SHOWALTER*

Historically it has been easier simply to attribute the unknown and mysterious to God than to recognize He has established the consistent principles and laws by which the universe is operated and through which personality is developed.

Long before man understood the law of gravity, he was subject to that law; and long before he understood that the world was round and made one complete revolution on its axis every twenty-four hours, he lived by this consistent law of the universe. His very life depended upon consistent laws about which he had very little knowledge.

I once knew a rather popular university professor lecturing in the field of psychology who often implied that man's concept of God was only his way to explain the mysterious and unknown and that when man is informed his concept of God automatically is removed. He once tried to illustrate his ideas by an explanation of "God given instinct". He said, "What we once called instinct we now find logical explanations for". He stated, "We used to say that a homing pigeon found his direction by instinct, and now we know that he has a built-in radar system similar to that used by modern man". I have not been able to verify his statement about the homing pigeon's radar system, but it will nevertheless serve for an illustration of my point. When men find the logical explanation to any phenomenon, they are tempted to conclude that their logical explanation somehow displaces God; however, if we consider God the author of the universe and the one who has established certain laws and principles by which the universe operates, then men's discoveries only verify the fact that there is a God. In other words, an intricate design demands an intelligent designer.

There has been, and likely still is, much that is unknown about the laws and principles underlying human behavior, and we have sometimes carelessly said, "That was the work of the devil", or "That was divine intervention". Now, I believe in these supernatural powers, but I believe that with few exceptions they work through the established principles and laws which God has predetermined.

I have a tremendous respect for men like Columbus who helped to prove that the earth is round; for men like Albert Einstein who receives much of the credit for discovering the laws of relativity, by which laws men are exploring space today. I have tremendous respect for men like Louis Pasteur who contributed greatly to the knowledge and control of germs; and I certainly have tremendous respect for the pioneers in the field of psychology like Sigmund Freud, Alfred Adler, and C. G. Jung, and for persons from their day to ours who have carried on consistent research in the field of psychology. We must always be grateful for those who seek to discover truth, and know that the discovery of truth does not threaten God in any way. My subject requires me to explain how I have personally sought to relate the fundamental principles of the Christian faith and the discoveries of modern psychology. First of all, let's summarize some of the psychological discoveries to which we must give honest consideration.

Many psychological studies suggest that perhaps man is not as free to choose the kind of person he will be as he once thought. At the close of the last century and the beginning of this century, men like Freud began to emphasize the importance of early childhood experiences in determining personality adjustment and maladjustment of later life and to emphasize the dynamic role of the unconscious processes in determining man's behavior. Emphasis on personality determinants was further stressed by the research and discovery related to what was called "conditioned reflex" which stems from the work of the famous Russian psycholo-

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gist, Ivan Pavlov. They experimented primarily with animals and learned that by reinforcing the type of response they wished the animal to make and by creating a stressful situation when the animal's behavior was not according to pattern they could train the animal to do many things. This was a strong emphasis in psychology just preceding World War I. This principle of conditioning was championed by men like J. B. Watson in America, and it has had an important part in the development of the stimulus-response learning theory of our day.

Without question, we must give serious consideration to these truths as we endeavor to relate discoveries of modern psychology to the fundamentals of the Christian faith. It is interesting to find statements in the Bible like, "Train up a child in the way he should go, and when he is old, he will not depart from it." In other words, the Bible recognizes the basic principles of these psychological discoveries.

There are many things in life which we have come to accept as determining factors in behavior without incorporating them into our total philosophy and asking the question, Is man's freedom of choice then more limited than we thought? Let me list a few of these:

Starvation experiments have been carried out which tell us that man's temperament goes through a radical change when certain important elements of the diet are missing. In other words, his diet may help determine whether he is a congenial person or an irritated, cantankerous sort of individual.

Closely related to this is the fact that man's moods can be manipulated by medication, so we hear medicine described in such terms as "mood elevators," "antidepressants," etc.

We are ready to recognize that when our finest missionaries and church workers become overloaded, their interpersonal relationships are strained.

Certain patterns of behavior suggest to the psychologist that neurological problems are suspected, and the client is referred to a neurologist for an examination. In other words, we no longer say when a child is hyperactive and restless, "It's just the devil in him."

When a child lacks motivation and appears listless, we recognize that he usually does not just willfully choose to be lazy, and that the person who describes his behavior as lazy is probably among the uninformed. There usually is some deeper cause, and we would certanly want the physician to make a complete evaluation. Often there are also psychological causes for what we have termed laziness.

I am sure that many of us are aware that much research is being carried on in the field of genetics. I quote from an extensive series of articles recently published in the Harrisburg "Evening News" by Ralph Dighton.[1] "Elementary efforts at 'genetic tinkering', altering the genes of lower life forms, have already succeeded. Heat, x-rays, and drugs have changed the offspring of bacteria and even insects so that they are hardly recognizable." To illustrate what Mr. Dighton is saying in this article, let us assume that man decided it would be wise to have a generation of people with very high I.Q.'s. Mr. Dighton is saying that it appears possible that through "genetic tinkering" future generations with extremely high I.Q.'s could be produced. He continues, "There is a grim side, too. The same advances conceivably could be used to turn men into a race of slaves whose thoughts and emotions are predetermined through genetic tinkering".

In another recent article in the "Saturday Evening Post" written by Steven M. Spencer,[2] the general public is being made aware of research by some prominent experimental psychologists. He refers to the work of Dr. Cameron, former head of McGill University Psychiatric Department, who claims that through the use of chemotherapy our ability to remember can be greatly improved, and that by administering proper medication the aging need not become so forgetful. He also refers to the work of James V. McConnell who is associated with the University of Michigan Mental Health Research Institute. He has trained flatworms to respond to various conditioning processes. They have taught the worms to stop crawling and contract at the signal of a light. McConnell sliced up a group of trained worms and fed them to a group of untrained worms. The latter then learned the new tricks much faster than normally and faster than those worms which had eaten untrained worms. Some scientists have questioned McConnell's experiments, but it shows you the direction that some research is taking; and I am sure you are aware of the implications in this study for determining behavior of people.

In reply to the resistance Dr. McConnell has experienced, he says, "People are frightened by the implications. Transplanting corneas or kidneys doesn't bother them, but when you talk about transplanting brains or the stuff of memory and learning, you are talking about transferring part of me, my individuality, and to some people that is frightening."

Another very interesting article in this area was published in the September, 1966, issue of "Eternity" magazine.[3] The article was written by James Thomas and entitled, *Bravely Into The New World.* Quoting from this article, "By 1980 they fully expect to discover a biological agent capable of temporarily erasing a person's will or even of altering it permanently. They hope to be able to change a person's personality by 1983, and are confident that by the year 2,000 brain-computer links will be able to enlarge a man's intellect . . . Science has clearly indicated it is now prepared to step up from a search for the means to control and manipulate man's environment, to a search for ways to control man himself . . . The biological sciences are already invading the traditional sanctuaries of theology —the areas relating to man's nature, his will, intellect, and his total personality . . . Science itself is beginning to recognize the need for a word from the church in these new areas of research . . . The church will have to be prepared to give theological answers which give evidence of a deep soul-searching and a recognition of man's eternal relationship to the Almighty. But first

the Church must clearly identify the spheres of concern. For example, what will the research into the control of man's will do to the traditional Christian concepts concerning man as a free moral agent and the Biblical concept of sin?" I feel that these theological questions need to be asked not only as they relate to possible future deterministic forces, but as they relate to the deterministic forces man presently experiences from his heredity and environment.

We, as Christians, cannot overlook the fact that our behavior, that of our children, and the behavior of those to whom we wish to communicate the message of Christ is partly determined by forces beyond the control of our wills, and it appears that this will be true to an even greater extent in the future. These forces, however, will always be in strict harmony with the principles and laws God has placed in the universe.

Dr. James C. Coleman[4] of the University of California has said, "Man is almost infinitely malleable, and his personality development is largely a product of the society in which he lives—of its institutions, traditions, values, ideas, and technology, and of the specific family and other interpersonal relationships to which he is exposed."

There are other psychological emphases which we must take a serious look at as Christians. The area of psychology commonly known as self theory is receiving an increasing amount of attention at the present time. We wish to look at two of the most popular approaches to self theory. The existentialists emphasize, and I quote again from Dr. Coleman,[5] ". . . the uniqueness of the individual, his consciousness of self, his freedom of choice, his quest for values and meaning, and his responsibility for determining whether his existence has meaning . . . For the existentialists, man is essentially free. Unlike other animals, man is conscious of himself as a self and has the ability to reflect and to question his own existence. He is aware that it is he who is faced by problems and that he can do something about them through his choice based upon his experience of being. Man's freedom is highly valued, but it confronts him with the problems of choice and responsibility and thus often becomes an agonizing burden. The anxiety it arouses, however, normally acts as a driving force in his search for new possibilities and his exploration of the unknown. Making the most of one's life does not occur by chance. It requires a willing decision or affirmation by the individual, and it often requires the courage to break away from old patterns and seek new and more fulfilling pathways and the ability to translate new insights into consistent action. Thus the good life involves a moral commitment to make the most of oneself and one's opportunities to become an actualized human being." Basic to their theory is the concept that each person must arrive at his own set of values. They would challenge the absolute standards of the Bible. In fact, they would make organized society impossible because every person is free to establish his own set of values. From the Christian viewpoint we, of course, realize that they give no recognition to God's provision for spiritual life through Christ and progressive maturity as one yields to the Spirit of God.

Another self theory that we wish to look at briefly is the client-centered psychology of Carl Rogers. He emphasizes the inner potential of man for self-direction, self-definition, and self-actualization. Rogers thinks of self-actualization as a continuing process. The fully functioning person is constantly changing and developing.

Self theory might well be labeled "Operation Bootstrap." The potential for maturity and wholeness lies within the individual, and if he will exercise those powers that are his, he will become a fully functioning individual; but if he avoids this responsibility and freedom of choice to move toward a meaningful and self-actualized life, he is then considered emotionally ill.

Some interesting research is being done in the field of extrasensory perception (ESP). In ESP there is a communication not traceable to any known sense, such as hearing. The Society for Psychic Research has recorded an accumulation of experiences where communication has not been traceable to any known sense. You will find these recorded in *Science and Psychical Phenomena* by G. N. M. Tyrell.[6] Some controlled research in this area has been carried out by J. B. Rhine of Duke University and recorded in his book, *The Reach of the Mind.*[7] It is true that ESP has not been completely established or accepted by psychology; however, there are forces at work in this area which intelligent man must continue to study.

In commenting on this research, Albert E. Day[8] says, "It is exceedingly interesting to have emerge from the laboratory of science after twenty years of rigid experiments the conclusion that consciousness can know things not reported by the senses and can enter into a relationship of knowledge with another consciousness independent of sense experience. Such a report from science is intimately related to the centuries' long contention of religion that the consciousness of man can enter into a living, knowable communication, life transforming relationship with God."

Another interesting book which is built around the assumption that ESP is a truly operative force in prayer is the book by Frank Laubach,[9] *Prayer, The Greatest Force in The World.* In this book the author demonstrates in a very effective way the possibilities related to the operation of ESP through prayer. It would appear that men are on the verge of discovering the laws by which prayer becomes effective; and I am convinced that men shall continue to discover consistent principles and laws by which the universe is operated and by which men relate themselves to the universe, to their fellowmen, and to God, and that these principles and laws will not be in conflict with the teaching of the Bible.

Most psychologists today take what the profession calls the *holistic* point of view. They are concerned about genetic influences, home influences, as well as physical and emotional conditions. The holistic ap-

proach would also include some understanding and acceptance of self theory. We are concerned that the holistic approach as generally summarized by psychologists today does not view the spiritual forces of the Christian faith as being a constructive part of the holistic approach to the personality.

So we are back to our original question, Does the discovery of certain principles relative to the causes of human behavior and personality development eliminate God or establish Him as the Designer of these principles? The thing that makes this question difficult as it relates to the field of psychology is that the psychological and spiritual fields overlap in many areas.

It would make little difference whether the discoverer of some great physical law were Christian or not Christian; but since psychological and spiritual laws often overlap, conflict is unavoidable. Take, for example, the matter of deep guilt related to illicit sexual behavior. The existentialist would say, "Set up your own values and desensitize your conscience about the absolute values presented in the Scriptures." The Christian must recognize that if God's standards are violated, he must seek the forgiveness of God and that this forgiveness is readily available through the atonement of Christ. There is certainly room for differences of opinion concerning the application of spiritual truth, but Christians consider the basic fundamentals to be absolute.

The evidences of the supernatural which are clearly observable in nature about us, the revelation of God through Jesus Christ as we have it recorded in Scriptures, the testimony of the saints through the ages, our own personal experiences as Christians, and the obvious need in our confused world to somehow add meaning and direction to life demand that we consider God and the implications of a personal relationship to Him through Jesus Christ in a truly holistic approach to the personality.

Thus far, I have been discussing some of the psychological concepts which I have needed to face realistically as I have endeavored to correlate psychological and spiritual truth into a working philosophy for myself.

In summary, I would like to incorporate these psychological concepts into my basic Christian philosophy by a series of summary statements.

I. The most important goals of life are spiritual goals. Jesus told Nicodemus in John 3, "Verily, verily I say unto thee: except a man be born again he cannot see the Kingdom of God. That which is born of the flesh is flesh and that which is born of the Spirit is spirit. Marvel not that I say unto thee, ye must be born again." In Galatians 5:22,23, we see the law of spiritual maturation. "But the fruit of the Spirit is love, joy, peace, longsuffering, gentleness, goodness, faith, meekness, temperance: against such there is no law."

2. Spiritual life is a gift from God, and it is an instantaneous result of faith in the atoning work of Christ. In Romans 6:23, we have, "For the wages of sin is death, but the gift of God is eternal life through Jesus Christ, our Lord."

3. Spiritual maturity is the result of spiritual growth as one appropriates the grace of God in daily living. Maturity in the Christian sense is only complete at the resurrection.

4. Both spiritual life and spiritual maturity are basically a work of God.

5. The work of Christ becomes effective in human hearts and lives as it is appropriated by faith.

6. Men are not all created equal as some have chosen to believe. They are not equal genetically; they are not equal in their drives for maturity; and the conditioning influences of their environments are unique for every person. (They should have equal rights to happiness, equal rights before the law of the land, and equal opportunity to develop their potential.)

7. It is God's will that all should have spiritual life and spiritual maturity, but both are dependent upon spiritual laws God has set in the universe.

8. The amount of nurture needed, the effort required for self-discipline, and the rate of maturation differ with each individual; and when a Christian fails to become mature, it may represent the failure of the family and the church to provide opportunities for maturation, as well as the individual to take advantage of his opportunities.

9. Man is not as free to choose as he sometimes thinks. It appears that he may be less free to choose in the future; however, it is possible that science may enhance man's freedom of choice.

10. Emotional problems are sometimes a cause of physical problems and sometimes a result of them.

11. There is within man a natural drive toward mental and emotional health. If the hindering forces are removed, he will move toward wholeness.

12. We are responsible to communicate the message of the Gospel of Christ, but we are also responsible within the limits of our knowledge, ability, and opportunity to change and control those situations which determine man's freedom to choose spiritual life and spiritual maturity.

13. Each person has a responsibility to move toward spiritual life and maturity in direct proportion to the freedom and opportunity he has to appropriate God's grace.

14. God's judgment of man will be as closely related to man's freedom to choose as it is to the choices he actually makes.

15. If man is free to move toward God, but will not, he has a spiritual problem; but when he cannot because of some limitation, then the problem would more accurately be labeled otherwise than spiritual.

16. One of the greatest forces in reducing obstacles to spiritual life and maturity is for man to exercise the "mustard seed" of faith which he already has.

17. Man's move to accept spiritual life and appropriate the grace of God for mature living is a process involving the whole man—intellectual, social, emotional, physical, and spiritual.

18. As Christians, we often fail our fellowman because of our limited concept of his total problem or

because of our limited concept of our responsibility. The physician often is concerned only with the physical problem, the sociologist with the social problem, the psychologist with the emotional and mental problem, the educator with the intellectual problem, and the Christian with the spiritual problem.

Unless the whole man is taken into consideration in counseling, we leave ourselves open to serious error. Unless the pre-eminence of our spiritual goal is clear, we work only for time instead of for both time and eternity. I feel that some psychological research is floundering because it has lost sight of the eternal God as revealed through His Son, the Lord, Jesus Christ, and as recorded in His inspired Word. We need a meaningful relationship to God to tie together the deterministic forces which we recognize and the power of choice with which man has been endowed.

Some emphasize "the gale," others the "set of the sail," but it is also of tremendous importance that we have a compass and an Experienced Mariner on board.

NOTES
1. Ralph Dighton, "Time Nears When Men Will Control our Evolution", HARRISBURG EVENING NEWS, Tuesday, August 9, 1966.
2. Steven M. Spencer, "The Pill That Helps You Remember", *Saturday Evening Post,* September 24, 1966.
3. James Thomas, "Bravely into the New World", *Eternity,* September, 1966.
4. James C. Coleman, *Abnormal Psychology and Modern Life,* (Scotts, Foresman and Co.; Third Edition), Page 53.
5. Ibid., Page 645-646.
6. G. N. M. Tyrell, *Science and Psychical Phenomena,* (New York: Harper & Brothers, 1938).
7. J. B. Rhine, *The Reach of the Mind,* (New York: William Sloane Associates, 1947).
8. Albert E. Day, *An Autobiography of Prayer,* (New York: Harper & Row, 1952), Page 50.
9. Frank Laubach, *Prayer, the Mightiest Force in the World,* (Fleming H. Revell Co., Westwood, N.J.).

THE EVOLUTIONARY SIGNIFICANCE OF THE SPECIES VARIATION IN CYTOCHROME c STRUCTURE

GORDON C. MILLS*

Information relating to the differences in amino acid sequence of cytochrome c of various species is reviewed briefly. The author notes that previous investigators have explained the similarities in amino acid sequence on the basis that all of these types of cytochrome c were derived initially from a single precursor segment of DNA, presumably as a result of mutations. A major limitation in this hypothesis is noted and an alternative explanation for these similarities is proposed: that similarities in structure of cytochrome c of various species is a consequence of a single Divine knowledge behind the creation of all these species.

In recent years, application of newer analytical techniques have permitted the determination of the amino acid sequence of a number of proteins with biological activity. Noteworthy among these are the sequences of amino acids in the polypeptide chains of hemoglobin and in cytochrome c. In the latter case, the amino acid sequence has been determined in cytochrome c from at least 35 different species. Since there are many similarities in structure in these different cytochrome c molecules, previous investigators have concluded that the genes responsible for the production of the protein structure of cytochrome c are all derived from a common archetypal piece of DNA[1]. The following quotation indicates the evolutionary significance that has been ascribed to these findings: "Presently under investigation, among others, are the structures of cytochrome c of wheat germ and from an insect. If, as already suspected, these proteins will fall into line with the others, we shall have accumulated overwhelming evidence for the common origin of a single gene and hence for the common ancestry of all present day forms of living aerobic organisms encompassing invertebrates and vertebrates, as well as primitive and higher plants"[2]. The evidence upon which this is based may be summarized as follows:

1. The polypeptide chains of different vertebrate cytochrome c molecules are all of about the same length (104 amino acid residues) and arrange them-

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selves into similar secondary and tertiary structures.

2. There are certain similarities in all vertebrate cytochrome c structures, e.g., in having cysteine residues at positions 14 and 17 and in having an eleven amino acid invariant chain from position 70 through position 80. In vertebrate cytochrome c molecules, there are 77 positions (out of 104) which possess identical amino acid residues. When yeast cytochrome c is compared with vertebrate cytochrome c, there are 58 positions with identical amino acid residues. For additional similarities, reference may be made to reviews by Smith and Margoliash[2] and Margoliash and Schejter[3].

3. Comparison of all the various cytochrome c molecules indicates a strict homology in structure; the closer the taxonomic relationship between two species, the greater the similarity in structure.*

4. Statistical considerations indicate that no matter how many species of cytochrome c were examined, 27 to 29 invariant residues would remain. These represent the amino acids that cannot be replaced without a major modification of the enzymic properties of the cytochrome c.**

As a consequence of the above evidence, Dr. Margoliash presents the following hypothesis: every amino acid similarity above 27-29 can therefore be ascribed to evolutionary homology (i.e., derivation from a common precursor). Consequently, since there are 8 to 12 variations in amino acid residues of the cytochrome c protein when comparing the cytochrome c of mammals with the cytochrome c of birds, this presumably represents approximately 8-12 mutations of the DNA which codes for the cytochrome c structure. In a similar fashion, a difference of approximately 18 amino acid residues when mammalian cytochrome c is compared with fish cytochrome c suggests that approximately 18-20 DNA mutations separate these two classes. Some of the other differences in cytochrome c molecules are summarized in Table 1, which is adapted from Margoliash and Schejter[3].

The major objection to this hypothesis of Margoliash and Smith (i.e., that differences in amino acid sequence are due to mutations of the DNA) comes from the finding that there is only one predominant molecular type of cytochrome c in each species. Currently, there is no theory to explain why a perfectly functional cytochrome c molecule should disappear from a population. Stated in another way, each mutation of the DNA for cytochrome c should increase by one the types of cytochrome c present in a given species. Only if the species population were markedly reduced in numbers (e.g., by a major catastrophe wiping out an entire population with only one or two survivors) would the laws of chance permit a mutant cytochrome c to become the predominant form.***

The following illustration may present this view more clearly. Suppose there was a mutation in the germinal DNA of one individual causing the production of a cytochrome c variant in the offspring. If this cytochrome c variant is perfectly functional, there would appear to be no pressures (survival value, etc.), once the variant cytochrome c was established, to cause its disappearance. The relative abundance of this cytochrome c in the entire population would depend upon inheritance factors. At the same time, there would appear to be no pressures to cause the disappearance of the normal cytochrome c. Consequently, each mutation would therefore increase by one the number of different types of molecules of cytochrome c present in a given species. Dr. Margoliash has noted that all the different types of cytochrome c which have been isolated, appear to be perfectly functional; none appear to have superiority of function that would provide survival value.

Consequently, if the variations in cytochrome c structure which have been noted, do actually represent mutations, there appears to be no reason why there should not be many different types of functional cytochrome c molecules in a given species. Since the evidence to date indicates that there is only one (or at least very few) types of cytochrome c in each species, certainly there is justification for questioning the basic assumption of Margoliash and Smith (i.e., that the 8-12 variant residues between mammals and birds represent 8-12 mutations).****

In place of the assumption noted above, an alternative assumption may be proposed: that similarities in structures of cytochrome c of various species is a consequence of a single Divine knowledge behind the creation of all of these species. The similarities of amino acid sequence then, are a reflection of the knowledge of a common Creator. The differences in amino acid sequence may represent, in some cases, mutations; but far more often would reflect a choice of the Creator in providing different species with immunologically different proteins for carrying out a specific enzymic task. The author is aware, of course, that invoking the intervention of Divine knowledge is not a new hypothesis; it was in vogue long before the current evolutionary hypothesis became popular.

The proposed hypothesis endeavors to provide a reasonable explanation for the experimental findings of

*Dr. Margoliash has noted, however, that rattlesnake cytochrome c (Table 1) does not fit well with this generalization. It resembles too closely the cytochrome c of man and monkey.

**Note should be made, however, that the amino acid sequence of cytochrome c from bacteria and from photosynthetic organisms has no resemblance to the amino acid sequence in cytochrome c of yeast and vertebrates[2].

***The author had occasion to question Dr. Margoliash following his lecture entitled "Cytochrome c Structural Variability" (Fourth Annual Pathobiology Conference, Aspen, Colorado, August, 1967) in regard to this limitation to his hypothesis. Dr. Margoliash noted that finding of only one (or possibly two) predominant types of cytochrome c in each species was a major problem, but he surmised that population geneticists would have to find an answer. He agreed that it was difficult to suggest survival value as an answer since all of the cytochrome c molecules appear to be perfectly functional.

****In criticizing the hypotheses of Drs. Smith and Margoliash, the author does not mean to be critical of their experimental work. The elucidation of the amino acid sequences of the different cytochromes represents a tremendous amount of careful and painstaking experimentation. Certainly, the work of these men and their collaborators represents a very noteworthy achievement in Biochemistry.

variation in protein structure that is consistent with both scientific evidence and the revealed Word of God. It must be emphasized that one of the basic assumptions of Smith and Margoliash (although not so stated), is that God did *not* enter into the processes involved in the formation and modification of life; or stated in another way, these authors assume that all modifications in living organisms are a consequence of chance happenings. The proposed hypothesis does not attempt to describe how the various cytochrome c molecules were formed in the various species. It is possible that God, in his sovereignty, brought about a change in the DNA structure to produce a slightly different cytochrome c. These modifications in protein structure might be ascribed to a purposeful "God-induced mutation" in the DNA causing the replacement of one or more amino acids of the original cytochrome c to form a new, but equally functional, variant cytochrome c. In this case, the modifications of cytochrome c (and other proteins as well) would presumably be sufficiently extensive to limit cross-fertility and hence ensure the establishment of a new species. On the other hand, it is equally consistent with the view presented, to propose that God might choose to produce an entirely new DNA for each species; in this case, however, retaining most of the basic "information" in the DNA for determining the structure of each protein. The resultant DNA would code for new proteins differing from the original proteins in only a relatively small portion of their amino acid sequences. It is certainly possible that other means could be proposed for the production of modified protein molecules, that are consistent with the view that God, in some manner, was involved in directing these modifications to achieve His desired purpose.

In view of the significance of the hypotheses mentioned herein to the basic structure of all proteins, a brief reference should be made to variation in the structure of hemoglobin. Presently, there are a large number of known variants of both the alpha and beta chains of human hemoglobin. In all cases, where the structure of the variant hemoglobin has been determined, these variants differ from normal hemoglobin by the replacement of a single amino acid, corresponding to a single base change in a DNA codon[4]. It appears likely that these hemoglobin variants are all due to mutations in portions of the DNA coding for the polypeptide chains of hemoglobin. With the possible exception of S hemoglobin (sickle-cell hemoglobin) all of these variants are rare, and in many cases (including S hemoglobin), the mutant hemoglobin is only poorly functional. Consequently, there is no reason to believe that any of these mutant hemoglobins will become the predominant form. In other respects, the arguments presented in relation to the structure of cytochrome c are equally valid for the hemoglobins. The hypothesis that the alpha and beta chains of human hemoglobin (which are similar in 61 amino acid positions) are derived from a single archetypal gene, has recently been challenged on mathematical grounds by Dr. Murray Eden[5].

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TABLE 1

Amino acid differences in cytochrome c

Species	*Amino acid differences*
Man - monkey	1
Man - horse	12
Man - rattlesnake	14
Man - dog	10
Pig - cow - sheep	0
Horse - cow	3
Man - chicken	13
Man - tuna	21
Kangaroo - tuna	20
Man - moth	31
Tuna - moth	33
Man - yeast	44

Adapted from Table III of the review by Margoliash and Schejter[3].

Have College Students Changed?

. . . College students have always raised questions, but it seems to me they are asking more fundamental questions today. This goes for students of our Christian colleges as well. Twenty years ago students in Christian colleges would challenge morality at the point of specifics—whether Christian conduct could properly incorporate petting, dancing, drinking alcohol, etc. Today, the whole notion of an enduring, universal set of moral principles is being challenged. . . . Today they wonder whether the church has anything to say to the needs of men and if it means what it says about brotherly love. . . . Today's students may not be anarchists or members of the New Left. They may never picket anyone or participate in a sit-in. But they wonder about a lot of things. They wonder why laws guaranteeing a good education to all, laws insuring proper standards for rental properties, and many similar laws are not obeyed. They wonder why demonstrators go to jail for trespassing or disturbing the peace, while slum landlords who flagrantly disobey housing codes are allowed to prosper. . . . These are searching concerns.

—Lars Granberg in *The Church Herald*

as printed in HIS, March, 1968. Dr. Granberg is a contributing editor to the *Journal of the A.S.A.*

Disheartening Drop

The world literacy figure has dropped from 43.3 percent to 39.3 percent, according to UN statistics. The increase in illiteracy has resulted in part from the population explosion.

—Reported in the *Alliance Witness*

as printed in HIS, March, 1968.

PHOTO TAKEN AT STANFORD CONVENTION—Aug. 28-31, 1967.

Right to left *Row* 1: Jack M. Carlson, Paul G. Simpson, Francis Chapman, Paul Robinson, E. M. Pattison, L. E. Richardson, K. A. Lincoln, E. Eugene Walker, Lindy L. Linville, Jeannette Acrea, Annie Amoore, John Amoore, Mildred Bowerman, H. H. Bowerman, L. M. Miller. *Row* 2: A. R. Tippett, Paul F Barkman, Robert M. Thomson, H. Harold Hartzler, Ludlow Corbin, Russel Hoyle, Jr., Richard A. Hendry, Alma Westberg, Jim Westberg, George Jennings, Bob Shacklett, Jeanne Shacklett, Jackie Allen, Elroy B. Robinson, Dorothy Robinson. Gretchen Dern, Karl Dern, Robert Hoyt. *Row* 3: Stanley Obitts, Wayne Frair, R. B. Fischer, Craig Allen, Martin Karsten, Michael Mecherikoff, Gerald Foster, Luella Lofgren, Lowell Noble, Brian Sutherland, D. Wayne Linn, William R. Nesbitt, M.D., Neil Elsheimer, Donald Logan, Charles Hatfield, Jr., Wayne U. Ault. *Rear*: Richard Bube, Norman Lofgren.

BIOLOGY

from contributing editor IRVING KNOBLOCH

The origin of life and organic evolution are usually treated as separate topics by biologists. However, this is a matter of semantics and convenience because the development of the first bit of protoplasm with its enzymes, RNA, DNA and so forth was a type of chemical evolution. Turning to this chemical evolution, we note that there are many scientists engaged in various aspects of the subject. Secondly, it is common knowledge that opinions as to what constitutes LIFE range from the naked DNA to the complete cell. Because the entire area is rather fluid at this time, it would seem unwise for anyone to claim that they had created LIFE. To give some of the recent thinking on the subject of the origin of life, we would like to quote the entire article by Judith Randal, entitled "Origins of Life" as found in BioScience 17(11): 821, 1967.* This article is beautifully written and may have escaped the attention of some of our readers.

One of the most talked about developments, not mentioned in the following article, is the work of Kornberg, Goulian and Sinsheimer, as found in the Dec. 22, 1967 issue of *Time*. Their work was to successfully synthesize a virus which could both infect bacteria and reproduce itself. It is worthy of note that they had to obtain their template from the natural DNA of a virus before they could proceed further.

ORIGINS OF LIFE

JUDITH RANDAL, Science Writer

Although "the creation of life in a test tube" in the Sunday supplement sense of the term is nowhere on the horizon, scientists continue to be curious about what can be done in the laboratory to simulate conditions on the primordial earth.

The classical experiments, of course, were performed by Stanley Miller who, as a graduate student at the University of Chicago in 1955, found that mixtures of methane, ammonia, and water yielded amino acids when exposed to high energy radiation or electrical discharge—giving rise to the idea the condensations of these amino acids in the oceans of prehistory led to the proteins we know today.

More recently, however, Clifford N. Matthews and Robert E. Moser of the Monsanto Chemical Company in St. Louis have challenged this sequence of events. Instead, they suggest in a September paper in *Nature* (Vol. 215, No. 5105), proteins appeared without the intervening formation of amino acids and as the process of evolution continued, the protein-dominated material on earth gave rise to protein-directed life. This would mean that it was not the condensation of pre-existing amino acids that set evolution in motion, but peptides, the larger condensation products of primordial gases.

Moser and Roberts do not deny that the action of lightning and solar radiation on methane and ammonia in the early atmosphere played an important role. What they are claiming is that it was the formation of hydrogen cyanide from this reaction that was the key event. More specifically, they believe that this gas polymerized and that some of the polymers were polypeptides of sufficient biological activity to spark the beginnings of life.

Laboratory investigations at Monsanto support this idea. Peptides containing at least 12 amino acids have been formed there in experiments using hydrogen cyanide and water with ammonia as the catalyst. Indeed, almost any chemical reaction which results in the formation of hydrogen cyanide under alkaline conditions is probably capable of yielding such peptides, the scientists believe.

The scientific literature is full of such speculation these days. Another scientist who questions the Miller model is Gary Steinman of Pennsylvania State University. In a recent paper in the *Proceedings of the National Academy of Sciences* (August), Steinman is not sure he agrees that peptides necessarily preceded the formation of amino acids. Rather, he thinks that there may be several "correct" hypotheses inasmuch as the atmosphere of the early earth may have varied, offering numerous conditions conducive to the beginnings of life.

Steinman quarrels, however, with the idea that nucleic acids were a requisite for replication and takes exception to the notion that peptides were formed from random combinations of amino acids.

The key word here is "random," with its associated idea of chance. In Steinman's view, the characteristic structure of amino acids and the energy levels available in nature billions of years ago made the formation of peptides not a mere possibility but a virtual certainty. As evidence, Steinman offers the demonstration in his laboratory that formation of a peptide in itself is all that is necessary for further peptide production. In experiments involving the linking of amino acids, he found a statistical preference for peptide sequences in known proteins over those sequences apparently not common in nature. He also discovered that the extent to which such linkages occurred between amino acids could be increased dramatically by adding another peptide to the mixture.

As has happened so often in the history of science, other investigators may have unknowingly confirmed the feasibility of his theory even while Steinman was still working on it. British scientists studying scrapie—a disease of sheep transmissible to a number of other species—came up with evidence suggesting that the responsible agent is a protein of low molecular weight, free of either RNA or DNA and replicating in the absence of both (*Nature*, Vol. 215, No. 5105). Thus the

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scrapie agent may be a biological fossil which like the peptides proposed by Steinman is capable of reproducing without the intervention of nucleic acid.

Perhaps another investigator, who brings a physicist's outlook to bear on the problem, will also find the scrapie agent of interest. It is the contention of this scientist, Peter Fong of Emory University, that reproduction was the initial event in the process of evolution. Fong, in the same (August) *Proceedings of the National Academy of Sciences* that carried Steinman's report, dismisses the idea that life began when simple compounds arose from inorganic materials and, in turn, polymerized into proteins. The laws of quantum mechanics, he argues, would rule this out—and in any event, reproductive processes "cannot appear step by step because each step taken out of the whole has no survival value and the Darwinian mechanism will not select and retain it."

Fong's point is that replication of non-living molecules was necessary before organisms could appear and that replicating molecules which originally were devoid of genetic information eventually mutated—gaining survival value in the process and thus becoming the basis of life. Speculating, Fong writes: "Many such mutations may take place by which the replicating molecules produce irrelevant products (trash) instead of replicase. As the trash builds up from all the nonsense replicating molecules, the probability increases that one of the trash products may become useful to help replication and thus has a survival value in the evolution process. . . . One may conceive . . . that many such useful trash products come into being together with their genetic information coded on the replicating molecules. This is the beginning of the individual organism which already has the ability to reproduce."

Have biologists then had it all backward? Are prevailing notions of biogenesis so fallacious that they must be discarded? Probably not, for as we examine some of the new thinking about conditions and events on the primordial earth, the impression is gained that the many scientists grappling with this problem have hold of different aspects of the same large truth. The parable of the blind men and the elephant is an old one, but in the absence of a surer grasp on the origins of evolution it is likely to remain apt for some time to come.

"Protestant"—a Dirty Word

A recent report states that every evangelical publication in Greece is now subject to censorship and, if approved after much delay, must bear the inscription on the front cover "Protestant Publication." In Greece the word transliterated Protestantis has a bad connotation, so the evangelicals there would rather not distribute under these circumstances. Evangelical bookshops, therefore, are threatened with closure, and exports of evangelical literature in Greek will cease.

—as reported in *Floodtide* as printed in HIS, March, 1968.

LETTERS TO THE EDITOR

The Significance of the Synthesis of Biologically Active DNA

A recent front-page article in the local paper was headlined "Major Step Taken Toward Creation of Life". Stories reported by television were even more sensational. In some cases, reports received indicated that man had actually created life. These reports referred, as I am sure most ASA readers are aware, to the synthesis of biologically active deoxyribonucleic acid (DNA) by Dr. Goulian and Dr. Kornberg of Stanford University. Without detracting from the significance of the work of Dr. Goulian and Dr. Kornberg, I must confess that I am a little disturbed to note the 'sensationalism' and speculation present in these news media reports.*

My major objection is the use of the term "creation" in describing the research. Let me summarize first, however, the actual accomplishments of Drs. Goulian and Kornberg.** The authors synthesized (outside of the living cell) new biologically active DNA using (1) a single-stranded viral DNA as a pattern, (2) two enzymes which were isolated from a bacteria, E. Coli, and (3) the four nucleoside triphosphates which serve as the building blocks for making new DNA. It is important to note that viral DNA (ØX174) was required as a pattern to copy. As yet, scientists have not been able to determine the sequence of the four building blocks (nucleotides containing adenine, guanine, cytosine and thymine) that make up the basic structure of even the simplest DNA molecule. We do know that each sequence of three nucleotide units has the genetic information ("codon") for determining the position of one amino acid in a protein. However, the order of arrangement of these nucleotide units into the entire DNA molecule is still unknown. This explains why there is a requirement in the studies of the Stanford researchers for a natural active DNA to copy, since no purely synthetic DNA has biological activity. It should also be emphasized that the viral DNA used by Drs. Kornberg and Goulian is much smaller and far simpler than the DNA of living cells. Although scientists have synthesized several biologically active proteins, the enzymes used in these studies are also of unknown structure and have not been synthesized. They were produced by living cells and were isolated by the Stanford scientists from these cells in a nearly pure state.

Although the findings of Drs. Kornberg and Goulian do mark a major milestone in the understanding of life, or more specifically, in the understanding of the replication (new production) of viral DNA, the relation of these studies to the "creation of life" is entirely in the realm of speculation. According to Webster's dictionary, creation means "bring into being" and usually implies "formation from nothing" or "formation of something complex from very simple materials". Consequently, the word "synthesize" would appear to be

much more appropriate than "create" in describing the above research studies. In addition, biologically active DNA is a long way from constituting "life". Viral DNA has properties of life only in the presence of other living cells. The virus acts by penetrating the cell and taking over the metabolic machinery of the cell. By taking control of the "information center" of the cell, it causes the cell to produce the specific proteins and enzymes required for the formation of new virus. The ØX174 virus is made up of about 5500 nucleotide units and contains the genetic formation required for the synthesis of about four to six different proteins of average size. No one knows how many different proteins may be present within a living cell; however, it has been estimated that there is adequate DNA within a living mammalian cell to provide genetic information for the production of 20 million different protein molecules of average size.*** In bacterial cells, the genetic information is adequate for the production of 20,000 different proteins. It should be emphasized that these are only estimates and assume an average size protein and also assume that all DNA is serving as a carrier of genetic information for the coding of protein structure. Nevertheless, these estimates serve to emphasize the difference between the ØX174 virus and a living cell. Although scientists may differ in their definition of what constitutes "life", they would all agree that a virus is far less complex than a living cell.

I feel that in directing the news interest of these research findings to "the creation of life" theme, the news reports miss much of their real significance. The understanding of DNA formation is basic to our understanding of the action of viruses, and hence is basic to ultimately finding a means of prevention and control of virus-caused diseases. The understanding of control of DNA formation is basic to understanding how the cell may literally "lose control" of its metabolic processes as it does in malignant tumors. Since viral DNA can penetrate the living cell, the possibility of inserting DNA fragments containing genetic information into a cell does not appear as remote a possibility as it may have a few years ago. It may become possible to provide individuals, who have a specific enzyme defect, with the genetic information for production of a functional enzyme. Consequently, the understanding of control of DNA formation is basic to ultimately achieving a means of treatment for a wide variety of inherited metabolic disorders, where there is some, as yet unknown, abnormality of cellular DNA.

With all of these potential practical benefits which may ultimately be derived from this biochemical research approach, it seems a little silly, if not absurd, to seek to sensationalize the research findings by speculating on their possible relation to the "creation of life". I wonder if this isn't an effort (unconsciously, perhaps) to replace the worship of God as Creator of life, with the glorification of the achievements of man. The living cell is a marvelously functioning and marvelously controlled piece of metabolic machinery. Consequently, I am not greatly impressed by those who emphasize how man, when he "creates life" will improve upon life as we know it now. One should remember that a malignant cell is a modified cell that, in certain aspects, might be considered an improvement over normal cells. It competes so avidly for amino acids and other nutrients that it often starves the normal cell. Yet, in so doing, it may ultimately lead to its own death as a consequence of destroying organs (blood vessels, etc.) necessary for its survival. Under these circumstances, it survives only because it rapidly divides and invades other tissues. Despite some apparent advantages of the malignant cell, there are few, I believe, who would argue that it is an improvement over the normal cell. I suspect that most of man's modifications of living cells will also prove deleterious. However, I believe there is great hope for the treatment of disease of all kinds, as a consequence of advances in the understanding of life. In my experience, I have found new discoveries in science to deepen my reverence and awe of God who conceived, created and endowed life with the means of propagating itself. God has given man the mind and the will to unravel some of the deeper mysteries of life. Should we not then marvel at the intricacies and wonders of God's achievement?

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FOOTNOTES

*It is of interest to note that the news media have been criticized for their "extravagant" reporting of the Goulian-Kornberg research in Scientific Research (Vol. 3, No. 1, p. 15, 1968).

**An accurate report of this research is presented in Science (Vol. 158, p. 1550, 1967). The original report of Dr. Goulian and Dr. Kornberg is published in the Proceedings of the National Academy of Science (Vol. 58, p. 2321, 1967).

***These estimates are taken from H. Busch, "Biochemical Frontiers in Medicine", p. 20, 1963, Little, Brown and Company.

The Sources of Science

Some few months ago my letter, commenting on an article by Mr. David Siemens concerning the sources of modern science, appeared in your journal, followed by Mr. Siemens' reply.

This reply raised more questions in my mind about the validity of his position than it settled. I therefore wrote to him directly (previously I did not have his address) asking him to clarify certain statements, and commenting on various matters raised by his reply. (Editor's note: The reply by Siemens is in the December '67 issue and the statement by Siemens following this letter is his reply to it).

It is history that modern science arose in the Christian world. The question as to why it did so, why it did not in other civilizations, and whether it could have done so in these civilizations is very complex and necessarily speculative. I am not convinced, however, that it was belief in the incomprehensibility of the material universe that kept Arabs, Greeks, and Chinese from developing modern science. The fundamental

block is not so much lack of curiosity about the universe, but uncritical acceptance of incorrect answers. The critical attitude characteristic of early scientists strikes me as more important than their belief in the rationality of the universe. Among the many other factors to consider when wondering why modern science developed in the Western world, is for example the printing press.

Siemens' position on the rationality of the universe is quite confusing to me. "Let me note that . . . the material universe is non-rational although, *prima facie,* it is rationally ordered." Presumably he means to say that the universe is not a thinking being, and if so I agree. If he really means to say it is non-rational, I disagree. To the best of my knowledge, the universe is understandable and logical. Of course, Siemens' whole article seems to take it for granted that the universe is rational. If he is criticizing my application of the word rational to an inanimate being, the dictionary bears my usage out, and he himself used the word in that sense in his article.

Further, I see no gross problem from a non-theistic viewpoint in the development of rationality. There may not be a detailed explanation, but we lack explanations for many things. There does not seem to be any intrinsic impossibility. Siemens then compares the argument that rationality emerged in an unexplained fashion (he uses the word inexplicable, but he undoubtedly means unexplained) to solipsism, and says it is logically unassailable, but not a satisfactory metaphysic. It seems odd for him to say it is logically unassailable; and it remains to be shown that it is an unsatisfactory metaphysic. Incidentally, let me note that his remark concerning "successful human relationships" (in my first letter) applies equally well to this expression. "Satisfactory metaphysic." Unless he defines a satisfactory metaphysic by his own value system, history has shown that people can live with exceedingly varied metaphysics, and survival is the only empirical test of success.

On this topic, let me say I used the word "successful" in the sense that most people mean it, just as I'm sure he used the word "satisfactory." Successful human relationships would therefore mean those relationships between humans that lead to happiness, welfare, and the progress of society. Granted that men can live with many different sets of value commitments; I still am not aware of any society, however primitive, that consistently practices and regards as exemplary lying, dishonesty, pride, anger, and isolation of the individual as opposed to truthfulness, honesty, integrity, humility, patience, and cooperation (the "virtues" of the scientist enumerated in Siemens' article.) And if there are scientists who deny the value of these virtues and continue practicing them, I would certainly like to see them.

Returning to the question of rationality, Siemens' Biblical references (Gen. 1:1—Eph. 1:11) do not imply order, design, and rationality in God's world. Belief in the rationality of the universe seems to be neither substantiated nor refuted in the Bible; assuming one, the Bible could be used to back the chosen position; for example, Romans 11:33, where Paul speaks of God's "ways past finding out". The fact that the idea of the rationality of the universe came not from the Bible but from the observations and experiences of the fathers of modern science is borne out by the fact that such a Bible student and scholar as St. Thomas could make God Creator *and still keep* Aristotle's doctrine that matter makes things incomprehensible.

Perhaps it will not do to invoke man's sensory equipment as analogous to his rationality, but until Siemens clarifies what is wrong with the analogy, I remain of the same opinion. I fail to see relevance of the fact that man may not respond to all the stimuli of the universe. If man could gather food, procreate, and defend himself from enemies without being able to sense electromagnetic radiation in its entirety, (hence,) if it was not necessary to develop senses responding to these stimuli, then man did not need them, and that is why he does not have them. The prolific rat does not find it necessary to his ecological niche to have wings and be capable of echo-location like the Chiroptera, nor does the ruminating cow need the fangs of a wolf. When I used the phrase, "adapted to his environment", I meant it in the scientific sense it is usually given, and didn't mean to mislead anyone.

My citation of Clemens was perhaps out of place in a religio-scientific journal, and I apologize. However, I'm not used to a person's ideas being rejected *in toto* out of hand merely because in trying to impart humor to what he says he may exaggerate the facts. This applies not only to Clemens but also to Siemens' statement that anything "seemingly relevant" anti-Christian that Clemens wrote "was refuted long before he stepped out of the pilot house." In his mock discussion of the German language, Clemens makes a number of valid points hidden, of course, in tongue-in-cheek exaggeration. This does not necessarily mean that what he says is all wrong, and good only for a few minutes laugh. Likewise, although most Christian apology deals with the problem of pain and evil, I have not read any that clearly refutes what Clemens wrote. Sometimes it seems to me that scientists and clergymen have a tendency to think that unless an idea is presented in the proper straight-laced manner in a proper straight-laced journal or book by a proper straight-laced person with at least two degrees, it is not worth considering.

In conclusion, science as a matter of history did arise in the Christian milieu; but to say that without Christianity science would not have been possible, and to imply that science is utterly dependent on Christianity, is to go further beyond the facts than is wise—at least on the basis of Mr. Siemens' arguments. Fortunately for the world, the validity of Christianity does not rest on its association with modern science, nor on Mr. Siemens' attempted defense of a necessary relationship with it.

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Reply by D. F. Siemens

In Parelius' attempted refutation (here and June, 1967) of my article and letter (Sept., 1966, and Dec., 1967), there are evidences that he has failed to follow the arguments. For example, he says that uncritical acceptance of errors is basic to the unscientific outlook of Arabs, Greeks and Chinese. But, as should be obvious, critical thought involves the application of reason to matters which are believed to be rationally comprehensible. The man who is persuaded that a matter cannot be rationally comprehended does not attempt to think critically about it: no man attempts what he is persuaded is impossible, whether his belief is well-founded or not. On the other hand, the uncritical acceptance of faulty explanations (I take "incorrect answers" to mean this) is often compatible with scientific advances, as may be noted in both Ptolemy's and Copernicus' systems, with their insistence on circular motion, deferrents and epicycles, or in the more recent use of "electric fluid", "ether", "atomic orbits", "animal magnetism", etc.

I do not doubt that Parelius finds my comments on the rationality of the universe confusing, for he has managed to collapse at least two senses of "rational" into one hodgepodge in both of his letters—even after I had remarked on the distinction, using terminology usual in philosophical discussions. To be sure, the dictionary recognizes the sense of "rational" he appeals to—and the meaning he confusedly introduces, and a goodly number of additional meanings. All of these meanings are acceptable, used one at a time, although philosophical analysis may involve further distinctions. Otherwise one falls into the fallacy of ambiguity or equivocation, which is generally recognized as a gross error.

Parelius further writes, "although most Christian apology deals with the problem of pain, I have not read any that clearly refutes what Clemens wrote." I add a precisely parallel argument: although all geography deals with the approximate sphericity of the earth, I have not read any statement from any geographer that clearly refutes all the points raised by a statement from the Flat Earth Society that I ran across last year. Lest this seem too flippant a dismissal of a point seriously intended, it is relevant to ask why I have found no geographer who attempts a point-by-point refutation, just as it is relevant to ask why Parelius has found no apologist who refutes Clemens. Not to be neglected in answering such questions are breadth of reading, the state of the science, the reader's ability to follow an argument, his insight into the scope of its application, to note just a few matters.

Parelius attempts to make many other points in his lengthy letter. They might have been considered one after another. But after pointing out an instance of inadequate analysis, a case of ambiguity and a use of the notorious *argumentum ad ignorantiam*, need more be said?

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The Bible and Human Evolution

Although I am not qualified to be a member of the *American Scientific Affiliation,* I do receive the journal and find it extremely helpful and stimulating.

Because of my lack of scientific training, I hesitate to criticize with very much dogmatism; but I would like to mention some points in Mr. Horner's article, "The Bible and Human Evolution" which appear to me to be erroneous. I am not so sure of myself that I do not welcome correction so would appreciate such by Mr. Horner or some other qualified person.

1. The author states "Nor is the Bible clear in stating that Adam was the first man. In fact, the name 'Adam' first appears in Genesis 2:19 after the creation of 'male and female' in Gen. 1:27." I am not disrupting the possibility of a pre-Adamic race; but wonder if the reasons stated by the author are valid. The Hebrew word translated 'man' in Gen. 1:27 is the same word as is translated 'Adam' in Genesis 2:19 (actually a transliteration). Newer translations of the Bible correct this peculiarity which is found in the King James Version. Furthermore, Chapter 2 verse four connects the man created in 1:27 with the man found in chapter 2.

2. The author states, "Adam is not the first biological man. He is the first man carrying God's promise into the world." He supports this by suggesting that Cain could not have married his own sister. However, if there was a pre-Adamic race, it appears that it no longer existed since Eve received her name, "because she was the mother of all living." Romans 5:12-21 also indicates that Adam did more than just carry the promise; he passed on a sinful nature to all his descendants . . . all humanity.

3. After giving three kinds of organic change defined as evolution the author states that strictly speaking only "Quantum" (jumping gaps) is really evolution since it alone meets the definition of evolution which he says is ". . . the gradual development . . ." This appears to be contradictory.

4. He states that figure 3 shows some of the fossil evidence defined as man and their approximate dates—". . . there is no doubt as to the veracity of these facts." Apart from catastrophism which seems to me to still be a possibility, considering the great variety of dates given to these fossils I question the accuracy of that statement. For example, Leaky places Australopithecines at 1,750,000 but Schenk (*The History of Man*) places him 600,000 to 400,000 (p.10). And, he seems a bit confused himself, for on Pp. 64,65 he puts them at 1,000,000.

Am I wrong in thinking that Wadjak I and II were found at the same level and lower than the original Pithecanthropus? If so, shouldn't we admit that dating Wadjak I and II at 10,000 and Pithecanthropus at 700,000 could allow for some doubt?

While on the subject, I wonder if someone could recommend a good book which gives a good summary of most of these ancient gentlemen (including publisher). I have found Schenk and a number of other such books as very incomplete and confusing.

5. Mr. Horner assumes that tools is an evidence of being a Homo Sapiens. This is standard thinking; but I do remember a stimulating article a few years back in the A.S.A. Journal which questioned this conclusion. Today I heard on the radio of teaching chimpanzees how to play "tic tac toe". It would seem that this is an area which could use more thought.

6. Again, another article indicated that the tools supposedly belonging to Zinjanthropus probably belonged to Homo Habilis who apparently feasted on Zinjanthropus. Mr. Horner said nothing about this and considered Zinjanthropus to be human. Why? Is there some new knowledge about the relation between Zinjanthropus and Homo Habilis?

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Response to Mr. Cole

I am pleased to respond to Mr. Cole's letter. I'm sure that in it he has also voiced the thoughts and opinions of others. Indeed, some clarification of points I made in the article are in order. My numbering will follow those of his letter.

1. The phrase "male and female" seemed to precede the phrase "Adam and Eve" in my Bible! It points up that *this* anthropologist's knowledge of the Hebrew language is as ignorant as most theologians' knowledge of anthropology. Since the morphology of early Hebrew poetry (mythology) reflects the Hebrew's worldview and requires an equilibrium, male and female are neatly balanced by Adam and Eve, both being the same. This is true throughout Genesis 1.

2. I quite agree with some of his points. I would stress my point again: that there were humans in the world *other than* the children of Adam and Eve whom the latter's children married. To say, "if there was a pre-Adamic race, it appears that it no longer existed since Eve received her name 'Because she was the mother of all living' ", is a good example of closing one's eyes to the overwhelming evidence to the contrary in God's revelation in nature.

3. Since evolution is an abstract concept, it can be used in almost any way one wants to use it.

4. The dates given in chart 3 are approximations with the exception of Zinjanthropus, which as a stable date, is 1,750,000 $\pm$ 300 years. In capsulating some of the material relating to Zinjanthropus and Homo habilis, I purposely omitted Australopithecus since I considered "it" as "ape" rather than human. I should like to develop this point now: a) It must be kept in mind that there are 77 Australopithecines in Africa alone. These are divided into two groups: "Australopithecus africanus and Austrolopithecus robustus. The "true" Australopithecus, the one giving the name to the group, belongs to the former; Zinjanthropus belongs to the latter. In fact, he is Mr. Robustus himself. Both groups were contemporary. The majority of scholars feel that Australopithecus africanus was an ape, while Zinjanthropus was hominid or human. The former, A. africanus was probably a random tool-maker though some question even this capability; the latter, A. robustus, was a symbol-maker who purposefully made tools. Although Leaky considers Homo habilis an Australopithecine, Clark, for example, doesn't and it will probably take a while before one will definitely know about the "handy man". He is up for grabs.

Schenk's book, published in 1961 is hopelessly out of date.

Wadjak I and II found by DuBois in 1892 were considered as on the same geological level as Pithecanthropus erectus, now called Homo erectus. A re-study of the stratigraphy of Java in the 1930's showed up this error with the result that the Wadjak's are Upper-Pleistocene and Pithecanthropus is Middle Pleistocene, rather than lower as DuBois originally placed him. The Wadjaks to my knowledge, were never placed lower than P. erectus.

5. Mr. Horner was careful NOT to say "that tools is an evidence of being a Homo sapiens". That is contrary to the facts. The point made was that man is unique in his symbol-making ability. The difference between a symbol-maker and a tool-maker is the difference between conceptual and perceptual ability. Man enjoys both. The chimps, porpoises and dogs among other animals enjoy the latter. The choppers made by Zinjanthropus, the religious ceremonies of Peking and Cro-Magnon man are a difference in concept compared to the sharpening of sticks to make tools and playing tic-tac-toe by the chimp, which are perceptual. *Man* can not live by tools alone!

6. Answered in No. 5. This relationship is not known.

Suggested Bibliography

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Protest, Power and the Future of Politics

A preoccupation with power—black power, student power, flower power, poor power, "the power structure"—is the most striking aspect of the American political scene at the moment. Oddly enough, obsession with power goes hand in hand with a fear of power . . . What the preoccupation with power reflects . . . is a deep-seated, pervasive feeling of powerlessness. The feeling is not restricted to particular groups; most citizens, a majority perhaps, are bedeviled by it.—Cary McWilliams in *The Nation*
as printed in HIS, March, 1968.

BOOK REVIEWS

MARLIN KREIDER, editor

FAITH AND THE PHYSICAL WORLD: A COMPREHENSIVE VIEW, David L. Dye, Eerdmans, 1966, 214 pages.

As a practicing physicist, Dr. Dye has a firm grasp of the scientific method. As an evangelical Christian, he holds a high view of Scripture. Like most thinkers, he feels the need for an adequate world-and-life view. In this book the author endeavors to develop a consistent Christian world view: *Christian* since it presupposes man's relationship with God in Christ; *world* in its purview of total reality; and a *view* that will make sense out of ourselves and our enviroment to give goals for living.

Dye pinpoints two opposite but equally irrational approaches to science in Protestantism today. The Fundamentalist tends to reject data that cannot readily be fitted into his current interpretation of the Bible. The Liberal, on the other hand, tends to accept uncritically interpretations of modern scientists and philosophers which require drastic revisions of Biblical doctrine. The author rejects both extremes as unscientific, in that they are uncritical, and delineates an alternative approach. In doing so, Dye has produced one of the best books in the field by an evangelical Christian in this decade, despite a significant weakness in his basic philosophical approach. As a diligent student of the Scripture and a practicing Christian, he has written with candor, perception, and humility. He has done his homework well, showing an open mind coupled with commitment to basic presuppositions. I shall briefly summarize his approach to life and the scope of the book, then pinpoint a basic weakness in the way he relates the scientific and Biblical approaches to the natural world.

Dye lucidly describes the scientific method in the section entitled *Physical Reality*. He explains its three basic operations: observation, generalization and verification. The author shows how these three pillars of the scientific method rest on three fundamental presuppositions or philosophical assumptions:

1. Physical reality exists and is objectively observable.
2. Physical reality lends itself to logical description.
3. Some kind of causality operates in nature.

Here Dye observes: "Note that we do not need to specify any particular concept of physical reality, nor the formal properties of the logic, nor the type of causality that operates. The particular meanings one assigns to these assumptions define, not his science, but his philosophy of science. . . . These three presumptions are both necessary and sufficient for descriptive science."

Dye corrects a prevalent misunderstanding about the nature of scientific truth. He defines scientific proof in terms of consistency: "It behooves us to remember that in science consistency of data interpretation constitutes proof." This consistency is of two kinds. A scientific generalization must be internally consistent, or logically non-contradictory like a geometric theorem. In addition it must be externally consistent with the phenomena predicted; if the theoretical description and experimental results agree, the theory is verified. Contrary to popular thought the scientific method does not discover absolute truth. Dye emphasizes that scientific theories or laws are always tentative, since the data are never complete. "In its history, however, science has abandoned many principles." In other words, science constantly travels but never arrives.

The author distinguishes this scientific method from scientism and naturalism, philosophical views which deny the possibility of any reality not amenable directly to scientific observation. "Science tells us how things happen not why . . . because of its presuppositions, science is philosophically neutral . . . this potentiality allows scientific inquiry to proceed unfettered by personal philosophic bias." Contrary to the claims of some scientific and popular opinion, science by its very nature cannot solve our deepest human problems. "We need ethical guidance for life which the increasingly accurate scientific descriptions do not contain. . . . To borrow a mathematical phrase, science is philosophically indeterminate."

Christian Presuppositions

In the next section entitled *Christian Presuppositions* Dye posits two additional assumptions. First is the existence and nature of God. He is designer and creator of the physical universe, omnipotent and omniscient, and spirit. Dye carefully points out that "God is not postulated as a means of explaining things not now understood by science, as many naively think, and as many Christians and others have mistakenly supposed in their past arguments. . . . Belief in God arises, humanly speaking, from the inherent human need for comprehending meaning and purpose in life, and this type of understanding is qualitively different from that of science's descriptions. Increasing the amount and accuracy of scientific description does not of itself lead us to acquire meaning in life, nor to achieve moral values."

The second assumption is the revelation of God in the Person of Jesus Christ. The author deals effectively with this revelation in Christ recorded by Scripture. He then describes the God revealed by Jesus Christ.

In a parenthetical discussion on miracles, Dye makes several cogent observations. "This is the criterion by which to define a miracle: "God's purposes are being specifically accomplished in a physical event." It may be what we call "supernatural" (unexplainable) or it may be a "natural" event whose remarkable feature is its timing. The essence of miracle is the use God makes of the event to glorify His name.

Dye concludes that a specifically Christian comprehensive world view rests on five presuppositions: three

scientific and two Biblical. The author has an interesting diagram showing the relationship between the world we observe and the perspective from which we view it.

The remainder of the book works out the implications of this position. An excellent chapter entitled *The Whole Man* shows man's need for extra-scientific meaning in life. Dye sketches the resolution of this problem through personal commitment to God in Jesus Christ. He then deals with problems of Biblical interpretation and criticism, the origin of the universe, the origin of life and the aberrations of emotionalism. intellectualism and legalism. An excellent selected reading list briefly sketches each book's purpose and position.

Critique of Basic Position

Dye stakes out his basic philosophical position in the introduction. The book starts with the assertion, "Science is a means of knowledge about the world in which we live. It is the best means of knowing thus far devised by men" (p. 11). He observes, "The development of science as the best means of knowing about our world has precipitated many discussions as to the validity of any other means of knowing." He expands this concept two pages later. "Science gives us at best only an incomplete picture of reality. Science is the best—perhaps the only—means of describing physical reality, but if another category of reality exists by which needed ethical standards are determined, or our moral natures are to be satisfied, then science might not be applicable to it. . . . The view of this book is that science treats only the physical part of our total environment. The other part—let us call it the spiritual part and leave it undefined for now—is also necessary for the fully satisfactory human experience of life (p. 14). . . . As subsets of the ultimate total reality, we have postulated the two spheres, physical and spiritual reality, about which we can know something, by scientific observation in the one case, by more specific revelation from God in the other" (p. 69).

The author here makes several major assumptions which I can accept: 1) reality as a whole comprises more than the physical world; 2) the domain of science is observable physical phenomena; 3) science is a means of knowing about the world in which we live; 4) the scientific method does not yield ethical and moral values, nor is it able to produce purpose and meaning or life.

But I must take issue with his basic approach to reality which asserts that science is the best, perhaps the only, means of describing physical reality while Christianity describes another realm, the spiritual. This compartmentalization is open to question on two grounds. First, the physical world may be observed and represented not only scientifically but also aesthetically—a dimension the author overlooks. Second, Biblical religion takes the physical world seriously. Unlike Greek philosophy, it does not differentiate between matter and spirit by relegating religion to the realm of the spirit and the mind. In other words, the scientific method is only one of many approaches even to the physical world, while Biblical Christianity does not concede the physical world as the domain of science, operating only in a "spiritual" category of reality.

While good military strategy often divides in order to conquer, this approach has been fatal to theology. We must learn this lesson from history. Thomas Aquinas assigned the domain of the observable and explainable to reason and the unexplainable to faith. Dye rightly rejects this position which produced a "God of the gaps". The Bible does not separate reason and faith as operative in different domains, nor does it so separate spirit and matter although it distinguishes between them.

On the contrary, we must approach reality as a whole, distinguishing not compartments or domains (which always engenders boundary disputes) but different approaches to the whole. The entire physical world may be observed from a variety of perspectives. Take man as an example. He may be viewed *chemically* as a complex of compounds; *biologically* as an animal organism; *psychologically* as a unique creation different from the animals; *aesthetically* as an artist; *theologically* as made in the image of God with spiritual awareness. In every case the *total* man is under scrutiny; he is not divided into sections (Christianity taking his spirit and science his body). Rather the entire man is viewed from different perspectives. Each perspective, a partial view of the total man, looks for certain elements and analyzes them accordingly within its own frame of reference.

So it is with the natural world. The scientific method measures, quantifies and predicts natural forces. It is not the *only* means of describing physical reality, nor even the *best,* but simply *one* very effective method for a limited purpose. Bethoven's *Pastoral Symphony,* the artist's painting, and the Psalmist's declaration "The heavens declare the glory of God" are equally valid, though widely different, representations of reality.

Dye writes, "Note also that science based on these presuppositions, describes observable reality and that this is the proper domain and function of science. This is the crucial point in our world view, for by it we decide where the interface comes between science and philosophy" (p. 34).

Observable objective reality is indeed the domain of science but not exclusively. It is also the domain of art, philosophy and even theology. Biblical Christianity is intensely physical as evidenced by the incarnation and resurrection of Jesus Christ. While it has dimensions beyond our natural world, it comes to us clothed in physical, observable phenomena. The "domain and function" of science should not be equated. Its domain is the world of observable phenomena; its function is to examine them from its particular perspective and for its own purpose. Philosophy has the same domain but a different perspective. Thus any "interface" between science and philosophy occurs not in the object studied, like a geographical boundary, but in overlap of method or approach. Questions of ethics,

morals, meaning, value and purpose are dimensions of the total world in which we live and also express themselves, for better or worse, in physical events.

This weakness in the author's basic philosophical position, however, does not seriously impair the book's usefulness. Dye makes a significant contribution to the relationship between science and Christianity. This is one of the most valuable contemporary books in the field which adequately interprets the scientific method in readily understandable language and relates it to a thoroughly evangelical interpretation of Scripture.

Reviewed by Dr. Charles E. Hummel, President Barrington College, Barrington, Rhode Island.

THE CASE FOR CREATION, Wayne Frair and P. William Davis. A Christian Forum Book, Moody Press, Chicago, 1967. 96 pp., paperback $0.95.

Recently, President Dick Bube has challenged ASA to its responsibility in the light of its stated purpose. He deplores the fact that, as an affiliation, we have produced only two books in 26 years! But is this the whole story? Publications by our members but not sporsored by ASA are becoming more frequent. His own "Encounter" ("The Encounter Between Christianity and Science," Richard H. Bube, ed. Eerdmans: Grand Rapids, 1968) and Maxwell Coder and George Howe's "The Bible, Science, and Creation" (Moody: Chicago, 1966) are two examples. This small paperback is another.

Using the "grammatico-historical approach to Scriptures" which is "the method of biblical exegesis (interpretation) most universally accepted among scholars of all shades of theological opinion today . . ." (p. 75), the authors build on the basis that:

1. "God is the Creator"
2. "There is order in creative activities"
3. The creation of man was the climax of creative activity.

Although not making a great isssue of time, they prefer "days of Genesis . . . comparable to our own days," and days reflecting "the temporal orders of creation." Their main working thesis is that:

> It is the task of evangelical research to determine the nature of the Genesis 'kind.' We may infer that all changes take place only within boundaries set by the creative hand of God since the Scriptures teach that organisms reproduce after their kind. Hence, no change can take place capable of causing an organism to move to a kind different from that of its ancestors. For this reason it is important to discover what the boundaries of the 'kinds' are. (p. 79)

The biological areas relating the General Theory of Evolution are concisely presented and alternative explanations of the data suggested. After tying in history (Darwinism) and philosophy (Nature of Science), they discuss briefly the reason for similarities, the various comparative fields, distribution in time and space, and prehistoric man. Except for a momentary lapse in describing *Seymouria* as "a mammal-like reptile" (p. 56) (*Seymouria* had some characters of amphibians, some of reptiles. The mammal-like reptile is *Cynognathus*), most data are up-to-date and presented in a straight-forward manner. High school and college biology students will recognize each topic. They will be helped particularly by the short annotated reading list. An index—usually missing from such short books—is a welcome feature.

Feeling that, "The Christian can present special creation as an alternative to the doctrine of organic evolution," they emphasize gaps rather more than synthesis. They make a point, for example, of the "host of fossils" found in the Cambrian "which are virtually absent from older layers of rock." They further state that from a scientific standpoint alone it is evident that a spectacular event must have occurred at that time and that "the abrupt change . . . is a result of God's creative activity." (p. 55) About the gaps they say that, "There appears to be little question about the fact that gaps are real, and it seems increasingly less likely that they will be filled." (p. 56)

Frair and Davis' purpose (p. 9) to formulate their main ideas "after honest examination of scientific data and proper biblical exegesis" has, I believe, been accomplished within the parameters of their presuppositions. Theirs is certainly one way to handle the various data. Refreshingly, they have resorted to a minimum of invective. Their challenging closing sentence re-enforces President Bube's concern. "Perhaps as a result of renewed research effort by God's people, clarification of His creative pattern will soon be forthcoming." (p. 81)

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Choice

Some of you have said, "The Journal has too much pro-evolution in it." Some of you say, "We have heard enough anti-evolution and flood material." It is hoped that, as President Bube has suggested, we may have more material on current crucial issues. Please send it in.

R. L. Mixter

Imagination in a Technical, Secular Culture

Perhaps the chief problem about the population explosion is not the crude one of food and shelter but the lack of spiritual room. The spontaneous is a manifestation of the life of the imagination, and we try to cut it off at its root. We establish rules that everybody had better follow or else the world will become unlivable. In the case of what we call juvenile delinquency, the farm youngster of old engaged in much the same behavior as the city child today, but he was simply Tom Sawyer having a lark. Now his urban counterpart is a social problem. And in truth, he is, as the farm youngster was not, because his behavior is no longer acceptable in a crowded industrialized world.
—Howard Radest in *Center Diary*:16
as printed in HIS, March, 1968.

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