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

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THE SUPPOSITIONS IN SCIENCE AND IN THEOLOGY

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The purposes of this paper are to review briefly the stated purpose of the American Scientific Affiliation, to present some comments upon the identity of current issues which are of significance in the area of the relationships between science and Christianity, and to consider in some detail an issue which is probably the most basic one in this subject matter area.

Purpose of the American Scientific Affiliation

The official purpose of the American Scientific Affiliation, as stated in its Constitution, is two-fold: (1) to investigate the philosophy and findings of science as they are related to Christianity and the Holy Scriptures; (2) to disseminate the results of such studies to both the Christian and secular worlds. Let us consider briefly four aspects and implications of this statement of purpose.

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(a) *The American Scientific Affiliation is a working organization.* Included in its membership are persons who are actively engaged in investigations and in disseminating the results. In the earliest years of the existence of the organization, the members were very few in number, and virtually all of them were actively engaged in working together in specific projects which were undertaken by the organization. In more recent years, changes have occurred, both within the American Scientific Affiliation and in the "worlds" with which it communicates. The membership has increased many-fold and is, in some respects, quite diverse. Not all of the present members are actively engaged in any organized or intensive way in the specific projects which are undertaken by the organization. Nevertheless, the general purpose of the American Scientific Affiliation remains the same (even though the exact wording has been changed in the past and may change in the future), many members are very actively engaged in the work projects of the organization, many are actively engaged in similar projects not officially within the organizational structure, and all of the members presumably are deeply interested in its existence and accomplishments.

(*b*) *The American Scientific Affiliation concerns itself with a certain, broad subject matter area,* the relationships between science and Christianity. This has long been a very important subject matter area. Using somewhat different terminology, A. N. Whitehead wrote in 1926, "When we consider what religion is for mankind, and what science is, it is no exaggeration to say that the future course of history depends upon the decision of this generation as to the relations between them" (A. N. Whitehead, "Science and the Modern World", Macmillan, 1926).

Now, about two generations later, it appears that developments and decisions made relating to scientific matters during recent years have tremendously influenced the course of history. It further appears that ethical and moral problems of unprecedented magnitude are now facing mankind. Intense alarm, uncertainty and pessimism are rampant among laymen, scientists and theologians alike. People everywhere are looking in all conceivable directions, including to science, to theology and to Christianity, for the answers to the intellectual and practical problems, immediate and long-range, which face mankind individually and collectively.

Changes of even greater significance in the course of history are already in sight in the near future. It appears that the ability to use molecular biology and applied genetics to modify the genetic structure and physiology of coming generations will be even more important and more disturbing than have other scientific and technological developments to date.

Inasmuch as the ongoing progress of science is so deeply involved in moral and ethical problems and decisions, and inasmuch as Christianity is surely deeply involved in morals and in ethics and in the nature and existence of man and of his total environment, the specific subject matter area to which the American Scientific Affiliation addresses itself is of tremendous importance.

(*c*) *The American Scientific Affiliation approaches its work from the viewpoints of practicing scientists.* This fact is implied in the statement of purpose and is further spelled out in the criteria for membership—each member must be educated in science and must be currently engaged in some kind of scientific work.

Because of the interdisciplinary nature of the subject matter of the American Scientific Affiliation, the scientists who comprise its membership must be cognizant of the philosophy and findings of Biblical theologians, and they must contribute in two-way contributions and in joint investigations with theologians.

Perhaps it may seem presumptuous for scientists to attempt to participate in theological and quasi-theological studies. However, every field of subject matter inquiry can bear the scrutiny of persons whose professional orientation is outside of that field; in fact, this type of scrutiny is absolutely essential to the meaningful development of any field of inquiry.

(*d*) *The American Scientific Affiliation attempts to distribute widely the results of these studies,* and this not merely to its own clientele or to persons with related professional interests, but to the Christian world and to the scientific world. This distribution serves a dual purpose: other persons can benefit from the results of the studies; the wide distribution leads, through various mechanisms of interaction, to refinements and to further studies of significance.

In order for this dissemination to be meaningful, or even for it to be received, it is essential that the American Scientific Affiliation be relevant to the needs, the problems and the trends within the Christian and non-Christian communities, within the contemporary scientific and lay communities. Thus, the American Scientific Affiliation must exhibit, on the one hand, a stability of content and consistency of purpose and, on the other hand, an up-to-date awareness and relevancy to the continually changing times in which it exists.

Definitions (Descriptions) of Some Terms

Before proceeding to a consideration of the issues involved in the relationship of science and Christianity, let us briefly consider the meanings of a few terms which must be employed in this discussion. It is important to recognize that objects, concepts, ideas exist and that words must be used to identify and to refer to them, not vice versa. Thus, in using such common words as science, theology and Christianity, we are bound of necessity to specify and use them in their common meanings, or, if this is not feasible for any of several reasons, to specify clearly the meaning and context within which each term is used. To do less is to run the risk of failing to communicate with the "worlds" which are designated in the purpose of the American Scientific Affiliation.

A thorough discussion of the meanings of the three terms, science, theology and Christianity, could be very profitable, but it would be too time-consuming for present purposes. Therefore, working definitions or descriptions will be given here with very little elaboration.

Science is the body of knowledge obtained by methods based upon observation. Thus, science is both a body of knowledge and a method or, better, a variety of methods. Science includes experimental observation, both as a base for building knowledge and as an arena for checking during the process of building, but science also includes the interpretive and theoretical building upon that base. Human beings are necessarily involved, both in the observing and in the building of knowledge on the base of the observations. As Hooykas has stated, "In real life we never meet one (a scientist) in the chemically pure state" (R. Hooykas, "The Christian Approach in Teaching Science," Tyndale Press, London, 1960).

Theology is defined in Webster's dictionary as "the study of God and his relation to man and the world". Biblical theology is similarly defined in the

dictionary as "the theology that seeks to derive its categories of thought and the norms for its interpretation from the study of the Bible as a whole". Biblical theology, like science, has a subject matter of knowledge—"categories of thought"—and an authoritative standard—"norms for its interpretation"—so we will take as a working definition, *Biblical theology is the body of knowledge obtained by methods based upon the Bible.* Therefore, insofar as these working definitions are concerned, science and Biblical theology are (1) distinct one from the other in their ultimate authority, (2) may or may not overlap in the content of their bodies of knowledge, (3) may or may not overlap in the methods employed in gaining the knowledge.

Christianity is a complete world-view based upon the God of the Bible as its primary fact. Christianity must, as a complete world-view, encompass both science and theology, both as bodies of knowledge and as methods, insofar as science and theology are valid. By contrast, alternative world-views include the following, among others. (1) *Scientism,* which is defined in Webster's dictionary as "a thesis that methods of natural sciences should be used in all areas of investigation, . . . a belief that only such methods can be used fruitfully in the pursuit of knowledge", indicates that scientific knowledge is valid while purely theological knowledge is not. (2) *Biblicism,* which is defined in Webster's dictionary as "narrow or exclusive use of the Bible", indicates that Biblical knowledge is valid while purely scientific knowledge is not. (3) *Isolated dualism* is the view in which science and Biblical theology are both considered acceptable, but with the stipulation that they deal with different subject matters with little or no connection to each other. (4) *Other theistic world-views* are based upon "gods" other than the God of the Bible.

Identifying the Issues

Many points of issue arise within science, within theology, and between science and theology. Some issues involve very specific points and are of rather narrow significance, even though they may be of considerable importance and interest within their realms of significance. Other issues are much more basic and fundamental to the very structure of science or of theology. Many issues, of course, lie somewhere between these extremes.

Much of the effort of practicing scientists is necessarily directed toward the identification and resolution of specific issues. Similarly much of the effort of teachers of science is directed toward the teaching of detailed, specific points, with relatively little attention to the more basic factors which underlie, and are derived from, the specific points of issue. However, there is much attention being given now by practicing scientists to very basic and fundamental issues, including among others the chemical and biological distinctives of living matter and the chemical bases of thought processes and psychological behavior.

Theology, like science, is a very active field of inquiry today, and this fact is widely recognized and acknowledged even outside of the field itself. For example, a prominent engineer and engineering educator, M. Williamson, wrote in the August 1967 issue of *Research/Development,* . . . "There are more changes taking place in the field of theology these days than there are in the fields of science, and religion (i.e.. applied theology, plus) is likewise a more active area of change than engineering (i.e., applied science, plus)." Current theological issues include both specific points and basic ones. Both types demand and receive considerable attention, but again it seems that relatively more attention is being directed today toward very basic issues than has been the case for many years. Of particular concern to many persons, theological professionals and laymen alike, are such basic theological issues as the meaning and nature of authority and the nature and even the existence of God. The current stress upon very basic issues in theological circles is illustrated by the following quotation from an editorial in the August 2, 1967, issue of the *Presbyterian Journal*—"Sometimes it is argued that differences have always existed in the Church. True. But in the past these have been mainly over internal matters, over varieties of interpretation within the Gospel tradition, over disagreements between men who were Christian. The differences today are between fundamental Christianity and fundamental paganism".

In the inter—, as well as the intra—, science and theology realms, we again find many points of issue which are of considerable interest and importance today. Both specific and basic points of issue are in evidence, and again it seems that relatively much attention is focused now on the very basic issues, including for example the moral and ethical issues raised by developments in the broad field of biochemical genetics.

The one most basic issue in the subject matter area relating science to Biblical theology and to Christianity must surely be the one question—*is science basically compatible with Christianity and the Scriptures?* This issue, although stated here as a straight-forward yes-or-no type of question, is really a very complex one. It is not at all unusual for persons who take opposite positions on this issue to give very quick "yes" or "no" answers to it, often to the detriment of meaningful and valid investigation of the real issue. A full consideration of this question, in all of its complexity, is beyond the scope of this paper and, in all likelihood, beyond the capabilities of any individual. Nevertheless, much of the resolution of this issue must be based upon the presuppositions of science and of theology, and upon the provisions which are built into science and theology to check themselves, even to check the presuppositions. This is an extremely important topic which has received much less attention than it merits. As stated by a physicist, J. K. Wood (in his book, "The Nature of Conflicts Between Science and Religion," Utah State University, 1962), "The science-religion conflict comes

down to a conflict over presuppositions and the related conflict over ways of knowing." Wood then proceeded to point out a tragic consequence of failing to recognize this situation, in driving persons to embrace scientism, Biblicism or isolated dualism rather than Christianity (all as defined earlier in this paper), when he stated, "Both the religious background and the science are often presented to the student without mentioning the nature of the presuppositions underlying these two areas. If the student can see the contradiction, then he is likely to choose one or the other or he may set up a barrier between the two."

Presuppositions in Science

A presupposition is a piece of information, or even an attitude, which a person accepts as valid and correct without personally deriving or proving it, as he draws conclusions and as he does further work. There are presuppositions in scientific work, and the literature on presuppositions in science is extensive, albeit not very well-known in either scientific or lay circles. For example, physicist H. K. Schilling (in his book, "Concerning the Nature of Science and Religion", State University of Iowa, 1958) stated, "Now if there is an issue here, it certainly cannot be whether there are presuppositions or not—since surely they are inevitable —but rather what they are, and whether they are legitimate, significant and fruitful". Then Schilling proceeded to tabulate and to classify many which had been discussed elsewhere in the literature. R. Oppenheimer expressed a similar thought in different terminology (in "Perspectives in Modern Physics", in a 1967 publication of Wiley), . . . "for every science sees its ideas and order with a sharpness and depth that comes from choice, from exclusion, from its special eyes".

Many of the practical day-by-day presuppositions of the practicing scientists involve such details as the labels on bottles of chemicals, the markings on indicating meters and the reference data which are tabulated in various handbooks. He is generally fully aware of these matters and, in fact, frequently does take steps to validate or to modify them by analysis, by calibration and by redetermination.

There are also, however, presuppositions which are much more basic and fundamental to the structure of science, three of which will now be listed and briefly discussed.

1. *Nature (the physical realm) is real.* This presupposition, although occasionally questioned by philosophers, is normally accepted by scientists as so obvious that it hardly merits a thought. Nevertheless, in the words of M. Polanyi ("The Creative Imagination", Chemical and Engineering News, April 25, 1966), ". . . scientific discoveries are made in the search of reality—of a reality that is there, whether we know it or not . . . For the scientists' quest presupposes the existence of an external reality."

There is variation of opinion as to what all is included or involved in that which is assumed to be real. As a minimum, it must include the fundamental particles and the natural laws, as stated by D. Wooldridge ("The Machinery of Life", McGraw-Hill, 1966), "The explanations of physical phenomena must always start with the fundamental particles and the natural laws . . . He (the scientist) accepts as 'given' the laws and particles of nature and spends little time worrying about the metaphysical problems associated with their origin."

2. *Nature is rational,* in the sense that nature is consistent and uniform in total cause-effect relationships. The now well-known booklet, "Education and the Spirit of Science," issued in 1966 by the Educational Policies Commission of the National Education Association listed seven "values" underlying science. One of these "values" is respect for logic, under which is the comment that, even though there are varied systerms of logic, "all of them agree on the meaning of such basic concepts as consistency and contradiction". Without this firm belief in the rationality of nature, there could be no science as it exists today.

3. *Nature is understandable, in part.* This is a twofold presupposition, and both of its parts are tremendously important. Another one of the seven "values" underlying science, as listed in the above-mentioned publication, is the "longing to know and to understand" —"The spirit of science is, at bottom, a longing to understand". And yet this confidence in the understandability of nature is both tempered and also challenged onward by the recognition that, in science, "there is no perfect knowledge and no perfect knower".

Presuppositions in Theology

In theology, as in science, there are presuppositions. Again, there are many specific ones which are encountered in day-by-day work, and there are others which are so basic and fundamental that the very structure of theology would fall without them. We will concern ourselves here only with the most basic ones. We will list three, stating them with particular reference to Biblical theology. However, if the phrase "of the Bible" were to be removed as a modifier of the name, God, in each statement, these three statements would still stand as the presuppositions of theology in general.

1. *The God of the Bible is real.* Even though many attempts have been made by men to prove the existence of God, the Bible itself assumes His existence and nowhere attempts to prove it. The first verse of the Bible *states* His existence. In his famous sermon on Mars Hill, the Apostle Paul *declared* God. Furthermore, the Bible makes it clear that this absence of any attempt to prove His existence is deliberate, not merely an oversight, as stated, for example, in the book of Hebrews, "He that cometh to God must believe that He it". The reality of God, in Biblical theology, is accepted by faith, if it is accepted at all. The one most basic presupposition of theology is that God is real. There is a variation of opinion as to what or who God is, particularly in contrasting Biblical theology with other systems of theology, but this fact does not negate the

essentiality of the basic presupposition of the reality of God.

Over the years attempts have been made to prove philosophically the existence of God, by the familiar "teleological proof", "ontological proof", and so forth. This type of consideration does provide much supporting evidence for the individual who already believes. But these are not proofs, as is attested by the fact that many intelligent persons, thoroughly and honestly familiar with these philosophical "proofs", still do not accept the reality of God.

Similarly, attempts are made to prove the existence of God in nature. Again, this type of observation does provide much supporting evidence for one who accepts, as a presupposition, that God exists, but many intelligent, intellectually honest persons who are very familiar with the physical and biological realms do not accept the Biblical concept that God is real. It is interesting to note the Biblical terminology, "the heavens declare the glory of God and the firmament sheweth his handiwork"—i.e., *declare* and *sheweth,* not *prove.*

2. *The God of the Bible is rational,* again in the sense that He is consistent and uniform in total cause–effect relationships. The Bible declares that Jesus Christ is the same yesterday, today, and forever. This statement, if it is to be accepted at all, must be accepted as a presupposition, as it is hardly conceivable that any human beings would have either the time or the ability to derive or to prove it. One of the major reasons for the historical detail in the Old Testament, for example, is to provide information as to the existence and nature of God, and this information would be of no more than curiosity value to us if God were by nature inconsistent and self-contradictory.

It is important to note that circumstances and combinations of causes may differ from situation to situation and from time to time, but this does not alter the uniformity of the total cause-effect relationships.

3. *The God of the Bible is understandable, in part.* This is a two-fold presupposition, and both of its parts are essential. The Bible contains declarations of God, and much information concerning Him, in order "that we might know Him". Without the firm conviction that He is knowable, that He is understandable, there would be no Biblical theology. Again, however, this confidence is both tempered and challenged onward by the recognition that man, in this life at least, can understand God only in part. Even the most learned and profound of Biblical scholars have knowledge of God that is far less than perfect. The Bible itself clearly stresses this point. "We now see, as through a glass, darkly." His ways are beyond our ways. It is not for us to know, we are told, some things concerning God, His ways, and His plans.

Presuppositions in Christianity

Christianity is a complete world-view and must, as already discussed, incorporate both science and Biblical theology insofar as both are valid. There is ample evidence, which will not be discussed in this paper, for claiming that both must indeed be valid because to deny the validity of science in any basic way would be to deny the listed basic presuppositions of Biblical theology. Therefore, the basic presuppositions of Christianity are the basic presuppositions of science, plus those of Biblical theology, plus the further integrating factor that it is the same God who underlies, permeates and overlies all of science and all of Biblical theology, in fact, all of life and all of reality.

Provision for Checking in Science (and in Theology)

It is not possible to eliminate, in toto, all presuppositions either in science or in theology. Nevertheless, provision is included in science, and presumably in theology as well, for the checking of all information which comprises the "body of knowledge", and this provision for checking extends to the presuppositions themselves. The basic presuppositions of science are subject to essentially the same form of checking as are the everyday working details in any laboratory investigation, and the criteria for checking are inherent within the basic presuppositions themselves.

A study of the historical development of scientific knowledge as well as of the basic presuppositions, leads to the conclusion that, in science, consideration is given to dropping a presupposition whenever (1) it is not useful and meaningful, that is, if it is not subject to test and thus relevant to something other than itself, and/or (2) it leads to unreasonable difficulties, especially if some proposed alternative leads to less difficulty, or even to different difficulty. Let us now attempt to make evaluation of the basic presuppositions of theology against these criteria.

With respect to the first criterion, we note opposing positions and conclusions. Many persons in the past have found the basic presuppositions of theology (not necessarily of Biblical theology) to be useful to fill gaps in scientific knowledge, but consider that this is no longer necessary. Another quotation from D. Wooldridge, in the reference already cited, serves as a clear statement of this position—"A paradoxical consequence of man's predilection for logical thought was his invention of the important concept of the super-natural . . . to provide an 'explanation' for matters he despaired of understanding. The development of science can be described as the process of transferring one after another aspect of human experience from the supernatural category into the realm of natural law . . . It is good that our ancestors invented the concept of the supernatural . . . The physical scientist has at least managed to consign it to a corner of his mind where it does not greatly interfere with his day-to-day activities." If the role or concept of God be solely or primarily to fill the gaps in scientific knowledge of nature, this is a reasonable position.

Some persons, who recognize that the theological concepts of God are not intended merely for filling gaps

in scientific knowledge of nature, consider the basic presuppositions of theology to be useless in a somewhat different sense—because they do not consider them to be subjectable to test. The presuppositions of Biblical theology are indeed out-of-reach, not only to any person who rules out all knowledge other than that which is strictly scientific, a la scientism, but also to the agnostic person who says, "I don't know", to all that is not purely scientific knowledge.

Many persons find the presuppositions of Biblical theology to be very useful and meaningful, not so much as concepts to fill the gaps in scientific knowledge of nature and not so much as concepts which are entirely outside of nature, but rather as concepts of a God who underlies and permeates all of nature and all of reality and who enters into personal relationship with all who believe. We mentioned earlier the philosophical "proofs" for the existence of God and the evidences of God in nature. Even though these are not really proofs of Him they are strong supporting evidence of His existence to those persons who accept as presupposition the fact of His existence. This is, in part, the usefulness and relevancy of the presuppositions of Biblical theology, to persons who do accept them. Another very important point in the usefulness and relevancy to all of life of the reality of the God of the Bible to persons who believe is the inner witness of the Holy Spirit, a topic which is not discussed further in this paper.

With respect to the second criterion, we again note opposing conclusions and positions. On the one hand, many persons reject the basic theological presuppositions because of difficulties, whether alleged or real, which are encountered. For example, alleged contradictions and inconsistencies in the Bible, whether real or not, make it difficult or impossible for some to hold the listed theological presuppositions. The suffering which occurs in the world causes some to discard, or not to accept in the first place, the presupposition that there is a God. The observable hypocrisy of persons who profess to accept the Biblical positions causes other persons to reject as meaningless and useless these same positions. On the other hand, many persons find that the Biblical theological position and the Christian world-view lead not to unreasonable difficulty but rather to far greater rationality and meaning than any other.

In summary, it may be stated that there necessarily are basic presuppositions both in science and in theology, that no complete world-view can be established entirely on the basis of rational proof without presuppositions, that Christianity as a complete world-view encompasses both science and Biblical theology with the further integrating factor that the same God underlies and permeates all of reality, and that Christianity is fully as tenable rationally as is any other alternative. It is concluded, therefore, that science and Christianity are basically mutually compatible.

THE RATIONALE OF CHRISTIAN FAITH

PETER W. K. WOO*

What is the relationship between reason and faith? Is Christian faith rational? These questions, which have challenged the church from the first century, assume particular significance at the present time. For at this time Christian faith is challenged, not only by a world accustomed to critical, philosophical and scientific thinking, but also by new theologians within the church who radically question the divine nature of Christ and the concept of God, or who think that God is "dead" (*cf. Time*, April 8, 1966, p. 82).

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I was brought up in a Christian family. When I was a boy, my mother instructed me in Christian faith, taught me how to pray and depend on God, whose guidance, protection and care I did experience. I accepted what I learned from her, from the Bible. I did not justify my belief on rational ground.

Then I went to the university. In my enthusiasm to explain every phenomenon by physical explanation, in an atmosphere where freedom of thinking and critical examination of thinking were encouraged, in exposure to many types of philosophies, atheistical and agnostical, my beliefs, which I had accepted without question, were challenged. Many ideas, many historical facts made me seriously doubt my beliefs. Those were indeed tormenting years of doubt. It was tormenting

to think the beliefs which I had cherished for so long were wrong and could not be sustained by reason. It was depressing to have to look at life and the universe as purposeless, fortuitous combinations of atoms and molecules governed solely by physical laws.

It took several years, but my doubts were gradually erased, and I slowly came to the realization that faith can be justified on a perfectly logical ground. Now, it is my belief that Christian faith can withstand the utmost, honest, intellectual scrutiny; it is my conviction that, through logical reasoning, we can show that Christian faith should be perfectly acceptable to the logical mind.

The main reason it took me so long to realize the rationale of Christian faith was that I did not humble myself and therefore failed to see the limitation of human capacities and the limitation of science. Intelligence and senses of perception are indispensible assets in man's search for truth. But while we should use them to the fullest extent, we should use them in a proper manner, and proper use requires an awareness of the scope and limitation of their usefulness. Our senses of perception are limited. Our eyes can see colors which are electromagnetic waves from 400 to 700 mu, a very small range in the entire spectrum of 10^{-15} to 10^{16} microns, from gamma rays to radio waves. Our ears can recognize as sounds vibrations from 20 to 20,000 cycles per second but not beyond, even though ultrasonic vibrations exist. Our intelligence has its limitation. We cannot understand the concept of infinity of time and space—when and where the universe originated and when and where it will end. We cannot understand, a priori, the reasons of our own existence: Why am I here? What should I become? What is the meaning of my life? There may be answers to these questions, but we cannot, because of our limited intelligence, arrive at these answers by reasons alone. One human being is more intelligent than the other; thus a person with IQ 190 may comprehend something utterly inconceivable to me. One species of animal is more intelligent than another. This gradation of intelligence shows that there is no reason to believe that human intelligence is the highest attainable and that he has the power to comprehend everything there is to be known. He may not comprehend a being much more powerful and intelligent than he is, just as a butterfly may not understand what a man is. Finally, physical science has its limitation. The principle of uncertainty, well recognized by physicists, tells us that it is impossible to determine simultaneously the exact location and the momentum of a small particle like electron. This principle shows that science cannot find out everything there is to be found.

There is a Chinese parable about a turtle born and living at the bottom of a well all his life. Because of the limited perception, it is natural and entirely reasonable for him to think that the outside world consists of what he can see through the top of the well. We can easily see the pathetic folly of his ignorance. But are we not, with our limited intelligence and perception, just like this turtle in the bottom of a well?

Recognizing the limitations of our intelligence and perception, but making the best use of them, let us now proceed to find out how we may know God.

In order to explain the existence of this universe, it is reasonable to assume that something is responsible for its existence. Let us call this "creator." The assumption of such a premise should be acceptable to the logical mind. As an analogy, in order to explain natural phenomenon, it is a common practice in science to start with a hypothesis in a similar way. Thus, to account for certain observations in chemical reactions, the postulate of atom was proposed by Dalton in 1805, and now, after years of thorough verification, we all acknowledge that atoms exist.

This premise, that a creator exists, leads to only two corollaries or possibilities concerning its nature toward human beings. First, the creator is an impersonal, cosmic being, which is not interested in the human beings thus produced. The creator may be, for example, an intangible agent responsible for the uniformity of the physical laws of nature. In any event, since it is not interested in human beings, it is likely that we human beings may never be able to find out about the exact nature of this creator, because of our limitations mentioned previously.

The second and the only remaining corollary is that the creator is interested in the human beings he created. In this event, he will communicate with the human beings, even though the methods or channels of communication he uses may be inconceivable to our limited mind. In other words, even though we cannot, through our limited intellect and perception alone, find out about this creator, this creator may nevertheless, in his own way, reveal himself to us and let us know about his nature.

With this second corollary in mind, let us examine the message of the Bible. The Bible asserts God as the one who is responsible for the creation of the universe and all the living things therein. The Bible asserts that, far from being an impersonal, cosmic being, God is deeply interested in the human beings he created, he loves them, communicates with them and makes himself known to them. The scripture claims that it is given by the inspiration of God, to let us know what God expects of us (Tim. 3:16-17); it tells us that Christ came to earth to carry out a mission for God (John 6:38,40), and in doing so, thoroughly revealed the nature of God to man. Christ said, "I am the way, the truth and the life; no man cometh unto the Father, but by me" (John 14:6). "If ye had known me, you should have known my Father also, and henceforth ye know him, and have seen him" (John 14:7; John 10:30).

If we compare these assertions of Christ and of the Bible with the corollary based on purely logical reasoning above, that if the creator is interested in human beings he will communicate with them, the parallelism is obvious. In other words, these assertions in the

scripture are identical to what we have deduced as the necessary consequence of a creator interested in his human creatures. The logical mind is therefore faced with two possibilities. First, it can accept these scriptural assertions as logically necessary and consider Christ and the scripture as the revelation of God. Secondly, it can accept these assertions as logically acceptable but nevertheless consider them as simply the creation of man. How do we determine which of the two possibilities is true?

In science, hypotheses and alternative possibilities are often proved or disproved empirically, by experimentation which provides evidence not obtainable by reasoning alone. Thus the hypothesis of atom was confirmed after substantial experimental evidence had been accumulated, and the alternative possibilities whether the mass of an atom is heavily concentrated in a tiny nucleus or evenly distributed in space were resolved by Rutherford's gold foil experiment in 1911. Now, starting from a reasonable premise and employing purely logical deductions, we have arrived at two possible conclusions, namely, first, the scriptural assertions are logically necessary and are the revelation of God, and secondly, the scriptural assertions are logically acceptable but are the creation of man. If we can prove, empirically, that the first conclusion is true, then we will have completed the proof that we can know about the nature of God, and this proof will have been based on the same rational-empirical approach which is the foundation of physical sciences.

The scripture tells us how to proceed with this proof; it is a proof requiring faith and personal experience.

Christ told us about the righteousness and the love of God (e.g. Matt. 6:30-33). Like a light into the darkness he has come to the world to call sinners to repentence (John 12:46; Matt. 9:13). Whosoever believes in him shall not perish but shall have everlasting life—to have everlasting fellowship with God as father and be loved by him always (John 3:16; 16:27; 14:23; Rom. 3:23-25; 6:23).

The goodness of God draws and leads man to repentence (Rom. 2:4; John 6:44). If men do their part and response, humble themselves as little children, earnestly seek God with a contrite heart, they shall find God and enter into his kingdom (Matt. 18:3-4; Psa. 51:17; Isa. 57:15). Christ said, "Seek and you shall find; knock and it shall be opened to you" (Luke 11:9; Rev. 3:20). Similarly in the old testament God said, "Ye shall seek me and find me, when ye shall search for me 'with all your heart'" (Jer. 29:13).

Christ told us what would happen when one comes to him. Christ is the bread of life. He that comes to Christ shall never hunger, and he that believes on Christ shall never thirst (John 6:35). Christ will give him joy and peace of heart, saying, "These things have I spoken unto you, that my joy might remain in you" (John 15:11), "My peace I give unto you. Let not your heart be troubled, neither let it be afraid" (John 14:27). Christ will give him power to become son of God, power to experience in his heart and show forth in his life "love, joy, peace, longsuffering, gentleness, goodness, faith, meekness and temperance" (John 1:12; 15:5; Gal. 5:22,23).

Thus the proof as to whether the Bible was the word of God—the final step in our rational search for God—consists of a test of the promises of the Bible through personal experience. If one humbles himself, seeks God earnestly, faithfully, and finds, as promised in the Bible, the love of God, the peace and joy through God, the experience of forgiveness of sin, and the God-given power to lead his life away from sin to a life of love, then he has every reason to believe, on firm rational ground, that God, his revelation and his love are real and not figment of imagination. He may say, as Billy Graham did, "I know that God exists because of my personal experience. I know that I know him. I have talked with him and walked with him. He cares about me and acts in my everyday life" (*Time, loc. cit.* p. 83).

In conclusion then, these are the lessons that I have learned slowly through the years. Based on firm logical ground, it may be shown that the nature and the existence of God are beyond the scope of science and human intellect, but may be known through revelation. The love of God, the peace and joy through him now and everlasting, are to be experienced by those who walk with faith and humble, seeking hearts.

Beneath the Drab, Drama

Missionaries are much more effective than they appear when they are home on furlough. We do well to recall that they are often getting by on insufficient income, that many have to borrow money for even frugal living while on furlough. They often wear clothing which is out of style, realizing that it is senseless to spend large amounts of money on clothing for a particular climate when they will only be living in it for a short period. When they tell of their work humility prevents them from displaying too much enthusiasm, so that what is often a dramatic ministry seems drab because of a colorless presentation. — Robert H. Bolton in *The Christian Century*.

as published in HIS, June, 1967

Missing and Missed

Our Daily Bread carried a story of a Japanese girl who was a student in an American college. She was invited to spend the Christmas holidays with a classmate. Afterward, when asked how she liked it, she replied that she liked it very well, but she said she missed God in the home. "I have seen you worship in your church," she said, "but in our country we have a god-shelf so we can worship in our homes. Do not you Americans worship God in your homes?" — Editorial in *Moody Monthly*.

as published in HIS, June, 1967

THE BIBLE AND HUMAN EVOLUTION: PROBLEMS IN THE CLASSIFICATION AND CHANGE IN MAN

GEORGE R. HORNER*

"The conflict between the Creation account in Genesis and Science does not cease to inspire in earnest Christians a desire to harmonize the two."[1]

1. A Christian anthropologist can neither ignore Biblical evidence nor fossil (scientific) evidence in his research on classification and change in man, and in his attempt to harmonize Genesis and Science.

2. Genesis gives no details about earliest man or his biology. Genesis states that man was created in God's image. 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 Genesis 1:27.

3. The scientific classification of man has been largely based upon structure with change accounted for in time. If stress were placed upon culture—man as a symbol making creature—one might better define man as: where there is culture there is man, Homo sapiens, no matter the structure of a fossil.

4. The Bible is the record of man's Spiritual history. Adam is important only as he relates to Christ—the last Adam. Adam is not the first biological *man. He is the first man carrying God's promise to the world.*

5. God is not contradicted in either of His expressions: in man or in nature. Hence a harmony may be worked out if not prevented by our traditional interpretations.

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Preface

"The conflict between the Creation account in Genesis and Science does not cease to inspire in earnest Christians a desire to harmonize the two."[1]

I
A Statement

Any Bible believing, evangelical, Christian scholar can concur with the above statement as a desirable and even necessary goal toward which to work. I would add, however, if the evangelical scholar is forced to account for the process of biological change only in the manner set forth in the first two chapters of Genesis, along carefully delineated party lines and/or if the earnest Christian scholar must sign doctrinal statements of faith relating to Genesis which precludes alternative interpretations of these chapters, forcing a scholar into a Galileo-like impasse, harmony between the Creation account in Genesis and Science will not only fail to be achieved, but there will be a perpetual conflict between the two: *ad infinitum, ad nauseum, amen.*

The questions to which this paper will address itself are: 1) Can there be a harmony between Science and the Bible? 2) What are the implications of classification vs process? 3) The relation of the above to problems of classification and the process of change in man.

II
The Setting for the Conflict

From Aristotle to Hume it was assumed that Truth is of one kind and that the validity of statements about God can be tested by the same criteria that might also apply to angels, dogs, cats, art, beauty, society and man. From Hume to the present, validity about God and validity about man are achieved by two different propositions: the Truth of Dogma, "I believe" and

Truth arrived at through empirical methods: the Truth of Science.

This dichotomy has resulted in the so-called incompatibility of Science and the Bible. The Scientist and the Christian scholar seem to view reality through two different frames of reference. The Scientist, limited by his senses or extension of same, does not find God necessary in interpreting nature; the Christian scholar cannot interpret nature without God. Hence a conflict.

The Christian man of science cannot deny the evidence (facts) discovered by science—a fossilized human skull—any more than he can repudiate his belief in a God who has revealed Himself, no matter how imperfectly, both in nature and in the Bible. By repudiating, or not admitting God, the Scientist reduces nature and man to material, with process mechanically motivated.

During the past twenty-five years, Christian scholars have divided themselves into two polar positions. (This does not deny a third possible position.)

1. Anti-evolutionists
2. Pro-evolutionists

1. The anti-evolutionists have a long history in evangelical circles. The names of those belonging to this group are too well-known to have to be listed in this paper. To members of the group "evolution" has anti-Biblical connotations. The goal for this group is to disprove evolution—period.

2. The pro-evolutionists are a more recent phenomena, appearing on the scene during the past ten to fifteen years. They, at first glance, seem to have capitulated to the evolutionists. The group has accepted the fact (whatever that means) of evolution. They are evolutionists as scientists but evangelical and/or fundamental in their Christian beliefs. The group is also too well-known to list names.

Note that in both instances the magnetism of evolution, negatively and positively has drawn Christian scholars into the vortex of its influence.

III
Some Modern Meanings of Evolution

The fact that one can talk about "meanings" of evolution, let alone modern meanings, suggests the lack of specificity in the meaning of the word itself. It is a word of many different meanings. It is an abstraction. Darwin started with this abstraction in order to describe a process (Linneaus in the 1730's had set up the classification) of how new forms emerged from a continuity of change by means of natural selection. The word evolution has become a convenient catchword to describe any kind of change.

In order to have a reference point, I would like to use the following definition of evolution, one which will be understood as what I mean when I use that word: "Evolution is the gradual development from simple, unorganized condition of primal matter to the complex structure of the physical universe; and in like manner, from the beginning of organic life on this planet, a gradual unfolding and branching into varied living forms which constitute the animal and plant kingdoms."[2] The first is called inorganic evolution, the second, organic evolution. We shall be concerned with the latter.

It is apparent, from this definition that change is basic, is the "fact" of evolution. However, the kind of change and the method or process of change is not so evident and remains a major housekeeping problem among the evolutionary theorists. Further, just because evolution is change does it necessarily follow that all change is evolution?

There are three kinds of organic change defined as "evolutionary". These are: 1) Speciation, 2) Phyletic and 3) Quantum.[3]

1. *Speciation.* This is easily demonstrated and understood by all. The differences noted between, for example, kittens having the same parents, or between varieties of roses, are speciation differences. Speciation is the dynamic of change, of evolution. Speciation prevents sameness, it prevents two living organisms from being exactly the same as their parents or each other. This kind of change is called evolution.

2. *Phyletic.* This kind of change may occur within groups larger than the above, but within phylla, or genetically defined families; for example, changes in the horse series. This kind of change is also called evolution.

3. *Quantum.* This kind of change implies a probable process such as "jumping gaps," leaping over families, phylla, orders or classes.[4] *This kind of change has not been demonstrated; it is only theoretically possible.* This kind of change is also called evolution.

For purposes of clarification and to be strictly accurate (scientific?), I would call both speciation and phyletic change *developmental* rather than evolutionary, since only degrees of change are involved. I would reserve quantum change as true to the intent and the definition, given above, of evolution.

IV
The Classification of Man and Scientific Evidence

Man is classified as a primate because he shares with other members of this Order—the Chimpanzee, Gorilla, OrangUtan and Gibbon—biological similarities. To a lesser degree, he likewise shares with them certain physiological and psychological characteristics. Man and other creatures of this Order, for example, have approximately the same number and kinds of bones. Similar emotional and psychological responses are also shared such as anger. Such similarities are too well recognized to give further attention to in this paper.

Man is classified as *Homo sapiens,* not upon great structural differences but upon relatively small differences which, to paraphrase Shakespeare's *All's Well That Ends Well,* "make (for) differences so mighty." These small differences are found primarily in the skull, cerebrum, and to a lesser extent, in the skeleton. Space permits only one example from each of the above.

1. *Skull.* Two-thirds of man's skull is brain area. In contrast, two-thirds of the gorilla's skull is face area. One-third of man's skull is face area while one-third of the ape's skull area is brain.

2. *Cerebrum.* The cerebral difference is the presence of a large area of association in the rear of man's brain. It is practically absent in the ape. The presence in man of a well developed frontal area, an area where man controls his temperament and emotions of the more sophisticated variety, is lacking in the ape, and the area of speech is likewise absent in the apes.

3. *Skeleton.* One noteworthy anatomical difference is readily observed in the up-rightness of man's stature, a result of a four curved vertebral column as opposed to the single curve of the apes. This prevents the apes to naturally and habitually stand and walk while erect.

of processual change, with change oriented in a given direction. Darwin's original concept was modified by Huxley and today is the model of the neo-Darwinists.

The second model stresses random and fortuitous change through chance-environmental adaptation on a natural selection base as the process of evolution leading to man. This model is named the "Adaptive-Radiationist."[7]

These models also differ in that the Darwin-Huxley model theorizes that both modern apes and modern man had an ape ancestor (Dryopithecus) in common, preserving Darwin's original idea but with a difference. The adaptive radiationist model theorizes that apes and man had a common ancestor which is a now extinct monkey-tarsier type (parapithecus). Incidently, the tarsier is a little four inch tall, round headed, Mickey Mouse looking animal with pop eyes, big ears and can pivot his head in an almost complete half-circle.

MODELS SHOWING THE INFERRED PHYLOGENETIC RELATIONS OF MAN TO THE PRIMATES

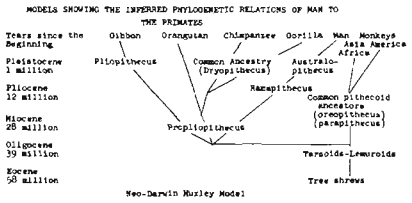

Figure 1

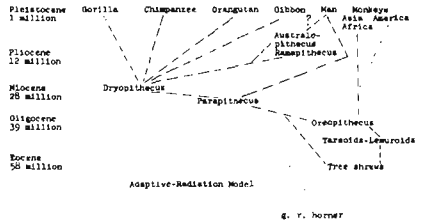

Figure 2

Very few argue about man's biology or his classification. "There is nothing unique about the animalness of man".[5] How did man become unique? In what way is man unique? What process was (is) involved? Here is where the Christian scholar of science faces his difficulties and differences and the basis for differences for all interpretations.

V
Two Modern Evolutionary Models

The two modern evolutionary models are illustrated in Figures 1 and 2. These may also be considered as classifications of man, for man is classified with others of his order.[6]

But more than a classification, both models imply process, an interpretation of change, illustrating the direction and the results of change leading to man. Both models assume that this change took place in the five epochs of the Cenozoic area, with man most likely first appearing in the late Pliocene, (3-5 million years ago), if the discovery of *Homo habilis* and its interpretation by its discoverer, Leakey, is confirmed. Both models start with the tree shrew although the tarsier is considered as more ancestral to man.

Despite using the same facts, these are two conceptually different models. One (Figure 1) relies upon Darwin's concept of natural selection as the dynamic

A growing group of modern anthropologists favor the Boule-Straus model which we shall consider next.

VI
Fossil Evidence, Evolutionary Models, and Factors Necessary to Interpret Process

Figure 3 shows some of the fossil evidence defined as man, where these fossils lived upon the earth and their approximate date. There is no doubt as to the veracity of these facts. Upon this evidence all interpretations must be made whether one is a non-Christian scholar, a Christian scholar or variations of any of the above.

Evidence is interpreted according to one's conceptual model; one's frame of reference. Figures 1 and 2 are two such models. With illustrations taken from the fossil evidence of man, I will demonstrate how one can arrive at two different interpretations using the same evidence.

1. *The Darwin-Huxley model.* This model classifies man as a primate and adding process to the model, it would appear that *a miscarriage by an ape brought forth man, or more technically, a mutation.* Evidences for this are the fossil apes found in Asia, *Gigantopithecus,* and Africa, *Australopithecus,* both considered as ancestral to modern man. These man-like apes, *homi-*

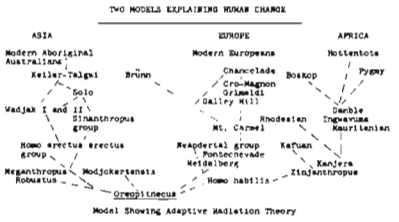

Figure 4

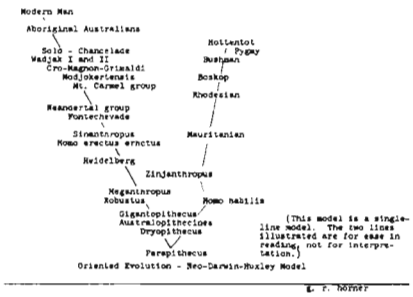

Figure 5

noids, gradually became ape-like men, *hominids*, so called because of ape-like facial and skull features, the supra-orbital ridge across the eyebrow and the keel growth around the skull. This is well illustrated in all anthropological text books. Those usually listed include: *robustus* and *meganthropus* of Asia (Java); the *Heidelberg* man (jaw) of Europe; *Homo habilis* and *Zinjanthropus* of Africa.

Through time, the hominids gradually changed, through the process of natural selection, until the first *Homo sapiens* appeared some 93,000 years ago: Wadjak I and II and the Solo River man of Asia (Java); Cro-Magnon and others in Europe and Gamble man in Africa as seen in Figure 5.

2. *The Adaptive-Radiationist model.* Here, too, man is classified as a primate. Interpretation of process (see Figures 3 and 4) demand parallel and random change; no direct lines between any two groups are theoretically possible and many, many missing links are implied.

Gigantopithecus and *Australopithecus* are not even theoretically useful in this model and theory since according to it, man lacked an ape ancestry. The model begins with *robustus* in Asia, *Heidelbergenesis* in Europe, and *Homo habilis* and *Zinjanthropus* in Africa. In short, this theory begins with the *hominids* or man. Man by-passed the ape stage in this model! To this group the *hominids* are not ape-like men. They are men with reservations, that is, different degrees of man. *Homo sapiens* appear randomly as opportunity and environment permits and often contemporary with the *hominids*, rather than at the end of a long process of natural selection according to the Darwin-Huxley model. Evidence for these racial mixtures and mixed populations living together can be observed in the Mt. Carmel caves where *Homo sapiens* were contemporary with the Neandertals. This is not an isolated example. It is also true of the Pekin (Choukoutien) skeletal material.

Factors. Both models are based upon a single factor or variable for its interpretation: the biological factor of anatomical structure. Although the factors of geography and strata (time) are noted, these do not carry the interpretive weight implied in them. Four factors should be included in the intepretation of any and all skeletal remains (wherever possible): 1) structure, 2) geography, 3) strata, and 4) culture.

I should like now to illustrate the importance of factors other than the biological.

1. *Geography.* Figure 3 shows when and where human fossils have been found with the process of human change going on simultaneously in Europe, Asia and Africa. This point is not brought out in using only the biological factor since the sequence in structure is most important. The question to be faced here is: Did man originate independently in three world areas or did he originate in one area and migrate? Evidence for the earliest human is found in Africa, *Homo habilis*, tentatively dated as 3 million years old. The evidence of geography argues for the possibility of polyphyletic origins of man.*

2. *Time.* The factor of time shows that there was not a neat sequence of bodily change from the so-called ape-like man to modern man according to the Darwin-Huxley model. Rather, there were mixed populations living both together and contemporary; and according to the evidence of the Neandertals, the pre-Mousterian (a cultural period in the old stone age when man used mainly axe-like tools) Neandertals were *Homo sapiens* while the later Mousterdian Neandertals were structurally "ape-like."

3. *Culture.* Only man is a culture or *symbol making* creature. Hence wherever culture is found, there is man. A stone accidently shaped or used by either man or ape, is not evidence of culture. A stone purpositively shaped and used and the knowledge acquired in the manufacture of such an axe, taught and passed down to succeeding generations, is primary evidence of culture and man.

For example, *Zinjanthropus* living almost two million years ago in Africa though biologically ape-like, yet as a culture producer, was a rational human being, a *Homo sapiens*.

* A monophyletic origin of man could be argued on the basis of blood types. 1. Blood type "O" is considered as the oldest (first?) since it will mix with all other types in transfusions. 2. Blood types "O" and "A" are found in a world-wide distribution, implying a common blood-type base, a common origin. Applying the *Sewell Wright Effect* in genetic drift, new types emerged from the ancestral types "O" and "A" as populations migrated farther apart in time.

GEOGRAPHIC DISTRIBUTION AND TIME SEQUENCE OF EXAMPLES OF PREHISTORIC MAN

GEOGRAPHIC DISTRIBUTION AND TIME SEQUENCE OF EXAMPLES OF PREHISTORIC MAN

Geological Epoch	Southeast Asia and Australia	Europe	Africa	Approximate date
Psychozoic (present)	Modern Asiatics and Australian Aborigines	Modern Europeans	Negro, Pygmy and Bushman, Hottentot	Contemporary
Holocene (recent)	Keiler - Talgai Wadjak I and II	Chancelade	Boskop Oldoway	to 10,000
Upper Pleistocene	Soloensis	Cro-Magnon Grimaldi-Brünn Galley Hill Mt. Carmel (Skhūl-Tabun)	Ingwavuma Gamble	to 200,000
Middle Pleistocene	Sinanthropus group (Pekin) Homo erectus erectus group	Neandertal group (Gibralter) (Swanscombe) (Steinheim) (Fontechevade)	Mauritaninses Rhodesian Kafuam Kanjera	to 700,000
Lower Pleistocene	Modjokertensis Meganthropus Robustus	Heidelbergensis	Kanam Zinjanthropus	to 1,750,000
Upper Pliocene			Homo habilis	to 3,000,000

Figure 3 arranged by g.r. horner

Culture ought to have the greatest weight in interpretation since culture associated with fossil evidence, identifies material as human *despite* structural appearance. Of the fossil evidence listed in Figure 3, cultural remains have been found in all but six. These are: *robustus, meganthropus, Heidelbergensis, Pithecanthropus erectus,* the first *Sinanthropus* (Choukoutien) and *modjokertensis.* Of this group, the last three are biologically identified as human, while the remaining are described human on scanty osseous evidence.

Culture, it seems to me would change much of the interpretation of fossil remains of man since, of those listed, the great majority are culture makers. There is evidence of *Homo sapiens* from the first men as science defines it.

Modern pygmies of Africa and the Philippines and the Arunta of Australia are biologically *"neandertaloid."* Both have bony eye-ridges, broad noses and long, narrow head, yet no one questions their humanness or that they are *Homo sapiens.* They appear to be the living descendents of man's earliest ancestors.

VII
Process

Because of the emphasis that the Darwin-Huxley model places on morphology, it is unsatisfactory as a model to interpret human change.

The adaptive radiationist model, although there are some still unanswerable questions implied in it, gives the best interpretive results, considering all of the factors involved, but particularly, in that the appearance of varieties (speciation) of man is based upon fortuitous combinations of genes. This model implies that there has been one kind of man, though differing in degree, throughout history. It further starts with man, but allows for different explanations for man's origin(s). Of the three types of evolution described earlier in the paper, the second model implies both speciation and phyletic change process, rather than quantum evolution as the interpretive basis for man's change as in the Darwin-Huxley model. Man has developed rather than evolved. Kraus, in his book, *The Basis of Human Evolution* (and almost contradicting the title of his book) makes the point very succinctly: "Invariably the question arises . . . could a pithecanthropus child, born and raised in the modern world, have developed into an efficient member of society? My (Kraus) suggestion is that he would have fared no better or no worse than a randomly selected infant born of *Homo sapiens.*"[8]

VIII
Sundry Conclusions

A Christian scholar can neither ignore fossil or cultural evidence, nor can he ignore the Bible. His goal is to harmonize the evidence found in the Bible with the evidence in Nature as they relate to the total "phenomena of man," to borrow from Chardin, as the basis for objective, truthful, scientific conclusions.

A scholar must face the fact that Genesis does not give many details about the biology of earliest man, or the earliest date of man; or where he was first created —or if there were many "Adams and Eves;" or if there was just one original pair.

Specifically, the Bible is very clear and to the point that man was created in God's image. We do not yet know what this fully means. Was it a miracle or a process? But how? Was the "soul" as God's image created *ex nihilo* or was a soul "planted" in a creature, say a *humanoid*? Were there a pair of these *humanoids* from which all men are descended? Was the imputation of a soul racially or multi-racially in one or more continents at approximately or exactly the same time in many groups. One point we are sure, like his Creator, man can create. It would seem that man's biological structure has little relationship here. Man is a rational, symbol making creature.

Perhaps scholars, both non-Christian and Christian, have spent too much time disputing the meanings of man's morpohological structure. The Bible relegates man's body to dust. It is the soul (God's image) which is unique in man, rather than the body.

Unless one pushes "Adam" back further and further in Time, each "time" changing with fresh discoveries, which is theoretically possible, it would appear that the first man (Adam) mentioned in the Scripture is perhaps best considered as our Spiritual First Ancestor, rather than our biological first ancestor. (Recall that the children of Adam and Eve found mates whom they could marry who weren't necessarily related to them.) The Bible is a record of man's Spiritual history, from Adam to Christ, rather than his biological development.

I mentioned a third group of Christian scholars in my opening remarks. This third group, of which I am a member, are the Neo-creationists. This group can be described as: non (quantum) evolutionary but certainly phyletic and speciational evolutionist! Creationist in the particular sense that the implanting of a soul, and symbol making capabilities in man, was a miracle, a creative act. This is the point of difference. It is the point which must be and can be maintained by those who wish to harmonize the Bible with human development.[9,10]

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INSTITUTE FOR ADVANCED CHRISTIAN STUDIES

The Institute for Advanced Christian Studies, an outgrowth of the Consultation on Christian Higher Education which met at Indiana University in the fall of 1966, was made possible by a grant of $95,000 made this summer by the Lilly Endowment. (See report in CHRISTIANITY TODAY, July 21, 1967.) The Institute is the fruit of concern felt by many Christian leaders throughout the U.S.

Christian young people often appear ill-equipped to face the moral and intellectual challenges of the secular campus. Christian faith has such low visibility that most of today's students are unable even to define it. There is a desperate need for sound Christian literature of all types to counteract the wave of books and periodicals which are largely hostile to God and which constantly stress the deterministic flavor of the varied setting for human life.

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THE BIBLE OF NATURE

PETER G. BERKHOUT*

(Abstract by Howard Mattson)

By the "Bible of Nature" we mean all that God has revealed to us outside *the Scripture. We often hear that God's revelation in nature is darkly seen and that we need Scripture as "spectacles" for its interpretation, but both the Bible of Nature and the Holy Bible were written by the almighty hand of God, and each must be infallible in its own way.*

We as Christians rejoice most when we place all our knowledge ultimately in the light of the Scriptures. The Holy Bible does not only give us the message of salvation, but tells us about the origin, meaning, and purpose of all that exists. This we cannot find out through pure science. Nevertheless, let us be bold to explore the Bible of Nature, and let us accept what is true. Where facts speak, let words be silent.

Some Christians will be startled when we speak of the Bible of Nature. They will say immediately that we have only one Bible, the Holy Bible. In a moment we will explain why we use this terminology. It is necessary first to define our terms. By the Bible of nature we mean all that God has revealed to us outside of Scripture. Some may ask why we do not speak simply of God's general revelation. In a certain sense we would not mind; but there are people who understand by general revelation only that which God has revealed of His being. We mean much more by it. It includes all that God reveals to us in nature, in the pursuits of man, and in the mind of man. It includes particularly all that is good and true and beautiful; although even so-called evil and catastrophies should not be excluded, through which God may punish or chastise man. The Bible of Nature is for all mankind; the Holy Bible, or special revelation, is revealed to "sinners" to whom God would make known His salvation. (Warfield).[1]

We wish to state in unmistakable terms that our faith in Scripture is not shaken. Scripture is unique in that it is the way to eternal salvation. And if we wish to place everything in subjection to the creative, providential and redemptive work of God, Scripture is absolutely necessary. And the true Christian is not content until he has made everything subject to the work of the Triune God and the Redeemer. We do not minimize Scripture.

Why then do we speak of the Bible of Nature?

In the first place, we were inspired to use that term when we viewed the *Biblia Naturae* of Jan Swammerdam. This classic in biology was published in 1738 by the illustrious and profoundly Christian Dr. Herman Boerhaave of Leyden, 58 years after the demise of Swammerdam. Of course, Swammerdam confines himself to the microscopic anatomy of insects; but it gave us our cue.

Secondly, we were emboldened in our choice by the beautiful words of the Belgic Confession, where it is stated in Article II that we know God, "First, by the creation, preservation, and government of the universe; which is before our eyes as *a most elegant book* (italics ours), wherein all creatures, great and small, are as so many characters leading us to *see clearly the invisible things of God.*" Notice that the Confession uses the words "see" and "clearly" and

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places them in italics for emphasis. The Confession then refers to Romans 1:20 where it is also stated that the invisible things of God are clearly seen, being perceived through the things that are made.

Note particularly that both Article II of the Confession and Romans 1, upon which it is based, emphasize that the invisible things of God are not merely shown in the Bible of Nature. In that case we could say that the unbeliever cannot see them. To the contrary, it says that they are *clearly seen.*

We talk too glibly that God's revelation in nature is darkly seen and that we always need Scripture as a pair of spectacles. We do not think that Calvin means this, nor the Confession, nor Scripture itself. That is true in certain fields. We have stated this in the second paragraph of this article. However, there are ever so many truths that are more clearly revealed in the Bible of Nature. Galileo in his "Letter to the Grand Duchess Christina", avers, "God is not less excellently revealed in Nature's actions than in the sacred statements of the Bible", and, "I do not feel obliged to believe that the same God who has endowed us with sense, reason, and intellect has intended to forego their use and by some other means give us knowledge".[2] Of course, Galileo does not mean here knowledge in regard to our salvation.

We know now how right Galileo was. But in his day both the Catholic Church and Protestantism said he was wrong, and they tried to use Scripture to prove it. The books of Copernicus and Galileo were kept on the Index of the Catholic Church till 1820. And more than a hundred years after Copernicus, when the proof for his view of the solar system had been practically clinched by the work of Newton and Kepler, the otherwise famous successor of Calvin, Francois Turretin at the College of Geneva still opposed it. With a multitude of texts from Scripture he tried to prove that the sun, moon, and stars revolve around the earth which stands still at the center.[3] Have we learned anything from this sad experience? The Catholic Church has become much more cautious.

For these and other reasons we selected the term Bible of Nature. Too long have we downgraded it. Both the Bible of Nature and the Holy Bible have been written by the almighty hand of God. Each is infallible in its own way; otherwise, speaking with all due reverence, we could not rely upon their combined Author.

We are frequently cautioned not to put natural revelation on par with Scripture. In many respects we agree. When it concerns our salvation, or if we wish to put everything *sub specie aeternitatis,* in the light of eternity, Scripture far surpasses; but there are many other instances where the Bible of Nature excels, simply because the Holy Bible is not for these purposes. Thus, for example, theologians will tell us that no one knows what the age of the earth is because Scripture has not revealed it to us. And we are even chided at times because we are considered to be too inquisitive. However, we believe that God has placed various time-clocks in the earth, particularly the radio-active isotopes, which make it possible for us to figure out the age of the earth quite closely. So let us not downgrade the Bible of Nature too readily. To belittle one revelation at the expense of the other may be sinful.

Scripture itself in many instances points to the value of the Bible of Nature. Thus, in the Chokmatic, or Wisdom literature of Scripture, we are constantly referred to nature to praise God through it and learn from it. The nature psalms are most beautiful. The well-known Psalm 19 tells us that "the heavens declare the glory of God and the firmament shows God's handiwork." There may not be voice or language in the usual sense; but their line, or rule, is gone out through all the earth. We have an excellent illustration of what we are trying to say in Isaiah 28:23-29. There the prophet tells us that the farmer does not have to go to the Bible to find out how he has to run his farm. The farmer plows, harrows, plants seed in his soil; but he is very particular. He has learned exactly where to plant everything, and then it grows. Then the prophet emphasizes that his God teaches him in nature and that this is wonderful to behold and he concludes, "This also cometh from Jehovah of hosts, who is wonderful in wisdom, and excellent in counsel."

This leads me to speak a word of caution about the expression which we use so freely that the Bible is the only infallible guide in faith and practice. When we read that first years ago, it did not sound right to us. We believe that it is true in regard to faith; but we doubt whether it is the only infallible guide in morals and practice. Scripture at least is not complete. We can point only to examples like the cities of refuge in the Old Testament and the list of forbidden consanguineous marriages in Leviticus 18. No confession states that Scripture is the only infallible rule in practice. To the contrary, the Westminster Confession states that there are, "circumstances concerning the Worship of God and government of the Church, . . . which should be ordered by the light of nature and Christian prudence." Chapter I, sec. vi. In other words, we are advised here to use the dictate of right reason. But if this holds for such a sacred sphere as the church in which, if anywhere, the Bible should be our guide, how about the more secular spheres, particularly science?

When the statement that "the Bible is the only infallible guide in faith and practice" became current among us, we investigated and discovered that it was devised by the divines of the Synod of New York and Philadelphia of the Presbyterian Church in the U.S.A. in 1787-89. There is no history as to how they arrived at it. Its origin is thus in the form of ordination for ministers of the Presbyterian Church. We have an interesting letter from the late Dr. Robert Nicholson Hastings, historian of that church. The last paragraph of this letter says, "A fair interpretation of the question is that it means that the Scriptures infallibly lead to sav-

ing faith and right practice. The word infallible does not refer to matters of history and science but to religious and moral guidance."

We consider this discussion relevant because Christians often use this declaration when they think they find something in Scripture that is not really there but must be found in the other aspect of God's revelation, the Bible of Nature. And that pertains not merely to facts. The serene classic sisters of the good, the true, and the beautiful, do not dwell in sweet isolation, but enjoy mutual interdependence. Dr. A. D. R. Polman has given us a four volume work on the Belgic Confession. And when he discusses Art. II and indirectly Romans 1:20 he emphasizes that these do not have to do simply with theological and moral implications; but that all problems are included. And he concludes, "Here [in Article II] we have a profound task for the future:—the problems of the ordinances of nature, the place of common grace, natural law [which is the dictate of right reason], etc."[4]

It would be worthwhile to consider just what is meant by the statement that the Bible is the only infallible guide in practice. Similar to the statement of Galileo that "God is not less excellently revealed in Nature's actions" is that of one of the foremost Calvinistic theologians of the Netherlands, the late Dr. Herman Bavinck, "Facts are words of God just as well as the contents of Holy Scripture". *Gereformeerde Dogmatiek*, Kampen, 1914, Vol. II, p. 535.

This means that those who devote their lives to the study of fields like those of the sciences should be

> "Slave to no sect, who seek not private road;
> But look through Nature up at Nature's God."

If Copernicus and Galileo had looked at nature through the Bible as a pair of spectacles, they never would have come to the conclusion that the earth goes round the sun. Of course, we as Christians rejoice most when we place all our knowledge ultimately in the light of Scripture. The Holy Bible does not only give us the message of salvation; but it also tells us about the origin, meaning and purpose of all that exists. This we cannot find out through pure science. Nevertheless, let us be bold to explore the Bible of Nature. And let us accept what is true. Where facts speak, let words be silent.

It frequently happens today that what we find in the Bible of Nature does not harmonize with what we find in the Holy Bible. The tendency then is to throw aside what we find in the Bible of Nature. This is not necessarily right. Often our *interpretation* of Scripture is wrong, or we think we find something in Scripture that is not there at all. But even when there appears a definite conflict, we should not be too ready to discard the evidence found. There are ever so many at least apparent contradictions in Scripture which we accept in faith. For example, speaking with due reverence, there is the fact that God is Holy, just and omnipotent and yet willed to permit evil; or the sovereignty of God and human responsibility, etc. These are, humanly speaking, mutually exclusive and insoluble; yet we accept them. So too with the two revelations, or, if you wish, the two aspects of one revelation; if there are "conflicts", let us accept them. The theologian ordinarily should not tell the scientist that he is wrong unless he has a better knowledge of the subject than the scientist has, and vice versa. Let each one speak for himself. Of course, it is a wonderful thing for competent scientists and theologians to counsel together, something the Catholic Church was advised to do by the Pope at least as early as 1950.

Not to accept fearlessly what the Bible of Nature teaches may have disastrous effects. As John Calvin says, we may thus be punished for our negligence. For one thing it is the reason why many are still floundering around in a biology that is at least two-hundred years behind the times, from the days before Hutton and Lyell.

Serious theologians are giving considerable thought to the first chapters of Genesis in the light of what the Bible of Nature teaches us today. Some people believe in a glamorized Bible. We may not glamorize either the Holy Bible or the Bible of Nature; but let the one shed light upon the other. Thus there are Christians who have too exalted a view of Adam before the fall of man. They view paradise in the idyllic language with which Isaiah describes the future world. But Adam was not yet in the state of glory. He was in the state of integrity. He still had to reach the higher state. That was the essence of the Covenant of Works. We have heard the statement that Adam was such a genius that compared with him Einstein was a piker.

However, we agree with the great Calvinist Theologian James Orr when he says, "The picture given us of the first man in the Bible is primitive in every way. The Adam of the Book of Genesis is not a being of advanced intellectual attainment, or endowed with an intuitive knowledge of the arts and sciences. If his estate is far from the savage it is equally far removed from that of a civilized man. The earliest steps of what we call civilization are of a later date."

These are Orr's words. Whenever we go back far enough in the history of any old civilization we always land in the Stone Age. We can picture Adam there too. Scripture itself gives us an inkling. It was not till much later, in the days of Tubal-Cain, that man began to use iron and copper. This agrees with what anthropology teaches us; the Iron Age began about 3000 years B.C.

Let us be realistic. The Bible of Nature presents us with so many facts that we should bring them to bear upon the early part of the Bible. Scripture in Genesis uses the language of adoration. It emphasizes that God is the Creator and also the Sustainer of everything in the universe. But it often expresses itself in picture-language which the people to whom it was addressed could understand.

I doubt whether today you can find more than one man in a thousand in the field of natural science who does not accept evolution. In fact, it was stated at the 1965 ASA Convention that it is impossible to obtain a Ph.D. in science if one flatly denies evolution. The great majority of our students and professors at even our Christian colleges accept it. The Catholic Church is beginning to take it in its stride. Pierre Teîlhard de Chardin was not permitted to publish his books. Today I have a volume of a Catholic theologian of the Low Countries entitled, "The Creation of God." It has as its subtitle, "Creation, Sin and Redemption in the Evolutionistic World View." This book, by Dr. A. Hulsbosch, O.S.A., was practically dedicated to Chardin, and yet it has the imprimatur and the *Nihil Obstat* of the Catholic Church upon it.

In regard to evolution Pope Pius XI is reported to have said, "We must not close a door which perhaps we should have to open again. In the history of the Church, one Galileo case is enough".[6]

Our own ASA is a good example of what is happening. Originally it was organized to combat evolutionary views. But some have become so disillusioned on that score that they have organized the "Creation Research Society." I doubt whether they will be able to stem the tide. They are well-meaning Christians; but to me they appear as a remnant of a passing race.

Whether we like it or not, we will have to put the old wine, the truth of Scripture, into new skins. Our young people are clamoring for it. Unless theologians and scientists who have a Christian training help, a lot of young people may be lost for the church. The sorry episode between Galileo and the church did and still does a lot of harm. You cannot suppress truth forever.

> "Truth crushed to earth will rise again;
> The eternal years of God are hers:
> But error, wounded, writhes in pain,
> And dies among his worshippers."

One of our members, Dr. Aldert Van Der Ziel, has said it so well:

"Some well-meaning Christians are so eager to defend the integrity of the Bible that they are willing to misrepresent science. Up to a certain point their discussion is fully objective. But when it comes to problems like the age determinations of rock, man, and the earth, or the problem of evolution, they all of a sudden become overcritical. They try to create the impression that the age determinations are largely unreliable and that the arguments against evolution are much stronger than those in favor. By doing so, they misrepresent the truth and create a false security."[7]

It seems to me that evolution is generally accepted as a fact and not as a mere hypothesis, as many well-meaning Christians like to put it. Some of it may be, and the evolutionists are the first to admit it; but it appears to be largely true. It is the method whereby God operates in this universe. What is the difference whether man originated as a mud-doll or that he evolved through a long process of time, as long as God is in control of this universe and is present at every step of the process? We do not have to sacrifice any fundamental truth of Scripture.

It should be a tremendous inspiration to us when we realize that when we study the various fields of science and medicine, whatever truth we find there is just as much the word of God as Scripture itself: Of the Bible of Nature even a man like Einstein has said:

> The religious feeling of the scientist is one of rapturous amazement at the harmony of natural law, which reveals an intelligence of such superiority that, compared with it, all the systematic thinking and acting of human beings is an utterly insignificant reflection. This feeling is the guiding principle of his life and work . . . It is beyond question closely akin to that which has possessed the religious geniuses of all ages.[8]

Let us then enthusiastically, even though cautiously, accept the truths and facts the Bible of Nature offers us. Let us do it with thanksgiving to God. And let us not be satisfied until we have put all this knowledge and action in the framework of the Holy Bible. What has not been proven we should attempt to study further or disprove it.

We should apply here the sage words of Marcus Aurelius:

> If anyone can convince me or bring home to me that I do not think or act aright, gladly will I change; for I search after truth, by which man never yet was harmed. But he is harmed who abides on still in his deception and ignorance.

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Will They Grow Out of It?—A Psychiatrist's View

Most adults learn to live with the existing culture more or less comfortably, even if it means blunting their awareness of its most glaring faults. It is always youth that feels most at odds with society and is most sensitive to its great social injustices — poverty, discrimination, war. The environment of the 1960's makes it possible for youth to protest within the context of the society, rather than merely by "copping out." For this reason, the "new beatnick" seems more truly out of tune with his times—despite his protests—than the old-line beat, with his philosophy of withdrawal, ever did. —Robert E. Gould, in the *Chicago Tribune Magazine*.

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MECHANISM: METHODOLOGY OR METAPHYSICS

PETER A. PAV*

Did mechanistic philosophers in the seventeenth century actually believe that the world was mechanistic throughout, or did they merely deem it methodologically wise to proceed as if *such were the case? At many points they explicitly avowed the methodological position; they did so as part of their reaction against scholasticism, according to which absolute certainty was possible. Seventeenth century savants felt that man could not know the inner nature of the world with certainty. They placed a more modest limit on human abilities, claiming that at best we could merely describe the appearances, we could not penetrate with certainty to the heart of things. But at many junctures they did not heed their own caveat. Their mechanism, which is announced as methodology, actually is more than that, and constitutes a metaphysical contention.*

One of the most inspiring and reasonable ideas to the seventeenth-century savant, was that nature was a vast and intricate machine, more intricate and extensive than man-made machines, but still a machine. Such an idea was utterly unthinkable to the medievals and ancients. By Huygens' time in the late seventeenth century, things had changed considerably. In his *Traité de la lumière* stands the following:

> . . . in true philosophy . . . one conceives the causes of all natural effects in terms of mechanical motions. This in my opinion, we must necessarily do, or else renounce all hopes of ever comprehending anything in physics.[1]

The whole contention of the book was that light, of all things, was nothing other than an effect of matter in motion. Huygens wrote at the end of the seventeenth century, when mechanics was busy assimilating almost the whole of science. Before mechanical philosophers were done, they spoke of the universe as one great piece of clockwork, and of God as an artificer. Did the mechanical philosophers really believe the world was mechanical, or did they instead find it scientifically useful simply to proceed *as if* that were the case? Stated differently, was their mechanism a methodological position or a metaphysical one? Did mechanists actually believe the world was mechanical, or did they merely proceed *as if* such were the case? That is the question. Its answer is best prefaced by a consideration of the birth, growth, and nature of the mechanical philosophy.

Such intellectual movements as the scientific revolution usually take their greatest stimulus from a reaction to preceding views. In the present instance, the idol to be tumbled was scholastic Aristotelianism. In the eyes of the founding fathers of modern science, Aristotelian explanations were not just false. They were wrong-headed, because they were occult, outmoded, and mystic, little more than mere verbiage. Molière, in an oft-quoted passage from *Le malade imaginaire*, uses the medical qualifying examination of Bachlierus to mimic scholastic science. Bachlierus is asked for the scientific explanation of why opium induces sleep.

> I am asked by the learned doctors to give the cause and reason why opium produces sleep: To which I respond, because there is a dormitive virtue in it, of which it is the nature to still the senses.

The doctors reply in chorus.

> Well said, well said, well said, well said. Worthy, worthy to enter into our learned body.[2]

Molière's overstatement of the case is not entirely hyperbolic. His attitude was shared extensively; his account is a stereotype of others to be found extensively throughout the literature.

Did the scholastics say that gold is as it is because it has the forms of yellowness, density, malleability, and ponderability? Ridiculous. Here is how Robert Boyle put it:

> If you ask a vulgar philosopher the cause of the fire burning, he will presently answer you, that the fire burns by the quality of heat that is most eminent in it: but if you further ask him what that heat is, and how it enables the fire to perform the various effects we daily see produced by fire; he will if he be ingenuous, confess to you in plain terms that he cannot tell, and though he be not, he will but in a confused and unintelligible discourse give you cause to conclude as much.[3]

Such a view of their predecessors was quite typical of seventeenth and eighteenth century natural philosophers. William Molyneux's dedication to the Royal Society of his *Dioptrica Nova*, in 1690, provides one more of many possible examples.

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> 'Tis wonderful to consider, how the Schools were formerly overrun with a senseless kind of Jargon, which they call'd *Philosophy;* and which men studied with the greatest Labour and Assiduity, that they might attain the name of *Wise* and *Learned* . . . and when they had intangled themselves in a thousand ridiculous Disputes about empty Questions, they vainly thought they had attained the Perfection of Philosophers; whilst they had no Ideas in their Minds answerable to those Noises they made with their Tongues; . . . in this last Age the . . . Philosophick Societies of *Europe* . . . have dissipated these dark Mists, and have abdicated this kind of empty Stuff; which had crept into even Natural Disquisitions; and like a Leprosie had quite overrun the whole Body of Philosophy, deforming its Beauty, and ruining its Strength. Men are not satisfied now with *noisy Words,* and nothing else; but require more solid Foundations of Knowledge, and believe no farther than they can find good proofs . . . The Commentators on *Aristotle* . . . have rendered *Physicks* an heap of froathy Disputes, managing the whole Knowledge . . . by Hypothetical Conjectures, confirm'd by plausible Arguments of Wit and Rhetorick, ordered in a Syllogistical form; and answering Objections in like manner: But never studied to prove their Opinions by Experiments. By which Method they were as ignorant of the Properties and Affections of Natural Bodies, as if they were not at all the Subject of their Disquisitions. . . . They'd tell you the Tides depend on the *Influence* of the Moon; and when you proceed farther, and ask, what is this Influence? They'll yet give you a *Word* for it, and say, 'tis an *occult Quality*: If you inquire, what an *occult Quality* is? They'r at a Stand, and having no farther *hard Word* here to fly to, are forced to confess 'tis a Quality they know nothing of. Had they not better at first have plainly confest, they know not the Cause of the Tides? no surely; For tho this had been more becoming modest Philosophers, it would not so well captivate the Vulgar, and gain to themselves the Repute of deep Knowledge.[4]

Recent scholarship has dealt more kindly with the scholastics than did Molière, Boyle, or Molyneux. Nonetheless, such medieval concepts as essence, form, quality, and sympathy were indeed being displaced in the seventeenth century by space, time, and mass. Why did the seventeenth century refuse to discuss acids, for example, in terms of the substantial form of acidity, and refuse to regard chemical reactions as the process of actualization of a dormant potentiality? Would that have been any worse than talking in terms of unobserved, perhaps unobservable, atoms? What of the seventeenth-century explanation of acidic properties in terms of sharp, pointy molecules, or tiny ones which moved with penetrating swiftness? Wedge-shaped atoms would give rise to a strong taste, for example, by sticking in one's tongue like so many little barbs. Yet such an explanation still begged the question, though perhaps not as obviously as the dormitive virtue did. After all, could not the explanation have proceeded as well in terms of massive, blunt particles which assaulted the tongue by brute force? And furthermore, what necessary relation is there between a sensation of taste, and the manner in which the tongue is accosted by atoms? It would seem just as reasonable to say that the actual acid imparted its form or quality of acidity to the tongue, giving a sharp sensation insofar as the tongue went from potentiality to actuality in respect of the quality of acidity.

Many of the 'new' scientific explanations look as if they were made from the old ones by the scissor-and-paste method of simply switching new terms for old, without further change. Surely, seventeenth-century scientists were not proud of something as trivial as merely exchanging one set of terms for another, mechanical for scholastic. They were happy because they had done a good deal more than just that. They had identified the logic of *un*observables with that of observables; it was precisely at this point that their predecessors failed.

Once the medieval explanation had been given in terms of natures, forms, or qualities, further requests for secondary explanations of the concepts occurring in primary ones were not merely beside the point, but ludicrous. The heaviness of gold came from its inherent substantial form of ponderability. The *explanans* was more simple than the *explanandum* in being more irreducible; that is, at the end of the conceptual line. But it was not more simple in the sense of being more verifiable or easily known. It explained only the data by which it was generated, and that is barely explanation at all. The explanation of acidic behavior pointed merely at the quality of acidity, which obeyed the logic of forms. That logic had precisely the characteristics needed to explain what had to be explained, and for an obvious reason—they were built in, *ad hoc.* This was what the seventeenth century meant when they hurled the accusation of word-juggling at their predecessors. But were the accusers themselves immune, since they had recourse to unobserved atoms? To some extent they were; for in replacing the forms and qualities by atoms in motion, they brought a powerful set of explanatory principles to bear on the matter at hand, one which had its logic already developed and tested; for a primary tenet of seventeenth-century atomism was that the atoms obeyed exactly the same laws as did macroscopic objects, the laws of mechanics which were proving their worth in explaining and relating all sorts of phenomena, from motion in the heavens down to the functions of the human body itself.

For the medieval scientist, the forms in iron of malleability, fusibility, and magnetism were completely independent; but in the seventeenth century they all were inter-related by their common cause, atoms in motion, in motion governed by known laws which reached through the whole of nature. The particulate structure of iron explained all of its observed properties, related them, and brought them all under the aegis of the science of mechanics. For example, the atoms composing iron were large, packed closely together, and sluggish, thus explaining its weight and solidity. Heat was merely atomic commotion, and if the atoms in a chunk of iron were sufficiently agitated by heat to break apart, the sample would melt, losing its shape, and also its magnetism, which depends on atomic alignment. It was in such a manner that color, taste, opacity, and all the other properties of iron would be explained in terms of atoms and their mechanical attributes. In actual fact, such a reduction was not effected until some two centuries later, in the nineteenth century. But even if the goal was not reached in the

seventeenth century, it was clearly defined then. That was a remarkable accomplishment in itself.

The approach was, however, not without its excesses. An example is Descartes' explanation of magnetism in terms of spiral effluvia. Little corkscrews were emitted from ferro-magnetic substances upon magnetization. Should they meet any iron as they coursed through the air, they would burrow into it like a driven screw, pulling it forward and also magnetizing it. A freely suspended magnet would be aligned in space by their passage, since their right-hand threads could fit only one way, much like a bolt in a nut. Now, all this is indeed strained, but in an elliptic sort of way it is not quite as ridiculous as might seem. We today talk in terms of little domains of atoms lining up under the influence of a directional magnetic field. In fact, our explanation is all the more tenuous because of its dependence on diaphanous fields, and our atoms, in distinction to those of the seventeenth century, are quite different from anything we can see or feel. The saving point is that our explanation subsumes the behavior of magnets under a well-developed electromagnetic theory. What that theory is for us today, mechanics was for the seventeenth century, especially against the background of what had gone before. Mechanical philosophers were not engaging in fantasy, nor were they revolting for the sake of revolt. They were eagerly using what looked for good reasons like the best tool, mechanics. Science benefitted greatly. A mechanistic approach is perhaps not the only one which could have done the trick so nicely, but it is indeed one which did.

Besides effecting a unification, the mechanical philosophy had another important characteristic. The final explanatory terms—atomic size, shape, position, and motion—were all mathematically tractable; not only did all sorts of previously disparate properties become inter-related, but they were all related to the triumphal victor, mathematical science. No wonder men were so happy, for they had in their grasp the means of explaining an infinity of observable phenomena in the simple terms of a few properties of atoms, properties which were quite like those already known at the macroscopic level, and which were subject to a rigorous and fruitful calculus. What did it matter, then, if hardly any of the details were ever worked out? The general notion in itself was enough to carry the day.

It is appropriate now to come full circle back to the question posed at the outset, "Did mechanists actually believe the world was mechanical, or was it merely wise to proceed *as if* such were the case?" Was their mechanism methodology or metaphysics?

There can be little doubt that mechanical philosophers did treat nature as if it were mechanistic. Robert Boyle was but one of many who went so far as to liken the universe to the great and intricate cathedral clock at Strasbourg. However complex the world machine might be, the mechanists felt it *could* be understood by those who took the trouble to study. The world was not basically mysterious and unknowable. Something could be learned in taking it apart and putting it back together; that is, in experimenting. The acceleration of scientific progress in the seventeenth century was directly related to the increased emphasis placed on experimentation. All this does not say that mechanism was merely a pragmatic approach and nothing more. But there are some explicit indications that the approach was *only* an approach. They can be found in Descartes, and are typical of mechanical philosophers in general; Descartes was speaking for his age.

When Descartes proffered his humorous explanation of magnetism, surely he did not mean that the world was *really* that way at all. He hardly could have expected readers to take him literally, but merely felt that he could aid the understanding of magnetism by proceeding in metaphoric manner. His model encompassed the directionality of magnetic phenomena, their diminution with increasing distance, and several other aspects of magnetism. Just because the model worked well, there was no need to claim that little screws actually were flying around. It might be useful so to proceed in investigating and explaining magnetic phenomena, but prudence would preclude mistaking the model for nature; that is, the portrait for the sitter.

In reading Descartes, another topic fosters the suspicion that mechanism was being used only as a tool. It concerns his efforts to give a purely mechanical explanation of the phenomena of light. He wrote that

> light is . . . nothing else, in the bodies termed luminous, than a certain movement or a very prompt and intense action which passes to our eyes through the air and other transparent bodies in the same manner that the movement or the resistance of the bodies encountered by the blind man passes to his hand by means of his stick.[5]

Various colors and intensities of light correspond to different kinds of pushes on the stick. The model clearly supports the rectilinearity of light. But what could the model do toward explaining refraction? That question had occurred to Descartes.

> But, because there is a great difference between the stick of this blind man and the air or other transparent bodies through which we see, it is necessary that I use here still another comparison.[6]

The second analogy served to show how light could permeate transparent media. In it, the material particles of these bodies were portrayed by a vat's motionless grapes past which wine, representing streams of light, tended to flow. This model served to explain how light could traverse a transparent medium. But neither it nor the first analogy explained the most important phenomena of all: reflection and refraction. For that purpose, Descartes used a third analogy in which light was regarding as a stream of moving balls.

It would seem obvious that Descartes was merely using models, rather than telling us what light really was; for three things at once, light could not be, especially since flying balls, rigid sticks, and the wine in a vat of grapes all behave quite differently. Descartes said as much at the end of his *Principles of philosophy*. Principle 204 in part IV asserts that concerning things

not directly accessible to sense-perception, it suffices to describe their nature, to say what they would be like—even if by chance they should not be so.[7] William Molyneux said the same sort of things in 1690.

> I know some will say, that by *Natural Philosophy* is meant not only the Knowledge of the Properties and Uses of Natural Bodies; but also the Assigning the true Reasons or Causes of these Properties. But in this Particular we are to proceed with great Caution. I know the Mind of man is of that inquisitive, prying Nature; that upon any Appearance offer'd to the Senses, it immediately falls to the search after the Cause producing this Effect. But indeed in Natural Disquisitions, 'tis generally (I may say almost alwayes) to no purpose. We may make plausible Conjectures, and some sort of feasible Guesses; but others perhaps may make others, and these also equally probable. But these deserve not the Name of *Natural Philosophy;* they serve only for Chat and Diversion. For the *Omnipotent Contriver* of the Universe has order'd Natures Operations to be performed by such fine Springs, Secret Motions, and inexplicable Ways; that Man in this Life may well despair of attaining the intimate Knowledge thereof; and must therefore content himself with the Contemplation of plain matter of Fact, in which he cannot be deceived.[8]

Thus it seems plausible that mechanism might have been methodology rather than metaphysics. So much the worse, for if it be shown that what seems plausible is false, rather than true, there arises the further task of accounting for the plausibility. That is precisely our position, for mechanism was indeed full-blown metaphysics. Descartes' disclaimer was given simply because of a standard metaphysician's problem—he could not incontrovertibly prove his point. Barking at the heels of scholastics who thought *they* could, in all candor Descartes had to admit his limitation. How can one prove that the world is really Ideas at base, or processes, or matter in motion? Such contentions cannot be demonstrated as could the presence of a 30-foot green snake underneath my desk. Descartes was logician enough to realize what he could not do; he was human enough to do it anyway. His disclaimer was immediately followed by the statement that nevertheless there is a moral certainty that everything is such as has been shown it could be.[9] Moral certainty was all that men, not being God, could attain. But immediately in the next breath, Descartes took the *full* step backwards, to claim that . . . in reality

> the certainty is more than moral.[10]

We have full and absolute assurance that the world is as he said. In his words . . .

> at least the more general things which I have written about the world and earth, can scarcely be made intelligible by any means other than as explained by me.[11]

So from methodology, through moral certainty, Descartes ascended to absolute certainty in metaphysics. Descartes could not make the move in one big step. He had to do it a little at a time.

Why, if Descartes was actually talking about the nature of the world rather than about a method, would he tender explanations as tenuous as that of magnetism, and as contradictory as that of light? Bear in mind, the problem does not concern merely Descartes himself, but involves him as a spokesman for his whole age, whose motivation consisted chiefly in a rejection of what had gone before. They believed that the world was mechanical and rationally understandable, and were extremely zealous to make their case. Were their explanations speculative? At least the explanations were mechanical. If Descartes proffered three clashing mechanical explanations of light, at least he had given three mechanical explanations. In that respect, they were thrice as good as one. The important goal was to establish the mechanical philosophy; details be damned.

It was because of the success of mechanics in the hands of Galileo, its amenability to mathematics, and the promise it offered in associating the unobservable with the observable, that mechanics presented itself at all. But why did it become metaphysics rather than just a method? The explanation lies in the youth of the age. At its inception early in the seventeenth century, modern science criticized earlier efforts at final and complete explanation of the world. There is no doubt that from antiquity through the middle ages, science was hardly limited merely to measuring and describing the appearances. Rather, the intent was to tender final explanations in terms of necessary principles. Scepticism increased in the renaissance. By the early seventeenth century, depreciation of medieval science was nothing novel. But no viable alternative had arisen; mysticism died rather early in its infancy. To widespread applause Descartes doubted away the Aristotelian world, and the resultant vacuum was unbearable. He and his century proclaimed that they could not really press through to the heart of nature, men could not know what lay hidden from their senses. All that science could do was *describe* the apparent phenomena; the human mind could not penetrate behind them. But the pill was too bitter to swallow. The empty frame had to be refilled with a new picture. So having claimed that they could not explain, but merely describe, the age promptly began to explain, and to explain exactly the same phenomena as had the Aristotelians, often in the very same order. (Of course, the explanations were mechanistic.) Descartes' *Météores* rigidly followed Aristotle's *Meteorologica* topic by topic, not merely because that was a logical way to arrange a rebuttal; but because the horror of an intellectual vacuum demanded that each old explanation be replaced by a new one. Mere observational descriptions alone would not suffice. Errors of detail could be forgiven, just so long as the holes were filled with mechanistic plugs.

It would be a matter of some time before modern science was mature and stable enough to forego trying to lay nature bare and trying to find one simple key to all her secrets, to desist from inferring that, since nature was not unknowable, it was thus known, and to stop confusing a hope with a fact. It comes hard to admit that there is no ready road to truth, and no final certainty in science. That is why mechanical philosophers could say no other than that something real and knowable lay behind observed phenomena. Their par-

ticular twist was to claim it was mechanical.

In laying the foundations for modern science what really mattered was not the collection of observably verifiable facts. It was the development of a view of the world and a corresponding method of investigation —neither of which can be shown incontrovertibly to be correct. Seventeenth-century mechanical philosophers were not afraid to take such a bold step.

FOOTNOTES

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COMMENTS ON ANDREWS' NOTES REGARDING CURRENT PSYCHOLOGY

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Recently, in response to an article by John Finch,[1] the present authors expressed the viewpoint that psychology should be defined as the scientific study of behavior and that attempts to apply an existential-philosophical orientation to psychology in the absence of a sound methodology as well as criteria for determining validity, appear to be fruitless.[2] We were pleased with the response our article received both in the pages of *JASA*[3,4] and through private correspondence. While we are particularly unimpressed with most current attempts at rapproachment between psychology and Christianity, we hope that through continuing dialogue better formulations might develop. We therefore welcome Andrews' notes[4] but feel that some points made by him require clarification and comment. The points to follow should be considered a brief, informal reaction to the notes by Andrews. Andrews raises too many issues and makes far too many unguarded comments to discuss each point thoroughly.

1) Andrews assumes that the problem is basically a debate between experimentalists and clinicians with us on the side of the experimentalists. He assumes that the nature of clinical work is unknown to us, and that the kind of psychology we are espousing is a totally inadequate framework for the practicing clinician. The fact is that the issues involved do not constitute a dispute based only on professional interest, nor is it true in our specific case. Dr. Walker obtained his degree in clinical psychology from Purdue University and Dr. Mecherikoff, while basically an experimental psychologist from the University of Minnesota, has had considerable training and experience in the field of counseling. One author (CEW) is currently a part-time staff member at a large state mental hospital and has had considerable experience in a wide variety of clinics and hospitals as well as private practice. The other author (MM) has been recently employed in the same setting. It is our observation that merely being a clinical psychologist with an interest in therapy does not drive one to an existential or phenomenological framework in theorizing. Most clinicians are not existentialists.

2) Andrews interprets us as criticizing Finch for his "unguarded transition from psychology to psychotherapy, perhaps unaware of the experimentalists' tendency to pounce on such transfer as illegitimate and unscientific." We do not feel that there is a basic split between psychology and psychotherapy, and we certainly do not regard any discussion of psychotherapy as intrinsically illegitimate or unscientific. It simply seems to us that psychotherapy is best considered as an area of applied scientific psychology. This is not to say that all psychotherapy practiced must be thoroughly underpinned by scientific research. Scientific research in this area is currently not that far advanced. Meanwhile, people are suffering from emotional and

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behavioral disturbances, and we need to do the best we can with whatever means we have at hand. We are grateful for the therapeutic efforts and successes of all therapists, existential or otherwise, but this does not mean that we need to accept their theoretical formulations. Further, Andrews' statement that it has become a comical anomaly in most universities to pursue research in psychotherapy outside the limits of counter-conditioning or other learning theory paradigms appears rather puzzling, because while learning theory models are becoming increasingly popular and useful in psychotherapy, there is a great deal of work done from other theoretical points of view. To a graduate student at heavily phenomenologically oriented Duquesne University it might seem that learning theory therapy is taking over the field, but such is far from the truth. Learning theory therapies are proving very fruitful and will undoubtedly be an important part of the therapists' armamentarium for some time, but other therapies have much to offer also. Thus, to us, psychotherapy is of legitimate concern to the psychologist but it should be based on empirical research as much as possible and it is expected that a number of different approaches will be included.

3) Andrews questions whether the methods of physics and natural science are sufficient to deal with the data base of psychology and indicates that attempts to limit one's endeavors to these realms will lead to a truncated view of human nature. He questions whether psychology should be thought of as a natural or a social science. The problem involved here concerns the basic definition of psychology. The prevailing majority opinion in the field of psychology is that the discipline should be considered an empirical, experimental, natural science devoted to the study of human and animal behavior. Any brief survey of journals and texts published in the field will confirm this. It is our contention that this strategy has had a good pay-off and there is no reason to change it. One must consider the fact that whereas natural science has a modcratcly well-defined methodology and criterion for truth, social science, if considered distinct from natural science, seems not to. To consider psychology as a social science, then, divorces it from the very procedures which have made it efficient and communicable. It is worth pointing out, also, that psychologists have long since given up attempts to copy slavishly the other natural sciences. Recognizing that most of the techniques and theories of physics, chemistry, and biology are not suited to the behavioral sciences, psychologists have developed methods uniquely suited for their own subject matter. These methods have proved exceedingly fruitful and useful to psychologists in the study of behavior. By contrast, the more speculative and philosophical approaches have generally failed to demonstrate an equal amount of productivity. It is for this reason, that psychologists by and large have chosen to define their field as the scientific study of behavior. This, of course, is the distinction made originally by William James involving the contrast between the tender-minded and the tough-minded. We find ourselves squarely on the side of the tough-minded in the definition and development of the field of psychology. To accuse psychology of having a truncated view of human nature because it fails to take into account other aspects of man than those which can be studied scientifically is to adopt a different definition of psychology and to attempt to include within the realm of psychology areas which psychology as a science is not equipped to deal with. If Andrews wishes to make the point that many psychologists have failed to show interest in these other areas (for example, values, moral behavior, purposiveness in life, etc.) his criticism is well taken for the non-Christian behavioristic psychologist. However, it is our proposal that Christian psychologists make more of an effort to relate these issues to a behavioristic, tough-minded psychology. We believe that this will result in the most progress and be the most fruitful approach in the long run. While the existentialist and tender-minded approaches to the study of human nature superficially appear to be more easily compatible with Christian belief, we feel that the wedding of these two will, in the long run, prove to be less productive than a combination of tough-minded psychology with Christian revelation. We wrote our original article in effort to stir up some interest in this direction. It has been our feeling that the existentialists and phenomenologists have held the field too long with respect to a Christian approach to psychology.

4) Andrews seems confused about the issue of subjectivity and objectivity, which is not surprising, because it is a confusing, unresolved issue. Questions Andrews raises in this connection are puzzling to us, and we suspect that a much longer explanation both on his part and on ours than is possible here would be required to reach any clarity on the matter. For example, there has never been any doubt that scientists arrive at their theories speculatively. Science is clearly a deductive and intuitive, as well as inductive, enterprise. This does not mean, however, that the behavior involved is beyond analysis and understanding. The scientist *is* a behaving organism, whose functioning is subject to the very laws he is investigating—physical, chemical, biological, and behavioral laws. Whatever "objectivity" means, it does not mean that the investigator (the "knower") leaves the universe or becomes a different order of being when he makes observations, constructs verbal interpretations, or communicates results. This is as much true of the physicist as of the psychologist. It is unclear to us why the kind of so-called "subjectivity" found in relativity theory or the microcosmic indeterminacy of quantum theory gives so much comfort to Finch and Andrews. Physics has not thereby become "existential," else why would we be warned *not* to model psychology after physics!

5) It is not true that the experimental, behavioristically oriented psychologist eliminates man in his "loving, dreaming, hoping, creativity, hating, fearing, dying, and his praying." Insofar as all of these things are behavior, they are potentially interesting to the behavioral researcher, although the behaviors are so

complex that at present practically nothing can be said about them scientifically. In this circumstance the scientist prefers to say practically nothing, rather than to risk speaking utter nonsense. To the extent that they fall outside of the realm of observable behavior, they become matters of theology and philosophy, not psychology. At this point the atheistic psychologist may quit, but the Christian psychologist need not. It is only crucial that he realize that he is outside the realm of his science at that point. What we do deny is that any man as observer can get inside the skin of another man and know his experiences directly. We have profound difficulty understanding what "subject-subject" research is all about, what its explicit methods are, and how one determines if one's verbal formulations (hypotheses, theories, "understandings") are anywhere near the truth. This is the reason for our "objectivity."

To counter that this request for information about methodology is part of some "natural science fallacy," and is therefore an unfair question, makes little sense to us. If each "researcher" is to be his own arbiter in these matters, only idiosyncracy and lack of communication can result. The matter of methodology simply cannot be escaped.

6) Andrews' desire to define science as any "systematic discipline" is obviously inadequate. Music, accounting, literature, plumbing, farming, and other areas *ad infinitum* are all systematic disciplines, but do not necessarily employ the methods of scientific inquiry and are, therefore, not considered basic sciences. That Andrews finds it necessary to use this type of definition of science in order to include the existentialists, only illustrates our point that this is no science at all.

7) Andrews' discussion of Wolpe's methods as a "strongly manipulative procedure" indicates a misunderstanding of the methods of learning theory therapy. Learning theory therapists have repeatedly pointed out that their techniques involve a cooperative effort on the part of the patient and therapist in which the therapist helps the patient achieve certain ends via scientific principles of habit change. Wolpe[5] has also pointed out that the general rapport and interpersonal qualities of the patient-therapist relationship are an important part of his therapy. It is also worth noting that careful examination of the supposedly non-directive and non-manipulative therapies reveals that these are often manipulative but in more subtle ways.[6]

8) Andrews' comment that a world of objective, impersonal, mathematical, and precise facts, "simply does not exist for the clinician and his human subjects," is strange. Does he think that Wolpe and those who employ learning theory therapeutic techniques are not clinicians, or is it that their patients are not human? As has been pointed out, both of the present authors are interested in therapy and counseling. The clinician author spends many hours doing psychoptherapy every week and people are helped by his efforts, but he is not an existentialist. It is all right to be an existentialist, but one should be careful about asserting that this method is the only method.

9) Andrews, toward the end of his article, notes that he is all for the insights that can be obtained by science but feels that this is not enough. We agree that the Christian is often interested in things that are beyond the scope of psychological research (such as God, spiritual reality, etc.), but let us admit this instead of defining psychology in such a way that it includes everything and specifies nothing.

10) In the midst of these objections two of Andrews' points deserve positive comment. First, he points out a bit of carelessness on our part, when we say that "psychology as a natural science cannot (nor does it attempt to) comprehend the full stature of man." The context of this statement is the assumption that there is a spiritual dimension to man which by definition is beyond the reach of natural science. In this sense science does not even attempt to comprehend man's full stature. But there are, of course, psychologists who do not believe in such a spiritual dimension; for them all of man is potentially comprehended in a thorough analysis of his behavior and the biological and environmental factors of which it is a function. The present authors do not fall into this category.

Secondly, he correctly summarizes the present debate as a difference of opinion as to how psychology ought to be defined: "Finch believes the existential approach looks more promising for the Christian, while Mecherikoff and Walker see in psychology as a natural science the more profitable path to follow." Our feeling is that this issue will be resolved by history. "Natural science" psychologists will eventually have to come to grips with the more complex functioning of man, while those already dealing with such functions at a practical level will have to clarify their criteria for distinguishing knowledge from false belief. It is not our intention to dogmatize, but rather to present an alternative viewpoint to an existentialist revision—a viewpoint which we feel is much closer to the mainstream of American psychology.

11) In summary, we would like to re-state our basic position, since some seemed to misunderstand it. We feel that tough-minded research as exemplified in functionalism and behaviorism has proved exceedingly fruitful in psychology and currently constitutes the mainstream of the field. We would like to see a serious attempt to integrate a Christian position with this orientation. While this appears intrinsically more difficult than integrating Christian ideas with those of the existentialists, we feel it offers more promise of value in the long run. The Christian psychologist should not deny the existence or importance of things beyond his science, but neither should he feel that it must encompass everything in the universe. Psychologists and theologians may fruitfully combine and compare their information about man via frequent dialog, but neither should (at least at this stage of intellectual history) take over the field of the other.

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BOOK REVIEWS

MARLIN KREIDER, Editor

THE BIBLICAL FLOOD & THE ICE AGE, Donald W. Patten, Pacific Meridian Publishing Co., Seattle, 1966. 336 pp., $7.50.

The dust cover of the book plainly identifies it as another "catastrophic refutation" of the prevailing uniformitarian view of terrestrial history. Webster (Merriam) defines uniformitarianism as "the doctrine that existing processes, acting as at present, are sufficient to account for all geological changes." Catastrophism, the alternative view, is defined as "the doctrine that changes in the earth's crust have generally been effected suddenly by physical forces."

With the discussion of *The Genesis Flood* by Morris and Whitcomb still fresh in our memories, members of this Society ought to be permitted at least one question. Strangely enough, the author anticipates this by opening his first chapter with, "Why write a book on the Biblical Flood?" His answer to this eminently reasonable but rarely asked question deserves some comment.

Although this book and *The Genesis Flood* both deal with the same general topic from comparable evangelical perspectives, vast differences exist in emphasis, content, and style. Whereas Morris and Whitcomb place primary emphasis on biblical authority in the conflict, Patten stresses the scientific inadequacies of prevailing positions. For example, one would hardly expect Morris and Whitcomb to make the statement, "Genesis, like Job is a valid historical document, and may be a valid spiritual one, too." (p. 307). Yet, by the manner in which he identifies the origin of uniformitarianism, the contemporaneous movements of humanism, biblical criticism, evolution, and communism he unequivocally establishes his theologically conservative stance. He contends that the uniformitarian views of Lyell, Kant, Darwin, and others are philosophically grounded and totally unsupported by critical scientific analysis. With his emphasis on hard evidence, Patten makes use of the Bible primarily as the most reliable among many ancient historical sources.

In developing an independent stance, Patten also points to certain weaknesses of his "catastrophic" forebears such as Price and Velikovsky. He also stresses a physical mechanism, a step apparently neglected by his predecessors; that *astral catastrophism* can better account for all the evidences of astronomy, geology, glaciology, meterology, biology, and history and yet preserve consistency with conservative views of Scripture. In response to his own question, Mr. Patten appears to offer as much justification for writing as one can reasonably expect of any author.

But what of the book, itself? Should you spend your valuable time with it? Should you recommend it to your skeptical colleagues, lay members of your evangelical church who respect your erudition, or to your own teenage son who probably does not? These are relevant questions, for its style is clearly that of a book written for laymen, some of whom may too easily be impressed by "something I read in a book."

The book will not score high as a literary effort. Long explanatory footnotes and a lack of thorough editing suggest a hasty preparation. For example, we read four consecutive sentences dealing with strata, each beginning with the same words, "They seem to have been laid down . . ." (p. 205). Occasionally he becomes dramatic, ". . . unless the mechanical cause of the Flood is adequately explained by catastrophists, geology may easily hibernate in its uniformitarian bed for another 100 years."

But what of the main thrust of the book? Let us look further into the book, beyond mere literary criticism.

Briefly stated, Patten postulates that by chance an icy body from the remote regions of our solar system approached Earth closely enough for a near capture. During the encounter that continued for about one year, the planetoid orbited Earth a few times, approaching close enough to have drastic effects on the earth. Enormous forces were produced in the earth's magma that led to devastating tidal waves, the biblical "opening of the fountains of the deep." He also postulates that the icy planetoid shattered as it reached the Roche Limit, cascading gigantic quantities of exceedingly cold ice upon the earth. This twin mechanism, he contends, can account for the observed phenomena associated with the ice ages and geological structures far more consistently than uniformitarianism.

In support of his hypothesis, Patten offers evidence

from astronomy that seems sound and convincing. That the serenity of Earth in a uniformitarian mode could be interrupted by an icy intruder from the neighborhood of Jupiter, Neptune, or beyond is plausible. He cites the well-known observations of the high eccentricity of Pluto's orbit, the strange orbits of Neirid and Triton about Neptune, the existence of asteroids and some of their strange orbits, the unique inclination of Uranus' axis and rotation of its satellites, the retrograde rotation of four of Jupiter's 12 moons, the icy rings of Saturn, and the prevalence of ice in the outer reaches of the Solar System. That catastrophic events have occurred in the Solar System seems undeniable; indeed modern cosmogony contains many cataclysmic elements.

Having established the plausibility of a catastrophic encounter of Earth with an icy space-wanderer, Patten develops the consequences of this event upon an antedeluvian Earth. With substantial reliance upon ancient historical sources, both biblical and secular, he contends that the earth was covered by a canopy of clouds, with water comprising from 5 to 10 per cent of the atmosphere. This is comparable to the perpetual cloud cover over Venus that John Strong recently identified as ice crystals and Kuiper as arid dust.

Some familiar, but nevertheless interesting, observations related to the ice ages are cited as conflicting with uniformitarianism: great numbers of frozen mammoths, their flesh unspoiled and their mouths and stomachs still containing identifiable, undigested vegetation; ice-encased trees complete with ripe fruit; ice caves situated between layers of lava. Patten reasonably contends that these could only be the result of catastrophic events, involving temperatures far below zero and with time measured in hours or days but not years.

Less convincing is Patten's discussion of the photochemistry of the atmosphere. The primary event in production of atmospheric ozone is described, "In the upper atmosphere, the solar wind beats down unrestrained upon the atmosphere until the solar rays, especially of the ultra-violet frequency, strike the oxygen molecules and ricochet. When they strike the nucleus of the oxygen atom in just the right way, they will split the oxygen molecules (O_2). The free oxygen atoms immediately recombine into another form of oxygen known as ozone (O_3)." (p. 211). Elsewhere he refers to both ozone and carbon-14 as atmospheric radicals and speaks of "ammonias, cyanogens, hydrides of nitrogen, hydroxyls, ionized carbon monoxides, and nitrogens." These plural nouns are confusing, to say the least. Because photochemistry of the atmosphere is a fundamental element in dating methods that use carbon-14, the ambiguity of this section of the book is a serious flaw.

This book serves to remind us that members of the ASA do not uniformly agree on the degree to which certain sections of the Bible should be regarded as literal. On some matters, however, we do agree. We believe that God has revealed Himself in Jesus Christ, in the Bible, and in Creation; and that these levels of revelation are consistent with one another. We also believe that God continues His revelation through science to the degree that its study accurately reflects the truth. We also recognize that Scripture speaks to us in simple, non-technical language to convey its essential Gospel. Both the wise Revealer and the faithful transcribers mercifully avoided mechanistic explanations for the divinely ordered events we regard as miracles. Thus, Peter was enabled temporarily to walk upon the sea, not by a drastic increase in the density or surface tension of the water, but by the power of God.

In all likelihood, we also differ in the depth of our commitment to the various theories of science. Although arguments surrounding the Theory of Evolution gathered more headlines, the great scientific battle of the 19th Century was waged between proponents and opponents of the Wave Theory of light. Shortly after he had experimentally verified Maxwell's equations, Hertz very reasonably stated in 1889, "The wave theory of light is, from the point of view of human beings, a certainty." This unfortunate statement was soon followed by Hertz's own experimental discovery of the photoelectric effect that Einstein used so effectively in establishing the Quantum Theory of light. A few years later, Newtonian laws of motion were "amended" by Relativity. In the space of 30 years both physics and chemistry had been reconstructed.

To reconstruct prehistoric events from degraded residues in a manner that is consistent with all observations and the firmly based knowledge of experimental science is formidable, indeed, as is demonstrated by the lack of agreement among eminent astrophysicists on the nature of the Venusian cloud cover and the origin of the moon. To offer new theories of cosmogony or orogenesis requires courage. To do so in the face of a contradictory and prevailing theory requires deep conviction. But these qualities are not enough.

No laws of science have been more successful than the Wave Theory and Newton's Laws as practical tools in the building of our Machine Age. Yet these theories do not speak The Truth. One wonders whether Evolution and Uniformitarianism are more reliable or whether they too are still part of the 19th Century.

Reviewed by Alvin O. Ramsley, Physical Chemist, US Army Natick Laboratories, Natick, Mass. 01760.

ISSUES IN SCIENCE AND RELIGION by Ian G. Barbour. Prentice-Hall, Englewood Cliffs, 1966. 470 pp. $5.95.

Ian Barbour teaches a course at Carleton College which is listed like this in the catalog:

> RELIGION 54 Science and Theology
> The interaction of scientific and theological thought and its influences on world views since the sixteenth century. Implications of theories in the natural sciences for such issues as "creation and evolution" and "freedom and determinism". Problems of language and method in science and theology. Interpretations of the relation of God to nature (e.g. pantheism, deism, theism, existentialist and process theology.)

Issues in Science and Religion is the central textbook for that course. Barbour uses it to provide a background for the various authors and ideas which must be discussed in a course of this type. It is *first* a survey of the relevant history and the important theories and ideas; it is *second* a fairly cautious presentation of critical realism and process philosophy as valid ways of relating the worlds of the scientist and the theologian.

Issues is divided into three parts, dealing with history, methods, and theories. In the first of these, the author leads us quickly from the static, geocentric view of the universe as held in the middle ages through the major new ideas of Galileo, Newton, the enlightenment, and Darwin to the modern ways of looking at the world. Along the way, he manages to sketch the basic philosophies that shaped science as it grew, as well as the theological changes and schisms of each century.

The second part sees a careful exposition of the methods of scientific theorizing, accompanied by a statement of four common philosophies bearing on such theorizing (positivism, instrumentalism, idealism, realism). Barbour suggests that critical realism, recognizing both the relationship of theory to actual phenomena and the arbitrary qualities of theory as created by men, is the way he would like to look at the world. He analyzes the methods of theology by comparing them with the methods of science. He finds considerable similarity, particularly in the comparison of the interpretation of religious experience and the interpretation of scientific data to produce theologies or scientific theories. The element of personal commitment, he holds, is a difference in emphasis rather than an absolute dichotomy. God's revelation in history is unique and different from the materials science works with, but it too is interpreted by men in ways that are not completely different from the ways men interpret scientific data. Barbour acknowledges the contribution of linquistic analysis in delineating the realms of religion and science, but he feels the similarities in method mean that these realms cannot be split as completely as they have been by recent philosophers and theologians.

In the third section of the book, he looks at the relation of science and theology in three crucial areas: 1) physics and indeterminacy, 2) the origin and basis of life and the meaning of the mind, and 3) evolution and creation. In each area he explains the scientific experiments and theories that brought the problem to the surface; he summarizes the present state of the controversy; he proposes some solution; finally he makes applications from the problem to his view of the world in general. His expositions of the problems are complete and understandable, particularly in his own area of physics. The reader may, however, feel a bit perturbed as the author presents one or another particularly attractive possible solution but then arbitrarily discards it in favor of some different way out of the problem.

In his final chapter, "God and Nature", Barbour divides the views of the relationship of God and the world into three groups: The classical views (God as omnipotent ruler), the existentialist and linguistic views (God who works only on a personal level), and the process views (God as an influence on the process of the universe). Working in the methodical way which characterizes this book, Barbour presents the views as culled from a few (he hopes representative) authors who hold each position, and he points out the strengths and weaknesses of each. In a concluding section, he plugs the holes that he sees in process philosophy with material from the other two views, and he presents the result to the reader as a way of looking at God in nature that will hold water.

A large part of *Issues* is summary and discussion of various viewpoints on the broad range of topics the book covers. Each summary is well documented by reference to the works of men holding each position, but the choice of positions to summarize and men to refer to is open to question. For instance, in the section of evolution and creation he ignores the recent contributions in fields like population genetics and outlines the theories of evolution working from sources ten years old and more. As another example, in his examination of classical views of nature and God, he somewhat arbitrarily divides these classical views into Barth, Neo-Thomism, and William Pollard, thus leaving out more than he includes. This detracts from the effectiveness of his criticisms, since a number of seemingly tenable positions not falling under his criticisms are not mentioned. This is perhaps excusable, considering the breadth of the material he is trying to cover, but it does leave the evangelical wondering where his position might fit into Barbour's scheme, and what criticisms Barbour might have of it.

Considering only those views he does choose to cover, the book is quite helpful as an outline and summary of some of the problems in the area of science and theology, and the history of these controversies. With his careful style of summarizing what he is about to say, saying it by dividing it into short sections, then once again summarizing what he has said, drawing conclusions, and fitting the whole topic into place, Barbour makes all the concessions he can to the reader. The book is an excellent introduction to certain selected issues in science and religion from certain selected viewpoints. Perhaps this is the most I can expect from this type of book.

Reviewed by Jay Cassel, Carleton College, Northfield, Minn.

Books Suggested For Review

Members of the Affiliation are invited to submit reviews of any of these books to the Book Review Editor. Reviews should not exceed 500 words unless the book is expected to be of unusual interest to the members. The editor should be notified before a review is attempted to prevent duplication.

INASMUCH by D. O. Moberg, Eerdmans, Grand Rapids, 1965. 216 pp. $2.45. A former editor of and frequent contributor to this Journal, this author chal-

lenges evangelicals to be aware of the profoundly social aspect of the Christian's spiritual life.

GALILEO, SCIENCE AND THE CHURCH by J. J. Langford, Desclee, N.Y., 1966. A detailed picture is presented of the religious and scientific atmosphere of the time.

POWER AND PRIVILEGE by G. Lenski, McGraw Hill, N.Y., 1966. A theory of social stratification is presented by a sociologist with Christian convictions.

MATHEMATICAL CHALLENGES TO THE NEO-DAWINIAN INTERPRETATION OF EVOLUTION. Edited by P. S. Moorhead and M. M. Kaplan, Wistar Institute Press, Phila., 1967. 140 pp. $5.00. Several men from well-known universities present serious problems with the theory of evolution. But it was clearly stated that their anti-evolutionary position did not mean that they were creationists.

THE ENCOUNTER BETWEEN CHRISTIANITY AND SCIENCE, by R. H. Bube, Eerdmans, Grand Rapids, 1967.

THE CHRISTIAN STAKE IN SCIENCE by R. E. D. Clark, Moody, Chicago, 1967.

FAMINE 1975: AMERICA'S DECISION WHO WILL SURVIVE by A. Paddock and P. Paddock, Little, Brown and Co., Boston. 1967, 276 pp. $6.50.

The Young in Head

Time (chose) the Young Generation as its figurative Man of the Year.... A good deal of the Young Generation's behavior is admirable and promising, much of it is at least comprehensible, and most of it is preferable to the torpor that prevailed in the Eisenhower years. My concern is with those who are more or less my contemporaries; with their attitudes toward the junior generation. To a considerable and dangerous degree, they have become bootlickers of the young.... At the base of these attitudes is an assumption that what is Young is good, true, pure, and hopeful; what is Non-Young is tainted, false, impure, and hopeless. This is a perennial American literary myth in ridiculous extreme—J. D. Salingerism exalted to a creed. To subscribe to it is an act of disbelief in young people's qualities because it implies that only lack of years has kept them as pure as they are and that time will inevitably corrupt them — Stanley Kauffmann in *The New Republic.*

as published in HIS, June, 1967

From and Through Men

Truth is not self-propagating. It is personal and moves from person to person. The one supreme and basic truth of God available to man in Christ has to be carried and communicated by men to men. The world needs Christ, and it can get Him only from and through Christian men. — Robert E. Speer, as quoted in *The Wesleyan Missionary.*

as published in HIS, June, 1967

New Materials Released by Christian Life Commission

NASHVILLE, TENNESSEE—"Yesterday afternoon . . . I lost the most precious thing that life ever gave me, a three-and-a-half-year-old girl child. She was murdered at three in the afternoon, in the basement of a house only a few doors from ours . . . Had I caught the boy in the act, I would have wished to kill him. Now there is no undoing of what is done, I only wish to help him. Let no feeling of cave-man vengeance influence us. Let us rather help who did so *human* a thing," writes a thirty-one year old math instructor.

This statement appears in one of the ten new informational and thought-provoking pamphlets just released here by the Christian Life Commission. The series is entitled ISSUES AND ANSWERS. The poignant declaration, taken from the juvenile delinquency pamphlet, opens discussion on the difficult issue and is followed by suggested answers for Christians.

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Floyd A. Craig, Director of Public Relations, Southern Baptist Convention.

LETTER TO THE EDITOR

The Sources of Science

In reply to Parelius' letter (June, 1967, p. 63), let me note first that he has quite misunderstood the nature of my argument. I wrote of the motivation for science, not of the nature of the universe. It is obvious that no one will seek rational understanding of that which is not rationally understandable, whether or not his belief is well founded. It was their belief in the incomprehensibility of the universe—excepting the

heavens—that blocked both Greeks and Chinese from searching for a rational order in the material universe, even though their notable accomplishments in other areas indicate no lack of capacity for such a search. Only the Christian outlook gives a rationale for empirical science. Even the secularized version, with its attempted defense of induction, manages at best an infinite regress, and has left man with only an irrational habit to support his search for a subrational regularity.

Since Parelius has brought up the matter of the rationality of the universe, let me note that man is obviously rational, despite his irrational lapses, and that the material universe is non-rational although, *prima facie*, it is rationally ordered. Therefore, to argue that, on a non-theistic view, if the universe were non-rational, man would be non-rational, is a gross error. Indeed, one of the major problems for any world view which does not recognize a rational Creator is the development of rationality from the non-rational. To be sure, one may argue that reason sprang up in some inexplicable fashion ("emerged" is the technical term which hides the lack of explanation), but this is very akin to the sophomoric penchant for arguing for solipsism: though logically unassailable, it is not a satisfactory metaphysic.

Further, it will not do to invoke man's sensory equipment as an analog to man's rationality. It is known that other creatures have eyes responding to different ranges of stimuli. The honeybee, for example, is blind to red light but sees near ultraviolet well. And there is no reason I know why an eye must sense but a narrow range of electromagnetic radiation. Are not these non-visible radiations, and subsonic and supersonic vibrations, also a part of man's environment?

Second, I am as amazed to find Mark Twain's "Letters from Earth" cited as a theological authority as I would be to find his "That Awful German" cited as the last word in a philological journal. Any seemingly relevant anti-Christian point Clemens ever made was refuted long before he stepped out of the pilot house. But since virtually every theology or Christian apology deals with the problems of evil and evils, there is no point in expansion here. However, I may note that Clemens is not always so anti-Christian: he cites a Christian missionary approvingly in "Slave Catching from the Slave's Point of View" (Janet Smith, ed., *Mark Twain on the Damned Human Race*, pp. 229f). Indeed, he there merely echoes the Christian's protest.

Third, as a matter of history, science arose in the West and the scientific virtues were adopted directly from the Christian milieu. That these virtues may be found elsewhere does not change this one whit. Parelius contends that these virtues "derive from necessary rules of successful human relationships." Unfortunately for his argument, unless "success" is defined circularly by reference to the expanded set of virtues he seems to advocate, anthropologists have found that man can live with many different sets of value commitments. Since survival is ultimately the only empirical test of success, any set of virtues must be given better and different support than Parelius has mustered.

Parelius' problem is not that the arguments are too undeveloped to be convincing, but that the foundations of his arguments found nothing but error.

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Prepared by M. Martha Hurst

OBITUARY

BOOK REVIEWS

(Reviewers' names in parentheses)

Prepared by M. Martha Hurst

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