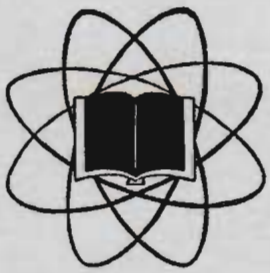
# Journal

of the

# American Scientific Affiliation



*The fear of the Lord is the beginning of wisdom. Psalm 111:10.*

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# The American Scientific Affiliation

**(Incorporated)**

The American Scientific Affiliation was organized in 1941 by a group of Christian men of science. The purpose of the organization is to study those topics germane to the conviction that the frameworks of scientific knowledge and a conservative Christian faith are compatible. Since open discussion is encouraged, opinions and conclusions are to be considered those of the authors and not necessarily held by others in the organization.

## PUBLICATIONS

*The Journal of the American Scientific Affiliation* is issued quarterly. Its contents include primarily subjects both directly or indirectly related to the purpose of the organization, news of current trends in science (including sociology and anthropology), and book reviews.

*Modern Science and Christian Faith,* is a 316-page book containing ten chapters on nine fields of science, each written by a person or persons versed in that field.

*Evolution and Christian Thought Today,* is a 221-page symposium by thirteen authors, expressing the attitudes of Christians on this subject a century after Darwin's writings.

## EXECUTIVE COUNCIL

The Journal of the

# American Scientific Affiliation

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# *Species Concepts and Definitions**

**J. FRANK CASSEL**
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The purpose of the American Scientific Affiliation as it is usually stated on our convention programs is that we are—

> A group of Christian scientific men, devoting themselves to the task of reviewing, preparing, and distributing information on the authenticity, historicity, and scientific aspects of the Holy Scriptures in order that the faith of many in Jesus Christ may be firmly established.

Reviewing, preparing, and distributing are sometimes hard to separate. Part of our objective, and our purpose in these discussions, is to determine just what the Bible says and just what it allows. Sometimes some of us who are in the scientific fields feel that perhaps the theologians are able to give us better ideas along these lines than we are able to derive for ourselves. I think this is part of the reason for our getting together with the ETS periodically.

We also want to know the facts of the created world. We believe that God, who has revealed Himself in various ways, will not be contradictory. Indeed He *cannot* be contradictory in His various revelations of Himself and hence the facts of science can in no way conflict or contradict the revelations of God by other means, such as in His Word and in Jesus Christ. What we *think* He reveals in the written Word and what we *think* He reveals in creation may be different from what is actually there. That is, there is the truth, and then, there is our view of the truth. And this is where the conflicts arise and this is the reason for setting up panels of this nature—discussions—so that we can gain as much of an insight into the facts—find out as many of the facts as possible. There are some things that we just have not found out yet and we want to know the areas in which we lack information. There can be much profitable discussion as to the meaning of the Scriptures or as to what the Scriptures allow. We want to be as informed as possible as to the possibilities and learn as much of God Himself (as He has revealed Himself in His various ways) as we can.

The *species problem* I think of as being similar to the problems some of us biologists have faced when we speak on science and the Bible. I at least tend to speak more about science and don't say very much about Genesis. People say, "You have told me these things, but you haven't said anything about how this fits in with Genesis." My answer often is, "If you tell me what you think Genesis says, then I can tell you how I think that it fits." There are more views of what the first chapter of Genesis says than there are possibilities of the interpretation of the origin of the organisms that we have today.

This holds also for the species. You can ask, "What is the kind?" "What does the kind mean in Genesis? Does it mean a species?" And we must answer, "You tell me what you mean by species and I'll tell you whether 'kind' means 'species.'" I think as you follow this discussion, you will gather that the biologists who are working in this area in the various fields that we are going to be discussing, and in many that we do not have time to discuss, are not in total agreement as to just what this group is.

What are the biologist's kinds? We have a plant kind and an animal kind. These we call kingdoms. Now we're not even in agreement up in this realm. Take the little organism Euglena. It has chloroplasts and it is also mobile. Is this a plant or an animal? The botanist teaches that it's a plant, and the zoologist teaches that it's an animal. There are numbers of organisms that are not as well defined as Euglena. Many of us have been taught that there are two kingdoms—the plant kingdom and the animal kingdom. Some taxonomists—people who work at classifying organisms—say that to classify simply as "plant" and "animal" is not satisfactory. Some suggest as many as six kingdoms now. In the kingdom Protista, for instance, some include viruses, bacteria, protozoa, and algae. There isn't total agreement, then, as to how many major categories or groups there should be, nor as to the category into which some organisms fall.

Classification is based (as we will emphasize

* Edited from a tape of an extemporaneous presentation at the Thirteenth Annual Convention of the American Scientific Affiliation, Ames, Iowa, August, 1958. Introduction to a symposium on *What Is a Kind—The Species Problem.*

| Phylum | Some Distinctive Characteristics | Common Name | Representative Forms |
|---|---|---|---|
| Protozoa | Forms self-sufficient in nature as single cells | Protozoans | Amoeba, paramecium, euglena |
| Porifera | Body having many pores | Sponges | Bath sponge |
| Coelenterata | Saclike digestive tract, nematocycts for protection and food getting | Coelenterates | Hydra, jellyfish, coral |
| Platyhelminthes | Flat and soft, often parasitic | Flatworms | Planaria, liver fluke, tapeworm |
| Aschelminthes | Body slender, digestive tract complete | Roundworms and others | Rotifers, hookworm, trichina worm |
| Echinodermata | Radial symmetry, tube feet | Echinoderms | Starfish, sea urchin |
| Mollusca | Limy external shell in most | Mollusks | Clam, snail, octopus |
| Annelida | Body with numerous similar segments, setae | Segmented worms | Earthworm, leech |
| Arthropoda | Chitinous exoskeleton segmented, jointed appendages | Joint-footed animals | Crayfish, lobster, insect, spider |
| Chordata | Notochord, dorsal, hollow nerve cord, gill arches | Chordates | Fish, reptile, bird, mammal, man |

later) on degree of similarity and degree of difference. Animals are grouped according to their similarities; they are divided according to their differences. We shall be discussing the animal kingdom for the most part because it is the one on which the panel members are best informed. It is divided into "kinds" which are known as phyla, the major ones of which are listed at bottom of preceding page.

The phyla are divided into "kinds," groups called classes. The classes of the Chordata, for instance, include cartilaginous fishes, bony fishes, amphibians, reptiles, birds, mammals. Each of these may be divided still further into groups (kinds) known as orders, the order into families, the family into genera, and the genus into species. Each kind is grouped with others of its kind because of similarity and separated from other kinds by differences. To illustrate, a robin is classified as follows:

| *Category (Kind)* | *Scientific Name* | *Common Name* |
|---|---|---|
| Kingdom | Animalia | Animals |
| Phylum | Chordata | Chordates |
| Class | Aves | Birds |
| Order | Passeriformes | Perching birds |
| Family | Turidae | Thrushes |
| Genus | Turdus | Typical thrushes |
| Species | *Turdus migratorius* | Robin |

A species has been described broadly as a group of individual organisms which are as much alike (similar) as the offspring of the same parents. We are humans. There are dogs, there are cats, there are lions, there are tigers. And there are robins.

It is the classification category level of Species which we will be discussing. When considered in the above relationship, the category of Species may seem rather clear-cut. May we examine it more closely? Just what is a species? Since this category is considered the basic unit of classification, we have to understand what it is before we can understand fully any of the other categories. And we must understand the nature of each category before we can determine its relationship to the use of the word "kind" in Genesis. That the idea of species is not clear-cut is demonstrated by the fact that at its annual meeting in 1955, the American Association for the Advancement of Science sponsored a symposium on "The Species Problem." This symposium was under the chairmanship (and editorship) of Ernst Mayr (*Publ. 50, A.A.A.S.*, Washington, 1957). Most of our remarks will be based upon this symposium as being representative of views now held by people working in this field and concerned with the problem of the species.

In his introduction Mayr points out that several approaches have been used in defining species. One is like that mentioned above which has to do with a group of animals that are very similar in their structure. It is known as a "Typological-Morphological Species Concept" (p. 11-14). According to this view all animals having certain characteristics (usually as represented by certain specimens, "type specimens," on file in a designated museum) constitute a certain species. This can be quite restrictive. Sometimes from a single specimen, or a very small series, a taxonomist will describe a new species, designating one specimen as his "type"—that is, as representing his best concept of the characteristics of the species he is describing. The next worker then has to determine whether what he has is enough like the first man's description or type to be the same thing or whether it is different enough to give it another name. This is taxonomy in action. Do we need another name or can we use the same name? Upon what basis shall the decision be made? How much alike are the specimens in question? How do they differ? How much do they differ? After considering the data amassed from such inquiries, the investigator then must decide whether the later form can be grouped with the former according to the restrictions of the description. If not, he will probably go through the same process to describe and name his form, so that future investigators will have a name to use in discussing this kind of organism. This is one aspect of a species, organisms that are like certain other organisms previously described and named.

There is another aspect of species which Mayr points out. When you see or hear the word "robin," you get a mental picture of a robin. You may think of robins in your back yard, of robins flying around Ames, or wherever else you've seen them. You get a certain idea of *Robin* as a group of animals actually living in nature. I want to designate this as a "Conceptual View" (p. 14-16). (Mayr gives it no name, actually.) What is your *idea*? It is not based upon a type, an actual organism, but on what you think of when the name comes to mind. This "definition" is somewhat broader in its limits than the typological one.

The third definition, one emphasized by Mayr and others in the symposium, is called the "Biological Species Concept" (p. 16-19). This view pays attention to how a group of animals come to be, to how it is maintained, and to what it will be in the future, as well as to what it actually looks like now. It presents the species as being a group of animals or plants which are interchanging their genes. The form of animals or plants is determined by structures within the nucleus of the cell known as chromosomes. In these chromosomes are genes—the hereditary factors. These factors, to be effective upon the offspring of any mating, must be passed on to that offspring. The particular combination of genes occurring in the offspring determine its form. Its actual structure—what the animals look like—is perpetuated by the passing on of these genetic characteristics from

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# *The Genesis Kinds in Our Modern World**

FRANK L. MARSH

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In the first chapter of Genesis we read that the basic types of plants and animals appeared upon our earth through an act of special fiat creation. These basic types are described as not only being formed each after its specific morphological pattern, but also with a reproductive mechanism which caused each type to produce new individuals like itself.

The briefness of this Genesis account of origins gives opportunity for the development of at least two schools of interpretation with regard to the degree of fixity in nature indicated by this terse record. During the Middle Ages, or medieval period of history, in round numbers from about A.D. 400 to A.D. 1400, the opinion prevailed among scientists that the statements of Genesis declared that in reproduction the new individuals of a kind were as like as pennies from a mint. The only institutions of learning of the Middle Ages were those controlled by the church, and in these centers of thought the deductive type of reasoning was used. With regard to origins, the general premise was always the assertion of extreme fixity said to be taught in Genesis. In certain theological centers this idea of extreme fixity even resisted the changes of the Renaissance and the shift to the inductive method of reasoning. And it was still taught as dogma to the students of theology at Cambridge when Charles Darwin was graduated from the Department of Theology in that university in 1831.

At Cambridge, along with the idea of an extreme fixity which did not permit the development of new varieties since creation, Darwin was also taught that all modern forms of plants and animals had been created and set down in the very pattern of geographical distribution in which we find them today. These two bits of dogma were presented to the students in theology at Cambridge as the only possible teaching of Genesis on these points. Accoutered with these extreme views of special creation, Darwin went forth on his five-year circumnavigation of the globe as a sincere creationistic naturalist.

There is small wonder that as Darwin proceeded from region to region on that voyage and observed abundant concrete evidences that organisms had spread over the surface of the earth and had commonly varied somewhat as groups became more or less isolated from their relatives, he became more and more troubled in his mind over the fixity of the kinds which he had been told was the teaching of Genesis. He pondered the apparent head-on collision between what he had been told that Genesis said and what he could see was really happening. We wish that Charles Darwin had studied Genesis for himself and seen the actual harmony between the Bible and nature. But he accepted the teaching of Genesis as extremists had interpreted it to him, and after battling with the problem for years after his return from his voyage, he finally reached a tragic decision. This decision was to refuse the idea of the fiat creation of basic types of organisms.

This decision was reached in the year 1844. At that time, in a letter written to his friend, the botanist Hooker, he said:

"I have read heaps of agricultural and horticultural books and have never ceased collecting facts. At last gleams of light have come, and I am almost convinced (quite contrary to the opinion I started with) that species are not (it is like confessing a murder) immutable." (See Erik Nordenskiold, *The History of Biology,* 1928, page 463.)

The second school of interpretation with regard to the degree of fixity within the kinds indicated by the statement of Genesis is based upon the opinion that the book of nature and the written Word shed light upon each other. Correctly interpreted these two sources of truth *do* agree. They have the same Author. The Bible itself directs us to go to nature for confirmation of profound verities. In Job 12:7-11 we read:

"But ask now the beasts, and they shall teach thee; and the fowls of the air, and they shall tell thee: or speak to the earth, and it shall teach thee: and the fishes of the sea shall declare unto thee. Who knoweth not in all these that the hand of the Lord hath wrought this? In whose hand is the soul of every living thing, and the breath of all mankind."

Therefore, the members of this second school of interpretation go first to the Scriptures and learn that the statements of Genesis neither exclude the possibilities of variation within the kinds, nor do they assert that plants and animals were created in their present details and set down in the areas where we find them today. Then turning to nature these students find that Darwin was entirely correct in his observation of migration over the earth accompanied with variation. What Darwin failed to observe was that variation is not without bounds and is definitely limited in each case to the locus of its basic type or Genesis kind. All individuals of even abundantly variable forms, such as men and dogs, are unquestionably in every instance bona fide members of their respective basic types.

Because of his outstanding ability and because of his great contributions to the basic science of taxonomy, believers in special creation are always glad to recall that the Swedish botanist, Carolus Linnaeus,

* A talk given at the Thirteenth Annual Convention of the American Scientific Affiliation at Ames, Iowa, August, 1958.

was a creationist. Interestingly it is not unusual even in our day to find people who are of the opinion that he was especially endowed by heaven in his ability to point out the created units or Genesis kinds among living forms. However, an endeavor to learn just what classification groups in nature were considered by Linnaeus to be the Genesis kinds is likely to end in some confusion because during his life he published at least two opinions on the extent of the basic created unit. During the most active period of his life we find in the various editions of his *Systema Naturae* the following assertion:

"We count as many species as have been created from the beginning; the individual creatures are reproduced from eggs, and each egg produces a progeny in all respects like the parents."

Linnaeus realized the difficulty of determining natural affinities and did, in my opinion, make many mistakes in his endeavor to distinguish the created kinds in nature. Illustrations of this would be his assignment of different species names to the American bison and the European bison, and to spring wheat and winter wheat.

In his later life, after a great deal of observation of the bordering of some species on one another, and particularly as a result of his own experiments in hybridization, he changed his opinion of the created unit. From his twelfth and last edition of *Systema Naturae* he omitted the statement, "No new species arise." Then in his *Systema Vegetabilium,* published in 1774, four years before his death, we read the following interesting opinion regarding the original created unit:

"Let us suppose that the Divine Being in the beginning progressed from the simpler to the complex; from few to many; similarly that He in the beginning of the plant kingdom created as many plants as there were natural orders. These plant orders He Himself, therefrom producing, mixed among themselves until from them originated those plants which today exist as genera.

"Nature then mixed up these plant genera among themselves through generations of double origin (hybrids) and multiplied them into existing species, as many as possible (whereby the flower structures were not changed) excluding from the number of species the almost sterile hybrids, which are produced by the same mode of origin."

Because Linnaeus used a purely artificial system of classification and recognized only the four taxonomic categories, Class, Order, Genus, and Species, it is not easy from the above statement to secure a clear pic-

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## SPECIES CONCEPTS AND DEFINITIONS

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one generation to another. This passing on of characteristics is very important in the concept of the species. If there is going to be any change in the species it must come through a change in the genetic make-up of the organisms which are further produced. This is the reason there is a great deal of emphasis being given to this particular concept at the present time. If all organisms, all the various different ones, have indeed evolved from ancestors in time past—then this is the only known mechanism whereby such differentiation could have been accomplished.

But how much change—how much differentiation is possible? Are there any limits to this process? If so, what might they be? As we discuss this matter of organisms containing hereditary characteristics which they pass on to their offspring, we are discussing, as many authors have pointed out, "evolution in action." Evolution is defined by some as any change in plants or animals which can be passed on to their offspring. By this definition any inheritable change is a form of evolution. Such change would tend in some cases perhaps to develop new species.

We want also to examine "creation in action." One of the points that we need to consider is, "Was God's creative activity greater at one time or another?" Is it true, as Carl Henry ("Science and Religion" in *Contemporary Evangelical Thought,* New York: Harper, 1957) says in one of his recent books, that one of the essential criteria of creationism is "that God created *ex nihilo* by divine fiat." Or, if I may put it this way, magical development—the appearance of a form where there was none before. This is considered by some, as I say, to be a necessary postulate of creationism. Is it?

These are some of the things, then, that we want to explore—that we want to consider—as we look at this problem of "What is a species?" How does it apply to, "kind," as the word is used in Genesis, in particular, as well as elsewhere in the Bible? Several papers have been presented on this subject in past conventions. Today, as I said before, Dr. Marsh will read his paper on "Genesis Kinds in Our Modern World," which we have characterized as a conservative creationist viewpoint of this problem, and then the other panel members will suggest some of the viewpoints that have been brought out either in the A.A.A.S. symposium or in other realms. They are by no means restricted to the symposium. We use this as a basis because it gives an excellent summary of what present-day scientists are thinking along this line. Then we'll have further discussion.

### REFERENCES

Henry, Carl F. H. "Science and Religion" in *Contemporary Evangelical Thought.* New York, Harper, 1957. (See also his "Science and the Bible," 1958, *Christianity Today* II [23]:20-22.)

Mayr, Ernst. "Species Concepts and Definitions in the Species Problem." *Publication No. 50* of the *American Association for the Advancement of Science,* Washington, D.C., 1957.

ture of what was his mature concept of the created unit. It may be helpful, in an effort to understand his mature opinion here, to select his order *Gymnospermia* as an example. Today our taxonomists use the name *Gymnospermae* for a class of plants made up of cycads, ginkgo, and conifers. However, Linnaeus' *Gymnospermia* consisted largely of mints and snapdragons.

Thus in Linnaeus' opinion God spoke into being parent forms of such groups as the mints and snapdragons and then by His own controlled hybridization developed among these, additional plant groups which Linnaeus called genera. Then as the centuries passed He built up the modern groups which we call biological species—groups which, to continue with our example, are illustrated by such plants as skullcap, catnip, motherwort, sage, horsemint, mullein, toadflax, and painted cup. It is possible that not all special creationists of today would be willing to agree that plants as varied as mullein and foxglove had evolved from a single created unit. However, we would stress the fact that we believe Linnaeus was certainly on the right track when he judged that any forms which would hybridize had sprung from a common ancestor. This would be a limited form of change, but certainly not evolution of new basic types. Possibly it would be more accurate to designate such change as mere variation within the original basic units.

It is obvious from the wording in Genesis that the expression "after his kind," includes both morphological and physiological characteristics. That is to say, when the plants and animals appeared upon the earth the individuals of each basic type were distinctly different in the details of their form and structure from the individuals of all other basic types. With regard to their physiology we read in Genesis 1:12 that not only were the members of a basic type alike in their form and structure, but when they reproduced, new individuals appeared which were like their parents. The Scriptures state that each of these forms yielded "seed after his kind." To express it mildly, in the light of this text it is difficult to understand how a basic type could transmute into a new basic type, or could give rise to a new basic type, if its reproductive performance was such as to bring forth additional individuals of the same kind as their parents.

Such is the letter of the written record. Should we conclude from this record that Genesis does teach the extreme fixity in nature which the creationists of the Middle Ages averred it did? The creationist of today believes that the Bible and nature are complemental, each helping to explain the other. Therefore, we turn to nature to discover the degree of fixity indicated by Genesis. In speaking of this situation in nature, Dr. Theodosius Dobzhansky, Professor of Zoology, Columbia University, says:

"Organic diversity is an observational fact more or less familiar to everyone. . . . If we assemble as many individuals living at a given time as we can, we notice at once that the observed variation does not form any kind of continuous distribution. Instead, a multitude of separate, discrete distributions are found. In other words, the living world is not a single array of individuals in which any two variants are connected by unbroken series of intergrades, but an array of more or less distinctly separate arrays, intermediates between which are absent or at least rare." —*Genetics and the Origin of Species*, second edition, pp. 3, 4.

This discontinuity is one of the most familiar characteristics of the living world as we recognize men, horses, cows, dogs, and cats, and roses, petunias, marigolds, zinnias, and water lilies. This same discontinuity is also one of the most striking features of the fossil world.

The explanation of this very real existence of gaps between the basic types of organisms is one of the great problems of the evolutionist. If all modern forms have evolved from one or a few primeval protoplasmic blobs, why should both the fossils and the living world present us with this striking discontinuity just as if the different kinds had originated as Genesis declares they did?

This problem was one of the topics in a series of letter discussions which I had with Dr. Dobzhansky a few years ago. Dr. Dobzhansky is today one of the leading American disciples of the theory of evolution. In our discussion I pressed him to give me just one instance in our living world where evolution of a new basic type was known to occur. His reply was as follows:

"When one says that evolution is established beyond reasonable doubt, one obviously does not mean that one can see evolution happen and reproduce it in a test tube, but this is the evidence which you escape by your device of saying that it is all change within a 'kind.' What you are after is evidently evidence for the thing which is called by this rather unfortunate term 'macroevolution,' Now, this is a process taking place in geological time, hence it, as any other historical process (human or natural), can be proven or disproved only by inference from the available evidence."

Dobzhansky's admission of the impossibility to demonstrate the evolution of new basic types among living forms is typical of the testimony of all evolutionists who are really conversant with the pertinent facts. After having admitted that evolution cannot be demonstrated among living forms, Dobzhansky passed the burden of demonstration over to the paleontologists who, in his opinion, could demonstrate that evolution of new basic types had occurred during geological time. He referred me to the then new work of George Gaylord Simpson, famous paleontologist of the American Museum of Natural History. This book had just come from the press under the title, *Tempo and Mode in Evolution*. Of this book, Dob-

zhansky remarked, "To me at least this is a most lucid explanation of paleontological evidence."

I secured a copy of Simpson's book and among much interesting material found the following assertions:

"On still higher levels, those of what is here called 'mega-evolution,' the inferences might still apply, but caution is enjoined, because here essentially continuous transitional sequences are not merely rare, but are virtually absent. These large discontinuities are less numerous, so that paleontological examples of their origin should also be less numerous; but their absence is so nearly universal that it cannot, offhand, be imputed entirely to chance and does require some attempt at special explanation, as has been felt by most paleontologists." *Id.*, pp. 105, 106.

On this same point of gaps between the various types of fossil forms, D. Dwight Davis, Curator, Divison of Vertebrate Anatomy, Chicago Natural History Museum, says on pages 74 and 77 of *Genetics, Paleontology, and Evolution:*

"The sudden emergence of major adaptive types, as seen in the abrupt appearance in the fossil record of families and orders, continued to give trouble. The phenomenon lay in the genetical no man's land beyond the limits of experimentation. A few paleontologists even today cling to the idea that these gaps will be closed by further collecting, i.e., that they are accidents of sampling; but most regard the observed discontinuity as real and have sought an explanation for them."

"But the facts of paleontology conform equally well with other interpretations that have been discredited by neobiological work, e.g., divine creation, etc., and paleontology by itself can neither prove nor refute such ideas."

We will agree with Dr. Davis that it is correct that divine creation of basic types cannot be demonstrated by the fossil record, but we cannot refrain from saying that the distinctness of the basic types in the fossil record with the absence of intergrading forms is completely in harmony with the creation of plants and animals after their kinds as portrayed in Genesis. The fossil record constitutes the only natural record we have of what occurred before the dawn of secular history. In the light of the fossil record, the theory of evolution which asserts that all modern types have evolved gradually from one or more simple blobs of protoplasm requires more faith for its acceptance than does the theory of special creation which asserts that God created the basic types instantaneously in all their morphological differences. We hear every now and then of "the missing link." Actually among both fossil and living forms great chains of links are everywhere absent between the basic types.

Thus it is that by observation of the living world and of the natural record of the past we find that there is no disagreement between Genesis and nature. Organisms appear always to have existed and still do live in a discontinuous pattern. We return to the question which concerns the degree of fixity that is referred to in Genesis. Were new individuals as like one another and their parents as coins from the mint are alike and are identical to the die which stamped them? The creationistic schoolmen of the Middle Ages declared that such was the doctrine of Genesis.

A study of the fossil record reveals to us that groups of organisms have maintained their individuality all the way down to our time. Austin H. Clark of the United States National Museum refers to this fact in the following statement from pp. 100 and 101 of his book, *The New Evolution: Zoogenesis:*

"Strange as it may seem, the animals of the very earliest fauna of which our knowledge is sufficient to enable us to speak with confidence, the fauna of the Cambrian period, were singularly similar to the animals of the present day. In the Cambrian period crustaceans were crustaceans, echinoderms were echinoderms, arrow worms were arrow worms, and mollusks were mollusks just as unmistakably as they are now."

Here is the sort of fixity referred to in Genesis, and behold nature shows us that the fixity is that of group characters and not a fixity of all individual characters. Each individual bears the distinguishing marks of his kind but is not necessarily identical with other individuals of his kind. Dr. Clark refers to this fact in the following statement from p. 100 of his book:

"In the details of their structure these fossils are not necessarily like the crustaceans, starfishes, brachiopods, annelids, or other creatures living in the present seas. Nevertheless, if they are sufficiently well preserved, we have no difficulty in recognizing at once the group to which each and every fossil animal belongs."

The testimony of *living* nature with regard to the extent of fixity indicated in Genesis is all about us in most intriguing forms. The processes of variation furnish us with many interesting breeds of plants and animals. Individuals often vary considerably within some groups. We have over 500 varieties of the sweetly scented sweet pea and over two hundred breeds of dogs. One author (see Griffith Taylor in *Environment and Race*) has divided human beings into as many as 160 breeds. Evolutionists love to call our attention to all this variation that is going on and insist that here is evolution before our very eyes. We all observe that variation *does* occur, but evolutionists fail to perceive that after all that the process of variation can accomplish has been accomplished, we unquestionably still have sweet peas, dogs, and men. The sort of evolution that the theory of evolution requires is the natural development of *new basic types.* But every additional case of variation that is studied, be it among the fossils or living forms, merely brings additional evidence that there is a law in nature which declares that every organism can produce only individuals which are unquestionably of

the same basic type as the parents.

The evolutionist makes a creator out of Father Time by affirming that if we will just allow enough duration then processes of variation will produce new basic types. The plea that time will do it is no more reasonable here than it would be should we invoke it in trying to lift ourselves. If we see a lad trying to lift himself by his bootstraps, we would be incorrect if we were to say to him, "Just keep trying long enough, sonny, and finally you will be able to do it!" Such a feat can never be accomplished because there is a law in nature which says that just as hard as you pull up just that hard you push down. In the same way time cannot accomplish the appearance of new basic types because there is no mechanism in existence which can accomplish changes of sufficient magnitude to produce one new basic type. Every additional case of variation studied adds one more bit of evidence further to clarify this principle.

Not infrequently the creationistic biologist is asked, "In our present system of classification of plants and animals is there any category which is an equivalent of the Genesis kind or created unit?" The answer to this question seems to be "No." At the time of creation the kinds of basic types were each created after a distinguishing pattern in form and structure, and they were able to produce other individuals like themselves. As we look into nature today we find that man, *Homo sapiens,* can cross with no other animal. So in his case the species is the created unit. In other instances we find that the dog, *Canis familiaris,* will cross with the gray wolf, *Canis nubilis,* and the horse, *Equus caballus,* will cross with the ass, *Equus asinus.* Here the genus is the created unit. Again the common goat, genus *Capra,* will cross with the common sheep, genus *Ovis* to the extent of producing fetuses which will live until just before the time for birth. A more successful generic hybrid is the case of the genus *Bibos* which will cross with the Brahma cow, genus *Bos,* making the family the created unit. (See *Mammalian Hybrids,* 1954, by Annie F. Gray, published by Commonwealth Agricultural Bureaux, Farnham Royal, Bucks, England.) Yet again the domestic hen, family *Phasionidae,* has been crossed with the turkey, family *Meleagrididae.* Thus the order becomes the created unit. (See *Handbook of Biological Data,* 1956. Edited by W. S. Spector. Published by Saunders. ) In the naming of plants we find the same lack of harmony with the Genesis kinds. Very commonly species of the same genus will cross, as the bur oak with the swamp white oak. Genera not infrequently cross, for example, rye with wheat, and field corn with Teosinte and gama grass. One of the most interesting crosses in plants probably is that of radish with cabbage, both representing genera of the mustard family. To my knowledge, among plants, members of two different families have not been crossed.

If we accept the ability to hybridize as the principal characteristic of the groups within the Genesis kind, we apparently have no single category in our present-day taxonomic system which is equivalent to the Genesis kind. It was in the light of these facts that in 1941 I suggested the new name *baramin* (Hebrew *bara*—created, *min*—kind) for the Genesis kind. (See F. L. Marsh, *Evolution, Creation, and Science,* p. 174.) This would be a physiological group into which all forms would be placed where even so much as true fertilization of the egg occurred. Even though the embryo might develop no farther than the earlier stages, its parents would still qualify as members of one basic type. This would give us the man baramin, the dog baramin, the horse baramin, the oak baramin, the maize baramin, and so on.

*Deductively,* the idea of the baramin springs from Genesis 1:12 where we are told that plants not only were made after their kinds but also brought forth after their kinds. This reproductive isolation would depend largely upon the chemistry of the different protoplasms. If two protoplasms were compatible, then true fertilization would occur. Morphology arises from the chemistry of the hereditary determiners in the protoplasm. We may believe that forms which could reproduce would be similar chemically and would be expected to be quite similar morphologically.

*Inductively,* in every known instance in living nature where true fertilization can occur, the parents are sufficiently similar morphologically to be considered members of a single kind, such as the man kind, the dog kind, the cow kind, the oak kind, the corn kind, the apple kind, and so on.

It is sometimes objected that the baramin concept is weak in that many of the crosses obtained have occurred in captivity and probably would not take place in undisturbed nature. This objection indicates that I have failed to clarify the baramin in the mind of the objector. Actually animal psychology does not enter into the baramin concept. Rather it is a physiological, that is, chemical, test and still applies whether occurring naturally in the aisles of the forest or artificially in vitro in the laboratory. The essential assumption is that the chemistry of the members of the Genesis kind are identical enough to cause them to produce germ cells which will be compatible and able to unite in true fertilization. Artificial pollination and artificial insemination would be the best tools for the discovery of the limits of the baramin.

We realize that the processes of variation, namely mutation, recombination, and chromosomal aberrations, have been working in these basic types since creation and have produced physiological incompatibilities within the Genesis kinds so that ability to interbreed may not now exist among all members of the baramin. In such instances morphological characters will have to be used to determine membership. An illustration here would be the two groups of the

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# *Some Basic Points Suggested for a Christian Philosophy of Science**

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A Christian philosophy of science will include rather obvious portions of Christian truth—theism, that there is a personal God; creation, that the material world is not independent of or explainable apart from God; a universe of law, that just anything cannot happen; and teleology, that God's purposes cannot be ruled out of His universe. These items and doubtless others could hardly be excluded from a Christian philosophy of science.

But a Christian philosophy of science will include much more. If it be truly Christian it will be a Biblical philosophy of science. Weaver in a fine article in the *A.S.A. Journal,* June, 1954, refers to Machen as saying that a religion not accepting the Bible has no right to be called Christian. By this standard I fear much of Christianity today is miscalled. For there is an alarming willingness today to let go of the Bible in the interest of any new theory. But Machen is right. Christianity has been a book religion from the beginning. Indeed it accepted the O.T. book at the start. All branches of Christendom in their creeds, and leading theologians have believed in an entirely true Bible. A Christian philosophy of anything should include the Bible as absolutely and entirely true. We need not take time now more than to state this point. I have argued it elsewhere.

I fear many scientists, even of Christian persuasion, do not realize how great a stake Christian theologians have in the Bible. Suppose some new experiment might prove that Moses could not live to 120 years of age. What difference would it make? Both modernists and neo-orthodox would say, "No difference." But the truth of the O.T. would be impugned, the authority of Christ denied, and thus the basis of our faith undermined. It is not a light matter.

Therefore, let no scientist think that he has a private hunting ground in which he can be happy. Theologians may not know much science. But they know a little bit very well. They do not speak with dogmatism born of intuition or external authority. But they speak with an assurance born of confidence in the Bible based on other and highly rational grounds.

The case is similar with history. The Bible does not give us a complete book of ancient history. But it tells us that Pharaoh Necho's troops killed Josiah. That fact I believe, realizing that it is based on the best of reasons—the witness of Christ. I do not tremble with every new excavation, wondering if it will prove that Josiah died otherwise. I *know* this fact stated in the Bible to be true. Likewise, when the Bible speaks plainly of science, I am confident it is true. I shall examine any scientific counterclaim in detail, confident that it will in due time be proven false.

Notice, I do not accept the Bible because its claims are subject to scientific examination. Most of them are not. What controlled experiment or repeated observation can prove the basic facts of the Gospel? Nevertheless, the Gospel is based on fact. It is the observed historic fact and testimony to Christ and His supernatural revelation. The basis for Christianity surely includes matters of inductive reasoning from known and observable facts. There are other reasons as well. The Holy Spirit, a Person just as we are persons, also testifies directly and personally to us concerning the central truths of Christ and our salvation through Him. Together these witnesses are entirely adequate to establish truth, even though they cannot be checked by controlled repeatable experiment. The scientific method cannot verify a once-for-all event unless the scientist happens to have been there at the time. The event may nonetheless be in the realm of the physical world and taken as true with an equal confidence.

This formulation is not agreed to by all. Albright says that before the tomb of Jesus, history fails and faith begins. This is a form of the two-spheres-of-truth theory. Neo-orthodoxy says that no material, scientific, or historical truth can be a revelation of spiritual truth. It would deny that Christianity has any conflicts with science or history because, it says, Christianity does not and cannot base itself on science or history. Neo-orthodoxy has departed from the Bible in this point as in others.

We should warn against the opposite extreme that would overemphasize the contact of the Bible and science. The Bible has far less contact with science than with history. This may be accidental and because of the recent date of scientific discovery, but at least it is obvious. There have been attempts to find scientific discoveries anticipated in the Bible, but the results have been unfortunate in most cases. For instance, "as birds flying" (Isaiah 31:5) will the Lord defend Jerusalem has been taken to refer to airplanes. In most such cases probably the fault is in rather elementary errors of interpretation.

* Paper read at the Fourteenth Annual Convention of the American Scientific Affiliation at Chicago, Illinois, June, 1959.

Some famous examples do no more justice to scientists than to Bible expositors. For instance, was Jonah's whale a fish? This is a rather foolish question. The answer depends on your definition. If a fish is a creature of a certain Linnaean classification, then a whale is not a fish. But in that case you should not buy oysters at a fish counter. Obviously the Bible does not observe Linnaean classifications, but it is not thereby wrong.

Likewise Solomon's laver gives us a ratio of 3 for Pi. It was 30 cubits around and 10 cubits across. This, too, is no problem. It may not have been a perfect circle, or it may have had a flared rim, or the dimensions may be approximate. There is obviously a nontechnical language and a popular approximation in the Bible quite consistent with the statement that the Bible is true when it speaks on scientific matters. The extent to which it speaks should be carefully observed.

The Bible, we find, speaks on scientific matters, and I am referring to the natural sciences. We are assured by Christ of its absolute truth. It does not cover all of science; in fact it touches very little. But in those contacts are the possibilities of conflict. When unfortunate misinterpretations are eliminated and regrettable antagonistic bias of naturalist scientists is discounted, still there are possibilities of conflict in various areas of contact.

We should emphasize that there is not a general conflict of science and the Bible. Christianity does not object to the scientific method of hypothesis, experiment, and generalization. Neither does Christianity base itself on that method. It is only in details that there is conflict. It is a misconception to imply that because a theologian objects to evolution that he therefore should not use telephones and refrigerators. It is a caricature to point to an alleged theologian who refused to look into a telescope for fear of what he would see! The repression of scientists by theologians has been occasional but not usual. The Roman Church of the Middle Ages did this some, but the Bible was not its guide. No Reformation creed seems at all disturbed about the discoveries of Galileo or Magellan. Cotton Mather opposed inoculation, but no church made anything of it. His great contemporary, Jonathan Edwards, accepted inoculation—and died as a consequence! May I warn against accepting at face value the evidence presented on these things by White in his "History of the Warfare of Science and Religion." A more biased book you could hardly find!

A Christian philosophy of science should accept the Bible to be true when fairly interpreted in all of its teaching. I should like to insist upon the primacy of the Bible even in those matters where conflict arises. Dr. Weaver in the above article offers five views of such conflict:

a. There are two spheres of truth. He rejects this.
b. No conflict is possible. This, too, is wrong.
c. Science is primary. Christianity is rejected in whole or in part.
d. Christianity is primary; reject science in part.
e. Assume that no real conflict can exist; so look for an error somewhere in the study.

Weaver accepts the last. It appears to me to be practically the same as the one before it. Both accept the primacy of Christianity—I should prefer to say, of the Bible. If a conflict exists, naturally the Scripture interpretation should be re-examined. But there are limits to this. Dr. Machen used to object to those who reinterpret the creed "that He rose again on the third day" so as to make it mean that "He did not rise again on the third day"! There are limits to interpretation. Noah's flood simply cannot be interpreted to be a local Euphrates freshet. The Virgin Birth cannot be interpreted away. You believe it or you don't! It is half of our job to find these essential points in Scripture interpretation. We believe that the Scriptures, fairly and critically interpreted in the light of all our knowledge, are *true*.

It follows that we do not believe in the primacy of science. A scientific theory may be good or bad. Our theory of oxidation may be correct or the old phlogiston theory could be correct for all we know as theologians. Newtonian gravitation might be right or Einstein, as far as the Scriptures are concerned.

The Bible may speak and does speak on certain basic assumptions of science—causality, rationality, regularity of natural process, etc. But on most of the domain of science—no. Science then is free to discover all it can.

But as we have said, there are limits. I know that behavioristic psychology is wrong. I do not know much psychology. Others, who knew far more than I, were convinced it was right. But the Bible, being a revelation from the all-knowing God, offers a weight of evidence against behavorism that overbalances, not science, but certain scientists and their particular conclusions. For the Bible gives some information about what man is. He is a creature somewhat independent of cerebral and bodily processes. He outlasts the cerebrum and embodied life. He lives when his biochemical functions are done.

Also the Bible speaks on the origin of man. Not only does it speak in general terms, but Christ himself specifically speaks of our first parents and their creation. I know, being informed by higher wisdom, that there was not a multiplicity of early brute men slowly attaining moral consciousness. The Scriptures simply say that God formed man of the dust of the ground, breathed into him the breath of life, and he became alive. I argued this at our A.S.A. meeting in Gordon in 1957 and one of those present picked Delitzsch's commentary from the nearby shelves and quoted it against this view. But Delitzsch was misquoted and this view has sound exegetical foundation. I believe it will stand critical exegetical study. The last word has not yet been said by science on the

origin of man. I am convinced that when it is said, it will be in accord with the plain teaching of Genesis. Until science comes to that view, I shall resist its conclusions *in this area* and encourage every investigation to bring out more of the relevant truth on the matter.

Other such points of contact are the age of man, the origin of species, the age of the earth, the origin of life, the universality of the flood, the relation of miracles and natural laws, and doubtless a few others.

It was planned that this paper and this whole meeting should not deal with these items, but rather with the philosophical approach to them. This is well, for each item is a study in itself. Yet I am not so sure that we need a specialized Christian philosophy of science as we need a continuing patient scientific study of these items by men who hold doggedly to the primacy of the Scriptures. I for one am convinced that the usual evolutionary approach to these items is wrong. I believe scientists at last will see it. I believe many of them have such a bias against creationism that they have allowed a false theory to dominate their thinking. They are far from objective. I believe that as archaeology has demonstrated the falsity of the Wellhausen higher criticism, so science will show the falsity of evolution. But in the meantime much harm is done to the Christian faith by those not willing to accept the primacy of the Bible in such matters.

A Christian philosophy of science appreciates science. It gives non-Christian scientists, who also are, by common grace, men capable of observation and investigation, free rein for study. But scientists err. Sin is in the world with its disordering of nature and warping of our minds. Scientists, like the rest of us, are sometimes wrong. The high priests of science also need to offer first for their own sins!

One book, however, we can trust. Our investigation of nature may be largely right. It is on the other hand partly wrong. In just those parts where scientists deny the Book, they are wrong. Often their very errors are the results of prejudice. One does not *wish* to believe in miracles, or the fall of our first parents. But giving the Bible its place as a prime source of evidence, we shall patiently investigate all these problems until they also yield solution.

I do not believe in two spheres of truth without contact. I do not believe that there is a Christian science and a non-Christian science. I am not a disciple of Dooyeweerd on this point. I believe truth is one. The Bible is all true. But it is not all of truth. Scientists both Christian and non-Christian have an ability and a duty to investigate to the full the spatic-temporal world. But this, too, is not all of reality. Nor is truth discoverable by scientific method all the truth there is. And where the book of nature and of revelation conflict, I believe eventually we shall see a solution honoring to the Bible fairly and critically interpreted.

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fruit fly, *Drosophila pseudoobscura,* which were formerly called Race A and Race B of *D. pseudoobscura.* Because complete sterility was found between some members of Race B when placed with Race A, Dr. Dobzhansky assigned to Race B the new species name, *D. persimilis.* The individuals of *D. pseudoobscura* and *D. persimilis* appear identical in external characters but may be completely sterile when mated. In such cases the morphological similarity of adults is sufficient to show that they belong to the same baramin.

Sometimes the question is asked, "Is the modern biological species identical with the Genesis kind?" I would answer that such may occasionally be the case. An example would be the biological species *man* which is also a Genesis kind. To be true members of the same biological species the individuals must be fertile interse. If within a biological species a group arises whose members are sterile when mated with others of the group, a new biological species would have arisen. The fruit fly mentioned above illustrates such a case. *D. persimilis* would be a new biological species arising within the older biological species *D. pseudoobscura.* Obviously all biological species are not originally created units. The growing popularity of the biological species concept among evolutionists is evidenced by the fact that, except for one, all eight contributors to the book, *The Species Problem,* a symposium edited by Ernst Mayr and published late in 1957 by the American Association for the Advancement of Science, accept the biological species and are rather enthusiastic about it. In recognizing the biological species as a natural unit, biologists are becoming less artificial in their classification and are making progress in the discovery of the Genesis kinds in nature.

Of course there are many forms in nature where the fertility test cannot be applied to determine either the biological species or the baramin. This situation would exist where new individuals are produced by such asexual processes as simple fission, budding, formation of spores, and even by the sexual process of hermaphroditism. The fertilization of their own eggs is quite common in higher plants and in a few animals. However, in these forms it is clearly evident that each is following closely the law of Genesis which says that basic types bring forth after their kinds.

The scientist reads in Genesis of the fiat creation and instantaneous appearance in the beginning of basic types of plants and animals which were made and which reproduced according to a certain fixity. The book of nature, through its fossil record, and in the world of living things, reveals that an actual fixity has ever existed and still does exist among these forms. The fixity is not one which produces identical

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# *Some Implications of Evolution for A.S.A.*

IRVING A. COWPERTHWAITE

At two recent annual conventions of our American Scientific Affiliation (at Gordon College and Divinity School, 1957, and at Iowa State College, 1958) there appeared to be a growing conviction that inexorable pressure of expanding knowledge is about to force us to accept some formulation of the theory of evolution, including the evolutionary origin of man, and that we must adjust our thinking in accordance with this eventuality. Naturally, if evolution has become established beyond a reasonable doubt, we must accept it even though it means that we have to make an "agonizing reappraisal" of our interpretation of Scripture.

There are a number of difficult, if not insoluble, problems involved in trying to harmonize the theory of the evolutionary origin of man with the account of the creation of man as found in the Bible.

In the first place, the Biblical account clearly implies that man was a special creation of God, climaxing His creative work in which He made the heavens and the earth. To be sure, Genesis 2:7 reads: "Then the Lord God formed man of dust from the ground, and breathed into his nostrils the breath of life; and man became a living being." Some seem to feel that the words, "formed man of dust from the ground," can be interpreted in terms of an evolutionary process spanning millions of years. Whether or not this is regarded as an acceptable interpretation, there is a still greater difficulty involved in the account of the creation of Eve. This story is told in Genesis 2:21, 22 in the following words: "So the Lord God caused a deep sleep to fall upon the man, and while he slept took one of his ribs and closed up its place with flesh; and the rib which the Lord God had taken from the man he made into a woman and brought her to the man." As Dr. R. Laird Harris pointed out at the convention at Gordon, these words quite clearly describe a specific act of creation in an apparently brief moment of time. The wording used in describing the creation of Eve would make harmonization with the theory of evolution most difficult.

A second difficulty is the Biblical teaching that the whole human race is descended from one man and one woman—Adam and Eve. It is difficult to imagine an evolutionary process that would culminate in the development of one viable pair. It would be much more reasonable to expect such a process to result in the production of a more or less widespread population.

In the third place there is the matter of the antiquity of man. The working of the genealogy in the fifth chapter of Genesis as presented in the English translation would certainly justify Ussher in assuming that he could determine the date of the creation of Adam by figuring back to the event. This genealogy is expressed in terms of unbroken succession of father and son from Adam to Noah. Possibly the original Hebrew language permits other interpretations. In any case, there are conservative scholars who believe that there are gaps of unknown duration in this genealogy and that these gaps push the date of Adam back far earlier than Ussher's estimate. However, it is hard to see how any intellectually tenable gaps could push the date of Adam back 100,000 and more years to a time when anthropologists and evolutionists claim that early man lived upon earth.

The foregoing paragraphs indicate three apparent discrepancies between the theory of the evolutionary development of man and the Scriptural account of his origin in a special creative act of God. These points are briefly outlined and there has been no attempt to present an exhaustive study of the problem. However, perhaps enough has been pointed out to indicate that very serious disagreement exists between the two. The following discussion is based upon two crucial "ifs." If evolution is now a solidly established scientific law which must be accepted and if evolution cannot be harmonized with the Biblical story then what is to be our attitude toward the Bible?

Can we dismiss the problem by assuming that the early chapters of Genesis are somehow of a lower order of inspiration than other parts of the Bible? If there are any reasons for assigning inferior authority to these passages they certainly are not generally known to reasonably well-informed laymen. However, the problem would not be solved by such an assumption because other passages of Scripture base teachings upon the story of the creation of man and by inference place their endorsement upon it. The following are a few examples of such teachings. The genealogy of Jesus as given in the third chapter of Luke traces His ancestry back to Adam. "The son of Enos, the son of Seth, the son of Adam, the son of God" (Luke 3:38). A number of passages teach that the sin of one man, Adam, passed a heritage of sin upon the entire human race. The following quotations are typical of this teaching. "Therefore as sin came into the world through one man and death through sin, and so death spread to all men because all men sinned—sin indeed was in the world before the law was given, but sin is not counted where there is no law. Yet death reigned from Adam to Moses, even over those whose sins were not like the transgression of Adam, who was a type of one who was to come" (Romans 5:12-14). "For as in Adam all die, so also in Christ shall all be made alive" (I Corinthians 15:22). The creation of Eve subsequent to the creation of Adam is also the basis of a New Testa-

ment teaching as found in I Timothy 2:12, 13: "I permit no woman to teach or to have authority over men; she is to keep silent. For Adam was formed first, then Eve." Thus it would appear that any doubts cast upon the authority of the story of creation would, by inference, also be cast upon many other passages of Scripture.

Perhaps we can resolve the difficulty by assuming that the story of the creation was written in picturesque figurative language and was never meant to be taken literally. It was, perhaps, a poetic "Psalm of the Creation." This solution to the problem would seem to set a dangerous precedent of "explaining away" troublesome passages of Scripture. What passages are meant to be interpreted literally and what figuratively?

Another possibility would be to consider that the Biblical writers wrote their messages in terms of the scientific theories and superstitions of their days and that any such scientific allusions can be ignored. Such a proposition could logically be extended to a similar assumption that these same writers also expressed their messages in terms of the moral and cultural patterns of their times, and that many problems dealt with have no application to us in this modern day and age. These suggestions would be equivalent to saying that "the Bible contains the Word of God" instead of "the Bible is the Word of God." This would mean that God has revealed Himself to man in a book written in terms of discredited science and outmoded cultural patterns. Acceptance of such a proposition would put a great responsibility on the Biblical scholar to search out the eternal revelation of God from among the temporal encumbrances.

On the basis of the two big "ifs"; if evolution is established and must be accepted, and if it cannot be harmonized with the Scriptures, some consequences in the field of Biblical interpretation have been suggested. All of the suggestions are apparently contrary to A.S.A. traditions and are doubtless contrary to our doctrinal statement. No solution to the problem of fitting acceptance of evolution into the framework of traditional A.S.A. beliefs regarding the harmony of science and the Scriptures has been found in the course of this study. It is therefore necessary to conclude this discussion with a question instead of an affirmation. Is harmonization possible, and if so, how?

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individuals, but rather is one which produces groups which enjoy considerable variation within their boundaries. These original groups demonstrate that they have no power to produce any new basic types. In this complete verification in nature of the assertions of Genesis, the Christian man of science receives added assurance that the Bible is indeed a book breathed by the God of Truth.

# *The Origin of Man and the Bible*

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This paper is in reply to the paper by Cowperthwaite on page 12.—*Editor.*

As evangelicals give closer consideration to the claims of science, particularly in the area of evolution, questions arise as to the assessment of the claims in the light of the Scriptures, and eventually vice versa. Although knowledge is expanding, I would judge that it is not the new information as much as the better understanding through more honest consideration of the old that accounts for the shift of emphasis by the A.S.A. with respect to evolution. When I was in college, "evolution" was a dirty word. When A.S.A. began, those of us who questioned this position and insisted that to study it we had to say it (and that study it we must if we were to combat it) were read out of fundamentalism—remember the comment on Mixter's first draft of his "Creation and Evolution"[1] after it had been circulated to the membership. As you will see from my comments[2] on Mixter's Gordon paper,[3] that as we began seriously, critically, but objectively to examine the data of evolution, we became less and less convinced of its refutability. That, then, which you find no way to refute, demands a measure of positive consideration. This we've been doing—with the caution of one who extends his hand toward a fire, to be sure. But we are beginning to approach the problem positively. The first results of such an approach are reflected in the Gordon and Ames meetings and led, of course, to the principal topic for discussion at the Chicago meeting—that is, if our approach is changing, does this mean our philosophy has changed? Do our present studies stem from, or lead to, a different philosophy of science and/or a different or modified theology? The discussions of Chicago have made it abundantly clear, I think, that we scientists not only do not know the answer to this question, but that the philosophers and theologians aren't too sure either. Had they been sure, I think they would have carefully, logically, and kindly led us to their point of view instead of pouring on us the tremendous heckle which may be good pedagogy for freshman philosophy classes but is hardly productive in solving the serious problems we were approaching. I thought when I left Chicago that perhaps I was just oversensitive, but after my experience at the N.S.F. Institute,[4]

1. Mixter, Russell L., "Creation and Evolution" Monograph 2, Am. Sci. Affil., Goshen, Ind., 1951.
2. Cassel, J. Frank, "The Evolution of Evangelical Thinking on Evolution." *J. Am. Sci. Affil.* 11:26-27, 1959.
3. Mixter, Russell L., "An Evaluation of the Fossil Record." *J. Am. Sci. Affil.* 11:24-26, 1959.
4. National Science Foundation Institute on History and Philosophy of Science and Mathematics, American University, Washington, D.C., June 15–July 24, 1959.

I am convinced this heckle was more an evidence of lack of a positive contribution to offer. I am also convinced that if an acceptable, satisfying, and productive philosophy of science is to be developed it will have to be done by scientists—the philosophers will make fine and much-needed critics—but the basic formulation must be done by those who are immediately involved in the implications of induction—and of that sacred cow, "the scientific method."

But back to the immediate problems. Remember, what we're interested in is how God accomplished creation. We begin with the acceptance by faith of Genesis 1:1 (and elsewhere) that God is *Creator* and *Sustainer* (Colossians 1:16, 17). God has revealed Himself in creation as well as in His Word, in Jesus Christ, in the Holy Spirit, in the believer, etc. Hence, there can be no real contradictions in His various revelations. If such appear, they must be only apparent and lie in the fallacy of our interpretations of one or the other or of both revelations under question. You pose the problem of contradictions between the creation and the Bible, but the basic assumption you seem to be making is that our interpretation of creation must be in error and the phase in which active harmonization must take place rather than vice versa. This is our basic fundamentalist heresy and the hardest to overcome, since we are products of the vicious battles of the twenties and thirties during which time we were assured, and not without reason, that any hint of fallacy in our *interpretation* of the Bible was an attack upon the Bible itself and upon its God.

The infallability of Scripture and the truth it reveals need no vindication, intellectual or otherwise. Being what they are, they will stand. Let's look, then, to our views concerning them, which may really leave something to be desired here and there. What I'm trying to say is that if we're to attempt a harmony, let's glean the facts where they are, put them together as best we can as we prayerfully work under the Spirit's guidance, realizing that He may not see fit to give us the whole picture at this time. I am becoming more and more convinced that we as Christian men of science should approach our scientific endeavors with the same reverence and devotion with which we approach any other spiritual office and that we can look for God's enlightment in our study of His revelation in creation just as we can in our study of His revelation in Scripture. Somehow, by force of habit and the climate of the times, my faith is weaker here —but it shouldn't be!

But to Genesis. The current insistence by Henry[5] and many others upon *fiat creation* as an evangelical position, I do not see demanded by Genesis, at least with the connotation always made, namely, the accompanying insistence upon *ex nihilo* creation. If "fiat" simply means at God's command, well and good, for God is not restricted by our time-space continuum. But the connotation I always feel in these discussions is that of "immediately—out of nothing." These are human terms by which God may or may not choose to restrict Himself. As to the *ex nihilo,* this bothers me, perhaps because I'm human and can't comprehend it, but perhaps by intuition. God Himself has always been; so there was never *nothing.* God had Himself to draw on for creation. Brackbill at Harrisonburg helped me with this when he said he liked to think of God as *omnienergic.* This is certainly compatible with almighty and all powerful, but ties in more denotatively with current scientific thinking. It makes me wonder whether $e=mc^2$ may not be a *creative* as well as a destructive formula.

I also "bump" at our current usage of "special" in *special creation.* Is not any creation *special?* That man is more "special" in God's sight in that He desires fellowship with him and sent His Son to die for him is undeniable. Any way that God did really achieve this end of His creation is *special,* whether it has been by gradual, well-planned development over a course of time or has been by instantaneous command. He could have done it as He desired. Why do we insist in the name of orthodoxy to restrict Him before He reveals it to us in His own good time? "But He has!" I hear the cry, "You're just too blind to see it." True, but aren't we all blind? Do we have trouble ascertaining God's will for man in Jesus Christ? Do we hassle over the sinfulness of man or the righteousness of God? Why should God, who reveals Himself so clearly in this way, be so obscure that only a favored few of the chosen may know how He made us? In other words, I don't think the Bible is crystal clear as to the processes involved in the creation of man, and so we do it no insult to look elsewhere for evidences. But before we leave Genesis 2:7, the principle that stands out to me in its very strange way of putting it, is the principle of "process." In fact, the only real "fiat" act in Genesis that I can see by any connotation is in 1:3. The rest of the account as in 2:7 is an account of making, of "process."

With respect to the account of the making of Eve, here the process seems well and explicitly described. Here, as in the Virgin Birth, there seems to be certain process without scientific precedent or explanation. In the case of the Virgin Birth, it is not easy to explain genetically the birth of a *male* except through the act of a father contributing the male sex chromosome. Neither is it to be expected that from cells containing male sex chromosomes, should be formed a creature not containing any of these, but rather another in its place. Herein, then, God did not act according to the usual pattern by which He operates today. There are numerous instances of this. We call them miracles. But this does not make the other acts—the sustaining acts of God in nature—any less miraculous. We are so bound in our thinking, however, by the doctrine of uniformitarianism that we

5. Henry, Carl F. H., "Science and the Bible." *Christianity Today* 2[23]:20-22, 1958.

have trouble believing that God may not so restrict Himself, or that if He does, it's in a broader way than we are able to comprehend. We assume only that He will be what He is—consistent with Himself—but this may not always seem consistent from our finite viewpoint.

I see then at least two possible conclusions that I can draw from Gen. 2:18-25. One is that it happened just exactly as it says it happened. This position demands no change in my views of Genesis 1 or of 2:7 as expressed above. Here I have detail which I accept; there the detail is lacking. If man evolved, the mutant that became man because of God's breathing into him the breath of life and endowing him with powers far above other creatures would not by natural process have been likely to have had a mate available with these same endowments. Hence the need of "flesh of my flesh."

On the other hand, I can say that this is a beautifully poetic account of the birth of mankind—that "Adam" means not "a man" but "man, the species," and that "woman" is of the same nature and "flesh" as man. The distinction is here made to set the stage for chapter 3. God has acted marvelously in creation. He has given man all of His bounty culminated by an understanding of love in the love of man and wife—and still man sinned! Repugnant as this sort of interpretation is to me because of my background and training, I cannot deny the possibility of this sort of interpretation because this is the way I've been taught to interpret Revelation 2 and 3 for instance.

But must I choose? Must I say that it's an "either-or"? Might it be a "both-and"? Or might there be but a dim picture of reality here—a picture so dim as to reflect little of what truly happened? Whom, indeed, did Cain marry? I conclude—I don't know! But I'll keep on washing, lest I throw out the baby with the bath.

I was at a conference last fall at which Davie Napier of Yale Divinity School spoke. He spoke on Genesis and pictured Genesis 1-11 as "mythological" in import. Not, he assured us, in the sense of "myth" as a fairy tale but rather as the essence of man's experience in prehistory—as he encountered God. It shows us, he said, the eternal plan of God in operation from the beginning of time—*creation, sin, grace, redemption.* What more do you ask of the first chapters of Genesis—in essence?

As I read on, it seems that I have in my meanderings above taken care of both alternatives in paragraph 4, your second difficulty. You again pose the question in an "either . . . or" fashion, as if God had no hand in evolution. If this indeed was His creative process, could He not guide it to His ends?

The age of man is a real problem. Here, of course, lies the area which perhaps more than any other has brought us face to face with the irrefutability of some of the scientific claims—God's revelation in nature. Times were originally estimated from the sedimentary bed-fossil correlation. Geologists examining processes in action today and applying uniformitarian thinking to the interpretation of the geological sedimentary formations estimated the time necessary to lay down and consolidate these beds. Obviously a great margin of error must be allowed. But when, with carbon-14 and fluorine dating, their estimations are refined, but broadly confirmed, then we feel that we must account for this time in creation itself. In other words, our interpretation of this revelation is verified, sending us to re-examine our interpretation of other revelation at this point. As to the validity of Ussher's and others' exegeses, I cannot speak; for I am not critically acquainted with the facts or the methods. But I am left with the problem of accounting for human remains and artifacts which, by using various interverifying methods, show an antiquity far greater than 6,000 years. My alternatives? One, my methods, assuming uniform process through the ages, may be off because of a fallacy in the basic assumption. This is a live question to be asked of most of our scientific conclusions in many fields. But when I have several independent methods of verification which complement each other, this becomes less likely—although there is still the possibility of the discontinuity affecting each line of evidence equally and thus obscuring the discrepancy.

Another alternative is that the remains and artifacts identified as human, are so only in the taxonomic, morphological, and archaeological sense, and do indeed represent something prior to the man of Genesis 2:7. That is, God's *man,* the God-conscious man, may have come long after the brute man was differentiated morphologically and even mentally—long after he learned the use of tools and fire, etc. Spiritually, men may be but 6,000 years old, but such a man is essentially undefinable by any presently recognized scientific terminology. Hence the matter of the age of such a man becomes one of faith (as indeed does any other view), but is not verifiable by present methods.

A third alternative is that there really is more time allowed by the Biblical context than is obvious on first reading. Naturally when I see the need of more time, and some Biblical scholar says, "Sure, you may have more time," I tend to jump on his band wagon very quickly. But I still wonder whether he's given me more time because I demanded it, or because it's really there. The same question applies to the days of Genesis 1 or the universality of the Noahic flood. Just because one interpretation makes better sense to me than another right now, doesn't mean it's right, but as Ramm says about his "progressive creation," it is "that theory of the relationship of God's works and God's Holy Word which makes most sense to the author—and upon what other basis can he make up his mind?"[6] I'm not always sure I have to make up

6. Ramm, B., *The Christian View of Science and the Scriptures.* Grand Rapids: Eerdmans, 1955:293.

my mind right now—but I tend, of course, toward that combination of views which seem most consistent and is hence most satisfying to me. (They're no less satisfying to me, incidently, if someone disagrees with me. He may be able to show me a still more satisfying correlation—or I, him. But why should we fight about it? Particularly so when we both are working from the same basic presupposition of God—the Creator, Sustainer, Self-Revealer, and Redeemer.)

Let me note, before passing on, that though the antiquity of man becomes solidly established at ten or even one hundred times that allowed by Ussher, this in itself does not establish the fact of the evolution of man, either mechanistically or creatively. Time is one problem; change is another. With respect to change, we must also remember that there *has* been evolution within the species *Homo sapiens* since the time of Adam as is evidenced by the various races now living in various parts of the globe. But we still have not established the limits of evolution—nor can we at the present time. Anthropologists are still pretty well agreed that they do not as yet have a clear picture of the origin of man. There are numerous possibilities suggested, but no sequence of forms have yet been found that come near being as complete or as correlated as that of the horse or of some other forms. The "missing link" is still missing here, and there is even disagreement as to what it might link man to, were it found.[7]

But what influence has all this on our view of the Scriptures? What is the role of inspiration? At this point, I feel our basic philosophy of science and our basic theology as well as our personal relationship with Christ is most important. Our relationship with Christ transcends, it seems to me, both exegetical and scientific problems. In Jesus Christ we have found reality and whatever other mistakes we make in our interpretation, He remains our solid fact! In the light of this knowledge, and by His grace, then, I feel that I can question some of my long-cherished interpretations of the Bible without being damned by doing so or being led astray by Satan in the process.

Certainly the idea of a lower and higher order of inspiration gives little satisfaction to our resolution of the problem—but what do we mean by inspiration, anyway? God certainly does not reveal Himself in falsehood, nor is He a God of confusion. Hence I look for consistency in the Bible as I do in truth wherever it is found. And with truth goes authority. I think I have shown that there are alternative interpretations possible in Genesis without, in my opinion, altering the basic truth and authority of the Word. The New Testament commentaries which you quote do not necessarily alter the basic alternatives but have their relevance in each framework. Some may not be as satisfying as others, to be sure, but to the person who holds to Adam as "man," Paul's "one man" would be to make his point, not to vindicate Genesis, and would negate neither. But rather, inspired by the account in Genesis, the Spirit guides him to explain the effect of Christ's sacrifice. Again, the Adam-Eve sequence can be explained as spiritual. Whether this is true or a dodge is, of course, an academic question, for is it not the spiritual message which God seeks most to impart to us? Then why worry about what passages are to be interpreted literally and which figuratively. Look, rather, to God to reveal Himself more fully and most directly to you from each passage according to your need. Do I sound neo-orthodox here? I can't help it, because it seems to me that, practically speaking, the Bible is the Word of God to you as He uses it to reveal Himself to you. But the responsibility placed upon the Biblical scholar is not to "*search out* the eternal revelation of God from among the temporal encumbrances" but rather, as he studies, to have prayerful faith that God will make clear to him from His Word those eternal truths which he needs for this time. Let God be true and every man a liar—but let His truth be ours in Jesus Christ according to His will.

So without accepting your "ifs" categorically, I still find no problem in doing so academically without feeling that I must alter my basic view of the nature, authority, and inspiration of the Scriptures. To the man of faith, *God is* and whatsoever is of Him is truth. The scientist, philosopher, and theologian alike are seeking to learn more of this truth; and as they do, they learn of God. There can be no inherent con-

(Continued on page 28)

## *Letter*

This is a letter in reply to the paper by Cowperthwaite on page 12.—*Editor.*

Thank you very much for your fine letter of February 1 together with the enclosure, "Some Implications of Evolution for A.S.A." Please do not feel that I am ever so busy that I could not be bothered with your problems. I am much concerned over the problem which you present, namely that of the attitude of the A.S.A. toward the subject of evolution.

You are not the only one who was deeply disturbed at the apparent drift toward evolution at the Gordon meeting in 1957. On the other hand it has always been the policy of the A.S.A. to attempt to think through difficult problems in the general area of the subject of science and the Bible. So it has been my policy not to be too disturbed by the approach of any individual papers on this subject of evolution. There are many unsolved problems in the area, and I am sure that the A.S.A. will not bring forth a final solu-

7. See Leakey, L. S. B. "From Taungo Skull to 'Nutcracker Man.'" *Illus. London News,* Jan. 9, 1960. Recent finds in Africa of *Zinjanthropus* need to be carefully assessed in this light as some are proclaiming this form as the "missing link."

tion. Rather, we should do as we have been doing in the past—investigate possible solutions. However, we do need to keep in mind that we accept the inspiration and divine authority of the Scriptures. The problem, of course, boils down to this: "What is our interpretation of any given passage?"

I have read your paper over carefully and have done considerable thinking on it since that reading. I have been attempting to find a mature Christian person in this vicinity with whom I might discuss your paper. I must say, as of now, I have not found such a person.

I certainly do agree with you that the Biblical account clearly implies man is a special creation of God: and furthermore, that this climaxes His creative work. Personally, I hold to the point of view that evolution does not have the answer here. However, we must reserve final judgment on this point until we have more evidence.

Concerning the matter of the antiquity of man, I must say that I do not see any possible difficulty between the Biblical account and the theory of evolution. Since the Biblical account itself skips as many as six generations when you compare one genealogy with the other, I see no reason for not putting in some similar gaps in early genealogical tables—that is, before the time of Noah.

Concerning the two crucial "ifs"—first, I wonder whether scientifically we have the evidence to state that evolution is now a fully established scientific law which must be accepted. I realize that this is almost universally accepted in the scientific world, but it always struck me that we have a good illustration of the scientist exhibiting his faith in a law rather than in divine revelation. Now, of course, it is true that in science we must exercise a faith—otherwise we could make no headway. On the other hand, is it reasonable to assume that we should have more faith in scientific principles than in divine revelation? Your second "if" suggests that the acceptance of evolution can not be harmonized with the Biblical story. Now, of course, there are many who say that this is simply not so. This has been brought out in several A.S.A. discussions. So you see, as far as I am concerned, this whole subject does not vitally effect my faith in the Bible. Your suggestion that perhaps the early chapters of Genesis are of lower order of inspiration than other parts of the Bible, of course, is firmly rejected by me. I assume that most of the members of the A.S.A. would agree with me on this point. Your other suggestion that the story of the creation was written in picturesque, figurative language and also that it was never meant to be taken literally is accepted by many Christians. I am quite sure that this is the attitude of a number of A.S.A. members. Here I agree with you that such a solution would seem to set a dangerous precedent of "explaining away" troublesome passages of Scripture. However, here again we must be very cautious and indeed quite charitable with those who take this point of view. We do realize that many parts of Scripture are quite figurative and it may be that this is another case.

Personally, I tend to take the story of the creation rather literally and I still am interested in attempting to correlate the Scripture passages and scientific facts and theory which may bear upon the same. One of our dangers in this area, of course, is that we tend to form final conclusions. We should realize that our interpretation of both scientific principles and of Scriptural passages must only be tentative.

Perhaps I have not helped you very much in your thinking, but I wish you to realize fully that I am deeply sympathetic with your point of view. I would be most happy if you could put together the various answers you get from different people and circulate them among your friends. Perhaps we could all be edified by such a procedure.

Yours in Christian service.
H. Harold Hartzler,
President

# PHILOSOPHY

**Robert D. Knudsen, Ph.D.**

For this issue I have again asked Dr. William W. Paul to take the column. Dr. Paul is Professor of Philosophy at Shelton College. This last academic year he was visiting Professor of Philosophy at Wheaton College. He has submitted the following review article on the philosophy of science.

### A Philosopher Looks at Science

John G. Kemeny, who has the distinction of being both a Professor of Philosophy and the Chairman of the Mathematics Department at Dartmouth College, gave to his recent text the title, *A Philosopher Looks at Science* (Princeton, Van Nostrand, 1959, 285 pp., $6.50). The work is especially fine in those sections devoted to the role of mathematics and measurement in the sciences. Kemeny believes that mathematics, like philosophy, is not so much a distinctive subject matter as it is a distinctive way of approaching experience. It is a most general branch of human knowledge which aims to provide the theoretical means for ordering all natural phenomena. As Russell and Whitehead demonstrated fifty years ago, mathematics has its roots in the symbolic logic which defines the concepts and demonstrates the properties of that quantitative science. What the author succeeds in showing with admirable clarity is that the symbolism of pure mathematics and logic can be applied to ex-

perienced reality to aid in the formation of scientific theory and law.

One will also find here a clear review of such topics as scientific methodology, the frequency concept of probability, confirmation theory, the idea of a hierarchy of laws, and the interplay between fact and theory in science. Noteworthy is the critique of P. W. Bridgman's theory, which equates each scientific concept with a set of operations defining its meaning. Kemeny feels that this is an impossible demand to carry out and that science has to be satisfied oftentimes with testing its theories through deducible predictions.

What then is science? Well, the method is the all-important factor, and science, Kemeny seems to say, is that body of knowledge brought together by a hypothetico-experimental method. Kemeny apparently subscribes to the view that to have a "unified science" the social sciences, psychology, and biology must be increasingly "reduced" to chemistry and physics. The third part of the book, however, which deals with some of the problems raised by science in areas where life, mind, values, and society are vital, provides no real support for the reductionist thesis. A more pluralistic approach is certainly a live alternative, especially a pluralism which seeks unity in terms of the interactions between the dimensions of experienced reality rather than in terms of reduction. For the scientist who believes in a sovereign Creator, unity and continuity are fundamental presuppositions and expectations, and they are a justification for the use of the principle of induction: but for the author the purposes of God, if there be any, have no bearing on science.

Kemeny makes the striking suggestion that the ideal aim of science is to establish a record of every event in the history of the universe! This is surprising not only because he knows very well that it is the task of science to establish laws and to predict as well as to describe and "keep records," but also because of the way he goes on to talk about an all-inclusive "law of nature." "Imagine," he says, "that some all-powerful heavenly agent keeps a careful record of all events in the universe, then these records, together, would form a law which covers everything that happens in the universe" (p. 40). Yet nowhere does Kemeny indicate that he believes there could be a God who could not only keep such a record, but who could by His sovereign power actualize a plan. He simply claims that it is the "all-inspiring goal" of science to find this one law which will enable the scientist to "explain all facts with perfect accuracy" (pp. 47, 167). Whether Einstein's Unified Field Theory will meet this test, the mathematician is not yet prepared to say.

Without any supporting data Kemeny claims that the average practicing scientist is a materialist, a monist who considers "the mental to be an offshoot of the material world" (p. 219). It may be questioned whether the "average scientist" has thought through metaphysics to that extent. Many probably hold to a common-sense realistic approach to the world and perhaps also view mind and matter as two interacting poles of human experience.

In keeping with the materialist approach is Kemeny's discussion of evolution. He sees "no religious danger in rejecting the scientific content of the Bible" (p. 196) because he fails to recognize that the moral and spiritual claim of the Bible cannot be easily dissociated from its factual credibility. He shares some common misconceptions about the account of creation: that it teaches that the "various *species* were created independently of each other" (p. 197) and that it rules out completely the possibility of mutations. I hope that Kemeny will notice how these matters are frankly discussed in the book edited by Russell L. Mixter, *Evolution and Christian Thought Today* (Grand Rapids: Eerdmans, 1959. 230 pp., $4.50). Kemeny himself recognizes that on a neo-Darwinian theory alone it is difficult to allow for enough favorable mutations in 40,000 generations to account for the evolution of man in the last million years (p. 201).

He admits that there is no clear support for the theory that evolution shows qualitative direction due to the supposed advantage a given change brings to the species. This leads him to suggest that a Lamarckian type of environmental influence may be a necessary corollary to neo-Darwinianism in order to provide "direction" to what would otherwise be chance mutation. Whatever causes changes in chromosomes remains unknown, but apparently for Kemeny it remains unscientific to bring the continuous creative power of God anywhere into the picture. In the light of the many uncertainties concerning what J. S. Huxley calls the "machinery of evolution" it might just be unscientfic to continue ignoring the Biblical presupposition.

# CHEMISTRY

**Walter R. Hearn, Ph.D.**

In the last issue of this column the problem of approaching scientific colleagues and university students with the Gospel of Jesus Christ in language understandable to them was discussed. In this issue I would like to share with you one approach which I attempted during an evangelistic mission at the University of Alberta earlier this year. The original presentation was given during the noon hour in the medical building and consisted of about a thirty-minute talk advertised as "A Biochemist's View of Life" followed by a twenty-minute open discussion period. Only a bare outline of the talk can be given

here, which is presented not only for your reactions and criticisms, but also with the hope that this attempt may stimulate you to consider other approaches derived from your own special training.

* * *

Biochemists like myself are interested in *life*, and no less so because life is very difficult or impossible to define. N. W. Pirie has pointed out this difficulty very emphatically in a paper on "The Meaninglessness of the Terms Life and Living." (We recognize the viruses as being at the border line between the living and nonliving at one end of the spectrum, but we certainly use the term "life" to include a wide variety of phenomena at different levels. Thus we speak of the life (and death) of a cell rather independently of the life of the multicellular organism of which it may be a part. It is often a shock to nonbiologists to learn that the HeLa strain of cancer tissue, now cultivated in laboratories all over the world, has continued to multiply until its total living mass is now many times that of the woman from whom it was derived—even though she "died" several years ago! To some people it does not seem an unwarranted extrapolation to speak of the "life of a city" or the "life of a beehive," but to others this is stretching the biological notion too far. At any rate, the biochemist in interested in life, whatever it is, and tries to discover the mechanisms actually involved in these phenomena. And so far, even the simplest forms of life leave us with many puzzles yet to be solved.

Now, Christians claim to have discovered a whole *new* phenomenon when they became joined to Jesus Christ in a spiritual relationship, and the term most often given to this phenomenon in the New Testament is that of "spiritual life." Becoming a Christian is spoken of as "being born again into a new kind of life," and indeed, this kind of Life (with a capital L) is regarded in the Scriptures as being so superior to the ordinary, human kind of life, that in comparison mere human life seems equivalent to death! One of the claims for this Life is that it is eternal, that is, not bounded by time. Another claim is that it is abundant, that is, richer or more intense than ordinary life and not subject to all of the limitations and frustrations of ordinary life. This does not imply that the spiritual Life of a Christian and his physical life are unrelated. Every Christian knows that if his body is deprived of food or sleep his prayer life will be affected, and there are theoretical reasons to expect this. After all, the "life" of my body that I experience is related to the "life" of my liver cells which I cannot experience, and to the "biological half life" of protein molecules at a still lower level. We should expect interrelations of life at different levels—and expect them to be very complicated!

Because I am both a biochemist and a Christian, I have given some thought to the possible "mechanisms" of this spiritual Life of mine, based on what I know about mechanisms important in ordinary physical life. You may consider these remarks as being in the form of an analogy or parabolic expression in which ideas from two different realms are laid side by side for comparison. (The Biblical word "parable" and the "parabola" of mathematics come from the same Greek root.) Such an analogy is valuable if it opens minds to new or neglected ways of thinking, but, of course, should not be taken "literally" or stretched too far. I say this so none of you will tell your professors that I said that Christian metabolism is better than, or even different from, non-Christian metabolism, or that God is an enzyme or something—I've been misquoted before! I am merely trying to illustrate to you in terms you may understand if you have studied biochemistry, or even if you haven't, what it is like to be a Christian—how spiritual Life may be superimposed upon the ordinary kind of human life which you and I already experience in common.

Modern biochemists are generally "mechanists" rather than "vitalists." We operate on the basis that physical life represents the sum of complex chemical reactions rather than the result of the direct action of some nonphysical "vital force" at work in the organism. However, we still have another choice. We may consider these chemical reactions from the standpoint either of thermodynamics or of kinetics. Thermodynamics deals with the driving force which makes a reaction go and kinetics with the rate at which it goes. The two approaches can be quite independent, but we now recognize that consideration of both of them is necessary for an understanding of how living things work. In fact, the whole chemical basis upon which living things operate can be said to be the existence of compounds which under certain conditions can be thermodynamically unstable (that is, they have a strong tendency to react) but kinetically stable (that is, their uncatalyzed reaction is extremely slow). By providing catalysts at the appropriate time and place, the living system can utilize the "stored" energy in a controlled way to drive its own synthetic reactions. Adenosine triphosphate or ATP is a molecule which liberates a great deal of energy on hydrolysis but is *stable* in water at physiological pH values because the strong negative charge surrounding its ionized phosphate groups repels the attack of water molecules or hydroxyl ions. The energy can be released readily by removing some of this charge by acidifying the solution or by bringing up an appropriate enzyme such as ATP-ase. The relationship of thermodynamics and kinetics is seen in the familiar derivation of the equilibrium constant of a chemical reaction. In abbreviated form, suppose that compound A reacts with compound B. At any time the rate of this reaction will be proportional to the amounts or concentrations of both A and B, or:

$$\text{Rate}_1 = k_1(A)(B)$$

where $k_1$ is a constant of proportionality called the rate constant. However, if the products of the re-

action of A and B are, say, C and D, as their concentration builds up there will be a greater tendency for them to react, and we can write the same kind of expression for their rate:

$$\text{Rate}_2 = k_2(C)(D)$$

If the reaction is reversible, so that:

$$A + B \longleftrightarrow C + D$$

then $\text{Rate}_1$ will continue to decrease and $\text{Rate}_2$ to increase until the two rates become equal, and the reaction will have reached a static "equilibrium." Since $\text{Rate}_1 = \text{Rate}_2$ at equilibrium, then:

$$k_1(A)(B) = k_2(C)(D)$$

and by dividing both sides by $k_2$, (A), and (B), we get:

$$K = \frac{k_1}{k_2} = \frac{(C)(D)}{(A)(B)}$$

where K, the quotient of the two-rate constants, is called the equilibrium constant of the reaction. The logarithm of this equilibrium constant is directly related to the thermodynamic quantity called the Standard Free Energy Change of the reaction, a direct measure of its tendency to "go."

In biochemistry, the reactions of interest are enzyme-catalyzed, and one must deal with an intermediate step in the over-all reaction of substrate (the biochemist's term for reactant) going to products, namely, the formation of the enzyme-substrate (or E-S) complex. Furthermore, the situation in living systems is such that the reactions, even though speeded up by the presence of enzymes, are generally *not* at thermodynamic equilibrium, but are in what biochemists call a "steady-state" or dynamic equilibrium. In fact, when a living system reaches thermodynamic equilibrium, it has ceased living! Living systems are "open" systems in which an inflow of energy prevents the attainment of thermodynamic equilibrium. A closed system at thermodynamic equilibrium cannot do useful work without internal change, but a steady-state system *is* capable of doing work on its surroundings or on the components of the system. "Furthermore, thermodynamic equilibrium is unstable in the sense that it is shifted to a different state by a single addition of energy to the system, but the steady state has stability and is rapidly re-established." to quote from Fruton and Simmonds (*General Biochemistry*, Wiley, Second Edition, 1958, p. 243). "Of special importance is the fact that the concentrations of the reactants at thermodynamic equilibrium are independent of the concentrations of substances that catalyze the reaction, whereas the stationary concentrations of the reactants in a steady-state system are determined by the catalyst concentration."

* * *

Now I would like to turn from consideration of physical life to consideration of spiritual Life. To do so, first of all I must discuss the unique character of *human* life, which I admit is rather hard to do in biochemical terms. But without getting involved in biochemical complications, let me merely summarize the data from my own human experience verified by contact with other human beings directly and through their literature. I mean to make this the most general description of man and not just the familiar Biblical one. Certainly many non-Christians have expressed the same basic idea after a much more thorough analysis of the human situation. The essence is that man's unique self-awareness puts him in the position of being either subjective or objective in his view of the world and of himself, and however this difference in viewpoint is expressed, we all know it from personal experiences of having made choices between them at one time or other in our lives. Sooner or later we come across an experience to which we may react emotionally or rationally, and we are conscious of making such a choice. In fact, one might even say that it is the possibility of this consciousness of choice which makes us *human* instead of merely thinking machines or "feeling" organisms.

Now to put this somewhat oversimplified picture of the nature of human life into the kind of symbolism a biochemist uses for reactions, we can write:

$$\begin{array}{ccc} \text{Man} & \longrightarrow & \text{Man} \\ \text{Subj} & \longleftarrow & \text{Obj} \end{array}$$

where the symbol on the left represents the emotional, biological, existential aspect of our lives, and the symbol on the right represents the rational, cultural, objective aspect. There is at least a sense in which the two aspects are mutually exclusive at any given instant, so that we must shift back and forth from one to the other. Following the previous derivation we could write for the over-all process a kind of "equilibrium constant" which would represent the ratio of the two aspects of a man's life.

What does Christianity have to do with all this? Well, many people, Christians and non-Christians alike, seem to have the idea that becoming a Christian means essentially a change in the "K" for the convert, although there is some disagreement about the direction of the shift. The Roman Catholics and some others argue that when a man becomes a Christian he becomes truly rational man. Others describe the nature of their Christian experience in terms that lead one to believe that their equilibrium constant has changed radically in favor of the emotional and existential or "mystical." However, I think these descriptions are neither very accurate nor very helpful in trying to convey what I mean by being a Christian. Personally I think there is a whole range of individual values for this "K" among people who call themselves Christians as well as in the general population. Some people tend to be more emotional and some more rational, and some of each kind become Christians.

For my own view of what it really means to be a Christian, let me remind you that the Biblical expres-

sion is that it means to have a new kind of Life. That is, when one becomes "alive" in Christ he becomes part of an open system, a dynamic situation in which there is an inflow of what we may call "divine energy" *preventing* the attainment of the "death" corresponding to an equilibrium state. A Christian, in this way of thinking, is no longer merely human; he exists in a sort of "God-man" complex, bound up as a substrate is bound to an enzyme. And the interesting part of this analogy is the theoretical necessity for the uniqueness of Jesus Christ in bringing this new Life to man: He is the "active site," providing perfect binding of man to God because of His perfect "fit" to both reactants—"God was in Christ reconciling the world to himself"!

Let me try to explain why this analogy is helpful to me in analyzing my own experience first as a "lost" human being (a closed system!) and then as a Christian. As a human being, if I explore the subjective view of myself thoroughly and play around with the thought of my subjective choices, sooner or later I come up against the idea that I am not only responsible for those choices but also that I make poor choices or wrong choices, by whatever my standard of good and bad. If there is a God who is the Creator of the universe, all my responsibilities ultimately go back to Him, so that at this extreme I come up against my own inexorable guilt. The only escape from this distressing situation is to flee into objectivity, as all of us have done many times—"we are no more guilty than anyone else, the circumstances and not me were really to blame, we don't really know that God even exists," etc. However, when one explores objectivity to its depths, one again becomes "lost"—lost this time as one's self becomes swallowed up in the universe and we see ourselves as thoroughly conditioned and controlled and we *become* merely chemical reactions, etc. Because of these crushing influences of extreme subjectivism and objectivism, one tends to oscillate between the two modes of thought in a state of terrific tension (which eventually shatters many people), or one finds the position of least tension—his equilibrium position—and "dies" there.

In contrast, there is a tremendous difference in my outlook as a Christian: Because the forgiveness of my sin has been provided for in the death and resurrection of Jesus Christ, I am free to explore the possibility that I am in reality *thoroughly* guilty and *never* make an unselfish choice. No extreme of subjectivity can frighten me or shatter me now! And since I have learned in Christ something of the nature and purpose of the Creator, I am no longer depressed when objective analysis shows me to be but a speck of cosmic dust, or a batch of chemicals, or a machine. My humanity is not extinguished because I now joyfully acknowledge Him as my Creator and share in His purpose even though *thoroughly* controlled. So, by being bound to Him in an "activated complex," I have been set free from the inevitability of equilibrium and death—I have been "born again" and am now gloriously alive in Jesus Christ! And in practice, I find I *am* able to influence my surroundings, being an open system through which God's love may flow to do "useful work" on those around me. Furthermore, I find that I *am* more stable as should be true of a steady-state situation, my relationship to God through Christ allowing me to absorb pressures that would otherwise upset me. And finally, I experience an intensity of life possible only to one who has been introduced to the full significance of his creatureliness on one hand and the joyous opportunity of full participation with his Creator on the other hand.

Jesus said, "I came that they may have life, and have it abundantly." "In him was life, and the life was the light of men. The light shines in the darkness, and the darkness has not overcome it." "To all who received him, who believed in his name, he gave power to become children of God, who were born, not of blood nor of the will of the flesh nor of the will of man, but of God." "Therefore, if any one is in Christ, he is a new creation; the old has passed away, behold, the new has come."

If this is true, it is too good to miss! Don't miss it any longer.

# ARCHAEOLOGY

**Allan A. MacRae, Ph.D.**

The great public interest in the Dead Sea Scrolls (to which two of these columns have been devoted) has in the popular mind shoved into the background other recent archaeological discoveries, some of which are at least as important as the Dead Sea Scrolls. Among these, one of the most significant was the discovery of the group of materials that is now spoken of as the Ugaritic texts, but was formerly generally designated as the Ras Shamra texts. If it were not that we are living in a period of so many great and varied discoveries in archaeology, the discovery and interpretation of these texts would have ranked as one of the most outstanding and interesting developments in the whole story of antiquity.

Ras Shamra is a place on the northern coast of Syria, where the remains of an ancient city have been unearthed. This city was called Ugarit, a name already familiar to archaeologists from mentions in Egyptian and Hittite documents.

In 1929 the distinguished French archaeologist, C. F. A. Schaeffer, who was about to visit certain archaeological places in Syria, then under control of the French, stopped at the headquarters of the Department of Antiquities. As he was leaving, the Direc-

tor remarked rather casually: "On the way to the place that you are to visit first, you will pass near a spot called Ras Shamra. For some years the natives have been informing us that they believe there are ancient remains buried there and that we ought to excavate. Usually such local people know nothing whatever about such matters and their suggestions are not worth following up. However, these people keep asking, and so in order to quiet them it might be good if you would just stop and look around there on your way." Schaeffer stopped at Ras Shamra and was so impressed by what he found that he carried on excavations there that continued for a number of years.

At Ras Shamra, Schaeffer found a library containing hundreds of clay tablets, in an altogether new type of cuneiform writing. Most cuneiform writing is based upon the system originated by the Sumerians early in the third millennium B.C. This system has about 300 common signs and quite a few less common ones. Most of the signs represent syllables, though many indicate entire words. On the tablets found at Ras Shamra only about 30 different signs were used. Copies of a few of the tablets were soon printed and distributed to various scholars.

One day Professor W. F. Albright, who was then the Director of the American School of Oriental Research at Jerusalem, received a paper from Germany in which there was an article by Professor Hans Bauer of the University of Halle, reporting on his study of the Ras Shamra material, and stating his belief that the language it contained was a Semitic language. He worked out a suggested interpretation for about two thirds of the signs, but not enough to be able to make much headway in the reading of the language.

Dr. Albright took the German paper and went to the headquarters of the French Dominicans in Jerusalem, a group of men who had for many years been doing excellent work in the study of Palestinian archaeology. There he showed it to Pere E. Dhorme, whom he knew to be interested in this type of subject. Dhorme told Albright that he had already himself done a good bit of work on the published Ras Shamra material and had worked out about two thirds of the signs. It so happened that Bauer had worked out a good many signs that Dhorme had not been able to interpret and that Dhorme had interpreted a good many that Bauer had not understood. Putting the two together, it was found that it was now possible to begin active work interpreting the texts.

It is interesting to note that Dhorme had acquired facility in deciphering strange messages through experience gained as an expert with the French army during World War I in interpreting enemy codes. And Bauer had performed the same sort of work in the German army at that time. Thus men who had been enemies now co-operated in a peaceful advance in our knowledge of ancient civilization.

It was possible to make sufficient progress in the work of interpretation to show beyond doubt that Dhorme and Bauer had indeed found the true secret of the meaning of the signs. It proved to be an alphabetic type of writing—one of the first alphabetic types in history! It is now certain that alphabetic writing of the type that we use for the English language developed from a system that began in southern Palestine in the second millennium B.C. The Ras Shamra signs bear evidence of being an artificial sort of writing, with wedge-shaped marks arranged in orderly fashion to indicate various letters. Quite evidently it was invented by someone who was familiar with the alphabetic type that had developed shortly before, from which all of the types of alphabetic writing in the world today have sprung. Thus if our Latin system of writing should be described as a grandson of the earliest type of alphabetic writing, the Ras Shamra system should be called its stepchild.

The language in which these tablets are written is closely related to the Hebrew of the Old Testament. They can be dated to the fifteenth and early fourteenth centuries B.C.

The Ugaritic tablets contain quite a variety of types of material, many of them being mythological poems about Canaanite gods and heroes. They give us a vivid picture of the Canaanite religion of Ras Shamra in the fifteenth century B.C.

Previous to this discovery almost all that was known of Canaanite religion consisted in the references to it in the Old Testament, which often refers to the leading god of the Canaanites under the name of Baal, and to their leading goddess as Asherah, translated "grove" in Judges 3:7; I Kings 15:13; 18:19; II Kings 21:7; 23:4, 6, 7 in the King James Version. Both of these names occur frequently in the Ugaritic tablets. The Old Testament refers to their religion as a very corrupt and sensuous system of worship, against which the Israelites were very strongly warned. The Ugaritic texts contain several long Canaanite epics, which depict the activities of their gods. These corroborate the picture that the Old Testament gives, showing that it was a religion with many gross and offensive features, very inferior to the ethical monotheism of the Old Testament.

The Ugaritic texts have added to our knowledge of the history of that part of the world, and have vastly increased our understanding of its religion and culture. At many a point they corroborate the Biblical picture of the Canaanite religion.

During the last fifty years there has been a constant effort to find the origin of Christianity or Judaism as a development from some purely human or natural background. This trend, which has lately been conspicuous in the attitude of certain writers toward the Dead Sea Scrolls, has also exerted a very strong influence upon the attitude of many students of the Ugaritic texts. Much has been made of the fact that the literary syle of some of the Psalms and of certain

portions of the prophetical books has much in common with the literary style of these epics. However, this is surely what one would expect in view of the fact that the languages are very similar and that literary style tends to spread easily from one place to another, particularly when the languages are closely related.

Starting from the similarity of literary style, some recent writers have gone on to note similarities of expression in reference to deity or deities, and to infer that a great part of the Old Testament is based upon a knowledge of this Canaanite material. On close examination of the material itself, it is necessary to write "not proven" against most of these assertions. It is entirely possible that the culture of the Israelites was affected to some extent by the culture of the Canaanites. And from the Ugaritic texts we get help in the interpretation of words and of cultural activities depicted or alluded to at various points in the Old Testament. But when it comes to religion, the relation is one of antithesis, rather than of similarity. The alleged close similarities usually prove on investigation to be based upon a rather forced interpretation, or upon comparing things which may be verbally similar but which in the light of context are utterly distinct in their meaning and significance. The Ugaritic material has already been helpful in interpretation of Biblical words, and will be even more so in the future. But the attempts to show that the Bible was a development from the religion of Canaan, rather than a revelation from the God of creation, when examined objectively and scientifically, prove to be quite without foundation.

# SOCIOLOGY

**Russell Heddendorf, M.A.**

## The Christian's Role: The Social Action Frame

Part I

In order for any society to exist, there must be maximum training of individuals in the efficient performance of their roles. This is particularly important for the more critical roles. Consider, for instance, the training given to a doctor not only in the technique of his profession but also in the administrative and social relationships involved. The precision of training in these areas indicates the high value we attach to the profession. Too often, however, we ignore the intrinsic importance of a role and do not adequately train an individual for its efficient performance. Unfortunately, the role of parent in our society holds relatively little value. This is reflected in the fact that, despite the knowledge that most children will assume the role of parent at some time in their lives, society provides little training in the correct performance of the role before the actual achievement of the role.

As in the case of family roles, too often the only training afforded the Christian for performance of his role is the observation of role behavior by others. Since much of Christian behavior may only be observed in the church, the role of Christian has been strongly identified with performance of church activities. The Christian, however, "acts" in many different times and places and a true training for a Christian's role would have to take into consideration the various types of acts. The basic social act may be understood by an analysis of its basic components of the individual, ends, conditions, means, and norms.*

Any training of the individual must take into consideration the subjective being. The two most important factors here would probably be the Christian's salvation experience and his ego orientation. The individual's perception of his role may be molded by his interpretation of the meaning of his experience. It could be viewed as a call to service following a life of sin, or as a rather apparent consequence of seeking for truth requiring little additional action. In addition, the individual's ego orientation may be variously modified by his experience. This could fluctuate among the strong relationships of individual to self, society, or God. A large part of the individual's cognition of his responsibility to the Christian or non-Christian environment would be determined here.

The great emphasis in any training for a Christian role should be on its ultimate end. The value to be stressed here is twofold and includes the fact that it is not completed upon death, nor should it find completion on earth, for once an end is achieved, there is no longer need for the role which brought it to pass. The strength of the Christian role, therefore, should be understood in terms of its inherent incompleteness. This fact would assume the establishment of new ends upon completion of others. The proper motivation for role performance may best be achieved when the concomitant ends are seen to be relatively absolute in nature. A problem may arise when such ends are not consistent with those of the prevailing culture. The need for deviancy in a person in such a situation may not be adequately manifested because of a conflicting ego orientation.

Additional training for the Christian's role would have to stress the conditions or obstacles hindering maximum performance. These will vary in their significance, partially as a result of the individual's con-

* For the original presentation, see Talcott Parsons, *The Structure of Social Action* (New York: McGraw-Hill, 1937), or the derivative versions by Kingsley Davis, *Human Society* (New York: Macmillan Company, 1948), and Marion Levy, *The Structure of Society,* (Princeton: Princeton University Press, 1952).

ceptualized ends and ego orientation. In fact, these factors themselves may constitute conditions limiting the individual. A choice of ends not in keeping with the Christian's role might require compromising the role. Similarly, an ego orientation which is not highly sensitive to God might be the reason for this choice of ends.

Probably the largest area of conditions, however, will be the general class of secular obstacles. It is necessary for the Christian to see such conditions as surmountable by supernatural means. Yet there should be keen perception on the individual's part of those conditions which might limit role performance despite the fact that they may be overcome. So much time might be lost or compromise made with the world in order to conquer the condition that performance of the role might be seriously hampered.

In order to reach some end, a means is used. The Christian must realize that the means he may use to overcome most conditions blocking his achievement of ends are both spiritual and secular. He has the choice of which will be used. Strengthening of the Christian's role will result when constant use of spiritual means is used in preference to the secular. This is particularly important since some conditions may be overcome only by spiritual means and inefficiency of role performance may result if secular means are chosen in situations calling for spiritual means. Nor should the individual neglect the possibility that conditions may be means when dealt with by spiritual means. Training in spiritual insight is needed here to provide a proper perceptive focus. In addition, the Christian must realize that means are not meant to be ends. Such a view could result in lack of growth since the accomplishment of such means would stifle the motivation for gaining ultimate ends.

The entire process of action takes place within a structure of norms. These constitute the ethical basis for role performance. The individual must be aware that here, as in the case with ends and means, both secular and religiously oriented action must take place within a frame of Christian norms. It is also necessary not to confuse a norm with a means since norms do not help to achieve ends. Much of the secularization of modern religion has resulted from this basic confusion. The idea of doing "social good" is seen as a means to an end which is not, however, within the Christian frame of ultimate ends.

The previous discussion assumes that the individual acts within a sphere devoid of social relationships. This is, of course, not a true situation. Daily interacting with others constitutes a condition-means variable which poses special problems. These will be considered in a subsequent column.

# *A Case History of the Power of Public Opinion*

**on a subject of particular interest to the A.S.A.**

One of the functions which members of the A.S.A. can usefully serve is to present a positive and authoritative witness in favor of secular literature which properly discusses the relationship between science and Christianity. They can also present an equally positive and authoritative witness against secular literature which improperly describes a conflict between these two disciplines. To show that such witness can have a beneficial effect is the purpose of this brief note, setting forth the case history of such an incident in which I was involved.

About sixty years ago, Andrew Dickson White, the founder and first President of Cornell University, wrote a book called *A History of the Warfare of Science with Theology,* which has been acclaimed a classic in its field. White was instrumental in preventing ecclesiastical control of Cornell University, and as a result of his efforts in this direction, he set down a summary of notions held by various theologians throughout history which had been proven false by further research and advance in science. Although White could hardly be construed as a conservative in Christianity, he professed to be a friend of Christianity and stated that his book was aimed against authoritarian anti-scientific dogmatism in an effort to free Christianity and science from such restrictions in the future. On the whole, White's book is fairly one-sided, accepting as it does any hypothesis of science at the expense of conservative Christianity, and by implication associating the harebrained notions of certain isolated individuals with the general belief of the church of their day. Yet it does serve a useful purpose in showing the peril in associating theological doctrine and practices with contemporary notions of the natural world, identifying Biblical interpretation with Biblical revelation to the detriment of both the scientific and the Christian community. So much is by way of introduction.

Dover Publications, N.Y., is currently putting out a paperback edition of White's book and circulating advertising leaflets concerning it. One of these leaflets was sent to me. The line adopted by the advertising copy writer is indicated by the following quotations:

> "Amusing follies of thought . . . thousands of entertaining accounts of the vagaries, absurdities, and fallacies which religion has tried to force upon science."
>
> ". . . delightful thorough coverage of the crank theories, crackpot explanations, and fanatical concepts that religion has attempted to force upon science."
>
> "It is the standard work exposing the persecution which theology has waged upon every

scientific advance in the past, and the damage which religious thought control has inflicted upon human welfare."

"It is a veritable compendium of folly held in defiance of reason.... This set will also enrage you, for it is the history of thwarted truth and suppressed knowledge—the story of mankind held back hundreds of years by bigots and fanatics."

A fellow scientist and I sent a letter to Dover with a restrained yet pointed denunciation of the false implications contained in the advertising copy. We pointed out that the copy makes the work sound like an anti-Christian book which it was not by the confession of its own author, that it dwelt on notions which all intelligent people have long since discredited but implied that "religionists" were a fanatic group apart who continued to seek to inflict these notions on others today, that it contained the false implication that a great gulf separated science from Christianity, and that it was at very least in exceedingly poor taste.

We received in reply a courteous letter from Mr. Hayward Cirker, President of Dover Publications, from which the following is a partial quotation:

"We had no intention of offending any religious group. Our copy writer was too enthusiastic in describing a book on the subject of the struggle between religion and science. I quite agree with you that most of these differences have been reconciled among intelligent people. However, the struggle continues among less educated groups.... If you would like to revise or rewrite it so that it might be acceptable to all Christians, we would be very glad to have your suggestions with a view to changing our circular in future printings."

We replied to this invitation by suggesting that Dover publish some quotations from the Preface by White himself to spell out the real purpose of the work. In addition we submitted the following brief summary of a possible advertising slant:

"History provides many examples of men basing their whole religious faith, life, and practice upon an interpretation of the Bible. They have been so convinced that their interpretation was the very essence of the revealed content of the Bible that they were willing to contest the discoveries of the scientific community, and to make acceptance of their interpretation, if not a requisite for life and safety, at least a requisite for entrance into the Christian church organization.

"Sooner or later such interpretations assumed in direct antagonism to the reliable investigation of science must give way. When they do give way, they leave behind the impression on the world that science has cleared up one more mysterious superstition that the organized church had been attempting to foist upon humanity. What has really happened is that one more false interpretation has given way to truth, and the real content of the Biblical revelation is found as usual to be in agreement with the real content of reliable scientific research.

"It would be a tremendous benefit to Christianity and to the world as a whole, therefore, if it were clearly recognized that the revelation of God given in the Bible cannot contradict the revelation of God given in nature. That to tie in the basic spiritual truths of Christianity with popular notions of the day relevant to the contemporaneous interpretation of the Bible with regard to the natural world is to saddle the strength of spiritual truth with the millstone of transient opinion.

"White's book gives a number of sad examples of the confusion of men's interpretation of the Bible with the actual content of the Bible, and of the unfortunate reflection on the integrity of Christianity which can result from such relatively isolated instances."

The response to this letter came within five days with the very promising statement:

"The circular will not be run again without making changes along the lines of your sound suggestions."

This is the end of the case history. Undoubtedly other A.S.A. members have had similar experiences. The time has come for all men who see the unity of scientific endeavor and Christian revelation to speak out over and over again that their testimony as Christian scientists may be known, not only to the limited audience of enlightened Christians, but to the world at large.

Richard H. Bube,
RCA Laboratories,
Princeton, New Jersey

# *Our Attitude Toward Materialism*

**William J. Tinkle**

Since materialism often is mentioned in the pages of the *Journal* and usually without a definition or discussion of the meaning, it may be well to discuss the term.

For a complete definition of the doctrine of materialism one should consult a book on philosophy. It usually includes a statement that there is nothing in the universe except matter and motion, or nothing except that which can be explained by the laws of chemistry and physics. Such a statement strongly infers a kinship between science and materialism. But we as Christians find it alien to our thought because it rules out God. The philosophers set the doctrine on our doorstep and say, "It is your baby"; but we say we have a good alibi.

We who deny the doctrine of materialism claim that we do not cramp the natural sciences. No sci-

# OF INTEREST

*Christianity Today*
(Nov. 9, 1959, p. 93) "Christianity and Psychiatry," Norvell L. Peterson. A discussion of psychological impacts, intrapersonal relationships, Christian aid to psychiatry, and the interpersonal world.
(Dec. 21, 1959) Symposium issue on "Christianity and World Religions," including articles on Judaism, Islam, Hinduism, Buddhism, Confucianism, as well as Christianity.

*Sunday School Times*
(Dec. 26, 1960, p. 1009) "Physical and Emotional Stresses of Missionary Work," Paul E. Adolph. A Christian physician who has seen missionary service himself outlines the problems encountered by the missionary in a series of articles.

*American Scientist*
Several articles outlining the secular scientist's attitudes toward the future of evolution are: "The 'Origin' After a Century: Prospects for the Future," C. L. Prosser (*47,* 536 [1959]).
"The Prospects of Genetic Change," H. J. Muller (*47,* 551 [1959]).

*Bibliotheca Sacra*
"The Papyri and the Critical Evaluation of the New Testament," M. L. Unger (117, 19 [1960]).

*Bulletin of the Evangelical Theological Society*
In the *Fall, 1959,* issue are four articles concerned largely with the early chapters of Genesis:
"The Principles of Interpreting Genesis 1 and 2," A. A. MacRae, p. 1.
"Phenomenal Language According to Dr. Bernard Ramm," M. J. Wyngaarden, p. 10.
"The Effects of Poetic and Literary Style on Interpretation of the Early Chapters of Genesis," G. Douglas Young, p. 15.
"Figures of Speech in Human Language," C. F. Pfeiffer, p. 17.

*The Satellite*
The *Fall, 1959,* issue was primarily devoted to Creation, Evolution, and Darwin. Among the articles were: "Evolution, Christianity, and Science," W. Frair; "A Biochemist's View of Life," W. R. Hearn.

*Eternity*
April, 1960, p. 15) "What Archaeology Knows About Melchizedek," E. M. Blaiklock. A study of a contemporary of Melchizedek from ancient records.
(March, 1960, p. 8) "Marriage Isn't What It Used to Be," L. I. Granberg. The author, a psychologist at Fuller Theological Seminary, examines this thorny problem with some practical Christian approaches to a solution.
(May, 1960) "Adam and Modern Science." Dr. Barnhouse discusses the problem raised by two recent books *In Search of Adam* and *The Death of Adam,* concerning the place of the Scriptural Adam.

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ence depends upon the doctrine. It has been a fellow traveler in some instances but not necessarily so.

Christians who are scientists recognize mechanism as a reality. Mechanical principles are employed even in our bodies, for the heart is a pump and our limbs are levers.

We do not agree with Berkeley and Mrs. Eddy that matter has no existence. It is true that we can not know objects as they really are, for all we have is our sensations which have come from sight, touch, hearing, etc. But when I have a sensation of one object affecting another object, for instance, an ax cutting down a tree, those objects must be more than sensations in my mind.

Christians part company with materialists, however, when the latter say that there is *nothing but* that which physical science can describe. Negation is not founded upon observed facts but is merely opinion. A scientist might say, "In my laboratory I have found nothing except that which agrees with the doctrine of materialism," but if he is truthful, he does not say that his research represents all the reality in the world.

Extreme determinism, which is the ultimate goal of materialism, certainly is unproved. But it is not advocated so much as formerly since physicists have demonstrated that the motion of minute particles can not be predicted except as averages of large numbers.

Certainly God is not limited by the average behavior of bodies, large or small. He usually acts in a way which can be predicted and it is well for us that He does so. But to limit God to only one reaction would place Him lower than the animals. Even an amoeba chooses what it will do. When touched with a rod, it sometimes glides away as fast as it can, but at other times it contracts into a ball.

As scientists we deal with matter but as men and women we recognize the reality of such entities as courage, faith, hope, and love. We recognize such words as *ought* and *regret* which would have no meaning in a system of materialistic monism.

*Command*
(March, 1960, p. 1) "The Christian View of History," W. Robert Smith. Smith's writings are always interesting and to the point. Here he brings the subject close to the personal life of the reader.

*Christianity Today*
"The Meaning and Goal of History," C. Gregg Singer. Part I, March 14, 1960. Part II, March 28, 1960. Dr. Singer looks at history from the standpoint of various philosophies.

*This Week* (January 24, 1960)
Dr. Wernher von Braun, the missile expert, points out from analogy that since no particle disappears without a trace, it is logical to believe in the spiritual continuance of a person when his body dies. (Quoted in *Sunday School Times,* March 19, 1960.)

*Practical Anthropology*
(Jan.-Feb., 1960) "Anthropology in Paperbacks," James O. Buswell, III. Eleven paperbacks are reviewed in this issue. Later issues will continue the listings.

# NEW MEMBERS

The following persons were elected into full membership in the American Scientific Affiliation.

**Bajema, Carl Jay,** 2053 Huizen Avenue, S.W., Grand Rapids 9, Michigan, is a graduate student at Western Michigan University as well as a science teacher at Grand Rapids South High School. He has received A.B. and B. S. degrees from Grand Rapids Junior College and Western Michigan University respectively. His field of study is in Biology.

**Bartels, Paul G.,** is an Instructor of Biology at St. John's College, Winfield, Kansas. He received A.B. and A.M. degrees in Biology from Colorado State College.

**Chapman, Ivan,** 1660 E. Division Street, Springfield 2, Missouri, is Assistant Professor in Social Science at Evangel College, Springfield, Missouri. He earned A.B. and M.A. degrees in Sociology from San Francisco State College. He has also done graduate work at the University of Missouri.

**Collier, Ivan T.,** 501 Restwood, Bryan, Texas, is a high-school chemistry teacher. He holds a B.A. degree in Chemistry from Baylor University and an M.Ed. from the University of Houston.

**Davidson, Steve E.,** is Assistant Professor of Biology at Evangel College, Springfield, Missouri. He holds a B.S. degree in Agriculture from West Texas State College, an M.S. degree in Agronomy from Iowa State College, and a Ph.D. degree in Agronomy from Texas A. and M. College.

**Davis, Percival William, Jr.,** 22 Bogart Avenue, Port Washington, New York, is an Assistant in Zoology at Columbia University. He earned an A.B. degree from DePauw University in Zoology, and his M.A. degree in Zoology from Columbia University.

**Ernst, Walter R.,** 1111 N. Glenstone, Springfield, Missouri, is Assistant Professor at Evangel College. He holds a B.S. degree in Chemistry from Newark College of Engineering and an M.S. degree from the University of Cincinnati in Chemistry.

**Faber, David A.,** 3365 Dallas Road, N.W., Salem, Oregon, is a teacher at Salem Academy where he teaches Mathematics, Spanish, and Bible. He holds a B.S. degree in General Science from Wheaton College and a B.S. in Education from Oregon College of Education.

**Fair, Donald C.,** 13748—118 Avenue, Edmonton, Alberta, Canada, is a Counselor at the University of Alberta. He holds a B.Ed. degree in Physical Science and an M.A. degree in Psychology, both earned at the University of Alberta.

**Geisler, John D.,** 1301 South 12th St., Apt. 214, St. Louis 4, Missouri, is an intern at St. Louis City Hospital. He received his M.D. from Baylor University Medical College and a B.S. from Wheaton College.

**Jacobsen, Werner,** 1726 West Berteau Avenue, Chicago 13, Illinois, is an Instructor in Science and Mathematics at Trinity Seminary and Bible College. He holds a B.S. degree in Agriculture from Rutgers University where he expects to receive his M.S. degree in June, 1960.

**Lauber, Burtis A.,** Box 977, Setauket, New York, is a biology teacher at the high school of the Bay Shore Public Schools. He earned a B.S. degree in General Science from Wheaton College, and an M.A. degree in Biology from Hofstra College.

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**ORIGIN OF MAN** (from page 16)

tradictions in God or in His revelations of Himself. We must be careful alike of our affirmations and of our negations and know that when harmony seems lacking it is because our eyes are blinded. "Is harmonization possible?" you ask. Anything else is impossible. "How?" By faith, for it is here that the Christian must both begin and end. This is always the ultimate resolution of our "How?"