JOURNAL OF THE
AMERICAN
SCIENTIFIC
AFFILIATION

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

VOLUME 21 NUMBER 3 SEPTEMBER 1969

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JOURNAL OF THE AMERICAN SCIENTIFIC AFFILIATION

SEPTEMBER 1969 PRINTED IN THE UNITED STATES OF AMERICA VOLUME 21, NUMBER 3

The International Scientific Affiliation?

In the third issue of the Journal published in June 1949, then called the ASA Bulletin, there is a letter to the editor that discusses the name of the Affiliation. The author of that letter writes,

> "'The American' is not necessary. We could well receive as members of our organization qualified persons from Canada or Cuba or Mexico or South America or even Europe."

In the last issue of the Journal published just 20 years after the issue mentioned above, there is a letter to the editor that discusses the name of the Affiliation. The author of this letter writes,

> "I believe that the ideas, discussions and philosophy of the ASA could more readily be promulgated in other parts of this world if our organization and its publication were not 'burdened' with the word 'American' in the name. . . . Why not broaden our horizons and set out to establish a world-wide 'ASA'?"

why not?

What's the Next Move?

TOM SKINNER*

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Harlem

Harlem runs two-and-a-half miles from north to south, one mile from east to west. In that small area is a population of one million people. The social statisticians tell us that if you concentrated the 200 million Americans now living in the United States into New York City, it still would not be as congested as Harlem is right now.

It was in this community that I was born and raised. I come from a fairly religious home--religious to the extent that my old man is a preacher, which makes me a preacher's kid. In my early teens I rejected any concept of Christianity, basically because I could not reconcile it with the Harlem community.

At that time Harlem was more than forty percent slums. Thousands of people lived in rat-infested, run-down, dilapidated homes. It was not uncommon for some mother to send a piercing scream through the community in the middle of the night as she discovered that her two-week-old baby had been gnawed to death by a large rat.

Forty-three percent of the kids in Harlem, born since 1945, were born out of wedlock, and 57 percent of them grew up without their fathers. Thousands live on welfare. More than 40,000 drug addicts live in Harlem, each one supporting an average habit of more than $40.00 per day.

Where is the Church?

In the midst of this, the big question I asked was, "Where is the church?" At that time, I put people on two basic extremes. One was what I called the "pseudo-existentialist," better known as the hippie or beatnik, who looks at society and decides that the world is hypocritical, confused, and mixed up. He prefers to run away and create his own little world and become his own god.

The opposite extreme was also a coward. He was what I called a "hyper-Christian." He called himself "a Bible-believing, fundamental orthodox conservative, evangelical Christian." He had Bible verses for every social problem that existed.

But he would never get involved. If you told him that a place like Harlem existed, he would give you some typical Christian cliché, but he himself would never go to Harlem to administer what he considered the "dose of salvation."

Black Nationalists

I came under the influence of some people in Harlem known as the Black Nationalists The Nationalists are a very militant, aggressive group who preach black supremacy. They would say to me, "Tom, your problem is that you have been brainwashed. You have been educated and trained and brought up under Christianity, which is just a white man's religion, given to the Negro to keep him in his place."

They pointed out to me that the leading exponents of hate, segregation, and bigotry in American society were basically Christians. During the 175 or more years in which the Negro was a slave in this country, it was the white Christian church that preached that slavery was a divine institution ordained by God.

They also pointed out that any attempt to pass open-housing laws that would give the Negro the right to buy a home that he could afford and attend the school of his choice was generally opposed by white Christians.

The Harlem Lords

Coming home from school one afternoon, I was approached by a fellow whom I recognized as a member of one of the up-and-coming gangs in the Harlem community. Very sarcastically, he asked me how I would like to belong to the gang called the "Harlem Lords." I told him I would like to.

That night I met the Harlem Lords. They gave me three choices of initiation. I had to pass one to be accepted into the gang. I chose to be stripped from my waist up, hung by my wrists from a long spike and slashed across my back twenty times with leather straps. I took the lashing without crying out and without asking the fellows to stop.

After six weeks of rumbling around with the fellows, I sized up the leader and decided, "Why should I just be a member of this gang when with my brains and intelligence I could be leader."

I challenged the leader to a knife fight and defeated him. Within two weeks, I was challenged by two other fellows. I defeated them, and for two years I was the undisputed leader of the Lords.

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While I was gang leader, I was also president of the student body, secretary of the Arista Society (students with ninety percent averages and above), president of the Shakespearean Society, and president of the young poeple's department in my church.

The reason that I got hoodwinked into the gang was simply that all of us are conformists, and many of us have a particular in-group by which we want to be accepted.

Also, the Nationalists said to me, "Tom, it is a fine thing that you are a brilliant student, and that you show the brilliant qualifications of leadership, but this is a white man's world. He controls things from the top to the bottom. He might allow you to be a jazz player, a rock 'n' roll singer, or the janitor in his building, but he will never let you compete with him on an open basis to make a tangible contribution to society."

Feeling sorry for myself, I became stagnant, and this stagnation channeled itself into social disorder. Before long I could bust a bottle across a fellow's head, jig the glass in his face, and twist it without even batting an eye.

I led the fellows in more than fifteen large-scale gang fights, and we never lost. It was a small gang—just 130 of us.

An Unscheduled Program

I was preparing strategy one night for what was to be the largest gang fight ever to take place in New York City. Five gangs were uniting together to fight a bunch of gangs from the other side of the city. If I succeeded in leading the fellows to victory in this fight, I would emerge as the leader of this alliance of Harlem gangs—the most powerful teenage gang leader in the city.

I was quite excited about it because I had planned a long time for it. I had my radio on, listening to my favorite disc-jockey, when an unscheduled gospel program came on. A preacher spoke on II Corinthians 5:17, which says, "Therefore if any man be in Christ, he is a new creature. Old things are passed away; behold, all things are become new."

Now, I had heard that Scripture before, but that night I began to realize the revolutionary content of the verse. The word "revolution" is very important in Harlem. I was being trained to help initiate the revolution that was to liberate all black people.

The job of a revolutionary is to take an existing order that has proved to be archaic and impractical and tear it down and build a new system. This Bible verse was saying that Jesus Christ came to tear down human nature, which had proved to be greedy, lustful, bigoted, prejudiced, and immoral, and recreate it with a new nature—his own.

Jesus Christ would live in me. The preacher pointed out that every person born into the human race is born without the life of God. And it is the absence of God's life that causes a man to live contrary to God.

He quoted John 1:12: "As many as received him, to them gave he power to become sons of God, even to them that believe on his name."

Obviously, if I had to receive Jesus Christ in order to become a son of God, I could not have been a son of God before I received him. The preacher said that Jesus Christ died on the cross to crucify in his own body the sinful, rotten nature with which all of us are born. And he said that three days later Jesus Christ arose from the dead to prove that he had the power over death, but also so that he could live his resurrected life in me.

Being a typical pseudo-intellectual, I had the standard arguments. Everything the preacher said was from the Bible. In my opinion, the Bible was a nice, poetical, religious history book.

The only way you can accept scientific theory as conclusive fact is to experiment. I had never experimented with Jesus Christ. I had never given him the opportunity to prove himself in my life. The only way I could prove whether John 6:37 was a lie or the truth was to come to Jesus Christ and find out whether he would accept me or reject me.

Second, I argued that, as a philosophical realist, I was not going to commit myself to a god that I couldn't see, touch, or feel. And third, I argued, "I don't understand God; and since I cannot logically figure God out in my mind, why do I need to bother with Him?"

One by one these arguments were smashed as I began to realize that there were things in my life that I accepted and believed which I could not touch, see, or feel—such as vitamins. I did not understand the international monetary system and was not an expert economist, but I certainly was not going to stop spending money until I understood.

I began to realize that God was not asking me to understand everything, but rather to believe the evidence that I had. I was a great advocate of the scientific method. Whenever someone made a mystical statement to me, I challenged him to prove it scientifically.

The only way you can accept scientific theory as conclusive fact is to experiment. I had never experimented with Jesus Christ. I had never given him the opportunity to prove himself in my life.

The preacher quoted John 6:37, which says, "And him who comes to me, I will not cast out." Now, either Jesus Christ was lying, or he was telling the truth! The only way I could prove whether that was a lie or the truth was to come to Jesus Christ and find out whether he would accept me or reject me.

I bowed my head and prayed, "Lord, I do not understand all of this, and I do not know how you are going to change me, but if these things are true and you can really make me a new person, I now give you the right to take over my life."

At that every moment, Jesus Christ came into my life. I saw no blinding flashes of light. I heard no thunder roar. I simply accepted the fact that if God was God, then God could only be God because he does not lie. Jesus Christ took up residence in my

life and has been living in me ever since.

The following night, I faced my entire gang—129 guys with knives and pistols and no reservations about using them. I told them I had committed my life to Christ, and, based on that commitment, could no longer lead the gang.

All the time I was talking, something inside of me was saying, "Cat, you is a fool! You ain't getting out of here alive!" Sitting in front of me was the No. 2 man in the gang. His nickname was the "Mop," because he was never happy in a fight unless he drew blood from someone and then put his foot in it.

I knew that he wanted to be No. 1 man, and I also knew he would say my committing my life to Christ was a sign of weakness. As you read this article, are you afraid to commit your life to Jesus Christ because you are afraid of the social repercussions? I walked out. Not one of those guys moved.

Two nights later, the "Mop" cornered me and said, "Tom, the other night when you walked out, I was going to put my blade in your back, but I couldn't move. It was like something or somebody glued me to my seat." He said the other fellows told him the same thing.

Then I knew that the Christ to whom I had committed myself was more than just some fictitious character who lived 1,900 years ago, or some nebulous spirit floating around in space somewhere—he was alive and real.

I asked the "Mop" if he would like to know that somebody who kept him glued to his seat, and he said, "Yes." Standing right there on the street corner, the No. 2 man bowed his head and invited Jesus Christ into his life.

The two of us went back to the gang, and we led five other guys to a personal relationship with Jesus Christ.

A New Person

At this very moment, I am a new person. Jesus Christ has completely revolutionized my life. I am not the product of a poverty program, or social legislation, or sociological theories. I am the product of a person called Jesus Christ. Society is made up of people. Therefore, if you want to change society, you have to change people. And the only Person who changes another person is Jesus Christ.

I used to be deeply concerned about the fact that people would not accept me because of the color of my skin. And I used to constantly preach and scream at people to stop looking at the color of my skin and accept me as a person. But I do not have to do that anymore.

Now I am a son of God, a member of the family of God—which puts me in the best family stock in the world. That makes me better off than the Queen of England's kids or the kids of the President of the United States, or any other socially elite person, because I can address the God of heaven and earth as my Father. That gives me status.

So now if a person gives me a "hate" stare, or tells me that he does not want to live next door to me, or does not want to be my friend because of the color of my skin, I simply tell him, "Well, fellow, listen, if you do not want to rub shoulders with royalty like me, that is your problem, not mine."

The Bible tells me that I am seated with Jesus Christ in heavenly places, which puts me on the highest social level in all the world. Therefore, I do not have to picket, demonstrate, pray-in, sit-in, wait-in, or do anything else "in" to get social acceptability. Why should I break my neck to come down from a superior position, to try to break into a society that is inferior to the one to which I already belong?

My Message to Society

My message to society right now is simply this: It does not make any difference if you do not accept me, because I have been accepted by the God of heaven and earth. It does not make any difference if you do not love me—maybe you cannot love me because of your built-in prejudices, your opposition to my Christian philosophy, or the color of my skin. I am already loved and accepted. All I ask is that you give me the privilege to love you. Whether or not you love me back is unimportant.

Some people will say, "But, Tom, that is the Uncle Tom philosophy that black people have been believing for generations, and white people have been taking advantage of them."

That is not true. What has existed for generations in the Negro community, as well as in the white community, is "religion." We have had the philosophy and principles of religion. But we have not had Christ, who is the center of true religion. And until people have Jesus Christ living in them, we will not revolutionize our world.

We can put thousands of people on welfare, but it is not going to stop them from drinking or taking drugs. We can remove them from the slums and put them in beautiful buildings, as we have done with white, middle-class America, but that will not put their homes back together—one out of every three white, middle-class American families break up even though they have education, money, and social position.

No, again, the answer is that we must reconstruct human nature. And only Jesus Christ can do that.

A Geologist's Response to Revived Diluvialism

Fundamentalism and the Fundamentals of Geology

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Introduction

With increasing astonishment, I read through the book *The Genesis Flood—The Biblical Record and Its Scientific Implications*, by Henry M. Morris and John C. Whitcomb, Jr.[1] If I had been told a few years ago that an apparently serious attempt would be made to reintroduce the diluvialistic theory on Biblical grounds as the only acceptable working hypothesis for the major part of the geological sciences I would not have believed it. I would have considered it just incredible that a professor of Old Testament and a professor of Civil Engineering would write it, and that the foreword would be written by a professional geologist.

The serious fact is that it has been written and published in a volume of more than 500 pages of excellent paper and illustrated with 28 photographs. To stress the pretended scientific value of the work, favorable comments of a theologian and various representatives of natural sciences—a geologist, a geophysicist, an archaeologist, a biologist, a geneticist, a chemist, and an engineer—are printed on the cover.

It is almost incredible that such an effort, which must have cost an enormous amount of work and money, has been made for such a bad procedure as this. I have felt very reluctant to write against it, but finally agreed to do so, yielding to stress from different sides.

There are two main reasons for this article. The first is that the authors of *The Genesis Flood* have written on the basis of their belief in the Holy Scriptures as the reliable Word of God. This belief I share. Second, it is my sincere conviction that it is a fundamental and extremely dangerous mistake to think that our belief in the reliable Word of God could ever be based on or strengthened by so-called scientific reasoning. Any attempt to harmonize the historical geology of today with the account of the first chapters of Genesis represents a colossal overestimation of science—as well as a misunderstanding of the Genesis record—an overestimation which is as great as that of those scientists who completely reject God as the Creator. If we thus overestimate science, we lose the battle before it is started. The Bible does not give outlines of historical geology nor accounts of scientifically controllable creative acts of God! If we think the Bible does provide these, we have brought God's creative work down to scientific control, down to the visible things, contrary to the teaching of the Bible that "through *faith* we understand that the worlds were framed by the word of God" (Hebrews 11:3a). We deal a death-blow to the Christian religion when we bring the Holy Scriptures down to scientific level by teaching that the Bible should give us a kind of scientific world-picture or axiomata of historical geology, or of Western science of history, or physics, biology, jurisprudence or whatever science it be. Thus, we lose the Bible as a reliable Word of God completely, because we then make its teachings dependent on the poor state of our scientific knowledge today . . . which will change tomorrow!

The overestimation of science fails to see its possibilities and its limits. It means the corruption of true scientific working, both in the evolutionistic thinking of those who do not believe in God, and also in the thinking of Christians who do believe in God. These latter corrupt scientific work thoroughly when they start from a pretended biblical (in fact, imposed by them on the biblical teaching) elementary historical geology, into which then the geological data will have to fit! This is no less pseudo-scientific than that kind of evolutionistic reasoning that ignores God, and therefore presents truly a very bad case for orthodox Christianity today!

Scientific Pretension and Scientific Foundation

Before I start a more technical treatment of a few important geological questions, I want to make a few

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critical remarks of a general character concerning the pretended scientific value of *The Genesis Flood.*

First, writing a book with such significant claims or conclusions requires a thorough knowledge of the geological sciences and their principles. Neither author —one a theologian, the other a civil engineer—is a geologist. Everybody knows that in the present state of scientific development it is practically impossible for one person to master more than one branch of science. Now, the list of modern publications cited in the book is impressive but at the same time misleading. The way in which part of this literature is used proves that the real problems have often not been understood. A theologian should know how dangerous it is to lift a text out of the context and to treat it separately. This is true not only for interpreting the Bible but also for explaining scientific publications. To lift a certain sentence out of a publication, and to use it for something quite different than the original author meant, is scientifically dishonest. I realize that the authors of *The Genesis Flood* did not *intend* to do this at all, and in a few cases they even admit that the author they cite used his words in a slightly different way, but in others they give evidence of not having understood the exact bearing to which they refer. Thorough scientific work makes extremely high demands on professional knowledge!

If I had been told a few years ago that an apparently serious attempt would be made to reintroduce the diluvialistic theory on Biblical grounds as the only acceptable working hypothesis for the major part of the geological sciences, I would not have believed it.

The Essential Importance of the History of Science and Theology

Second, it is really astonishing that the authors of *The Genesis Flood* do not seriously take into account the history of the "warfare between theology and geology". They sound as if this were the first time that the idea was put forward that the deluge was responsible for the major part of the fossiliferous strata in the earth's crust, whereas this idea was perhaps a respectable hypothesis early in the history of the development of geology but was soon shown to be false by evidence accumulated as the science of geology began to grow. This *history* of geology is an essential part of the study to be made, and has to be taken into account as an event which God has revealed to us in the middle of the twentieth century.

Is it any wonder, if we neglect this history, that we make the same mistakes as our fathers did one, two, three or even more centuries ago? When I saw the pictures of the pretended—but definitely not—human footprints in Cretaceous strata of Texas with the comment: 'Note the tremendous size which immediately reminds one of the Biblical statement that there were "giants in the earth in those days" (Genesis 6:4),[2] I was immediately reminded of the times before Cuvier when bones of elephants found in the earth were also considered to be evidence of the Genesis flood and declared to be remains of the giants of those days. Even the undeveloped science of that time was thought to confirm the reliability of Scriptures, and it is said that these bones were nailed to the doors of churches for the sake of strengthening the faith of simple Christian believers! I recall the days when Scheuchzer found his famous fossil which he named *'Homo diluvii testis'*, the 'man witness of the deluge'.

But Cuvier, the father of comparative vertebrate anatomy, by scientific methods ascertained elephant bones to be elephant bones and Scheuchzer's "Homo" to be the skeleton of a Miocene salamander. Where then was the foundation on which those simple Christian believers built their faith? And what are Professors Whitcomb and Morris doing now for those Christians who do not know about geology but believe in the Holy Scriptures as the reliable Word of God? The so-called scientific foundation which they want to lay under the Christian's faith can be easily shown by unbelievers to be no more than loose sand. They could have known it too, if they had simply made a *serious* study of the history of the (largely man-made) problems between the Bible and geology!

Uncritical Criticism of Geological Principles

Third, the last general remark I want to make concerns the uncritical attitude of the authors regarding their own reasoning. The whole book intends to levy a fundamental attack on the so-called uniformitarian principle in the geological sciences. They do not realize that, in part, their reasoning is based on the same starting point. In part, also, they fight against windmills, because most present-day geologists do not accept this principle exactly in the sense as it was understood by Lyell (who was no evolutionist when he wrote the first edition of his Principles[3]), but use it in the sense of a constancy of physical and biological laws, which does not at all exclude, for example, periods with climates differing from that which we know presently, or alternating longer quiet periods with shorter 'catastrophic' or paroxysmal episodes.

Besides, one could even agree that Lyell himself was not dogmatic in presenting his uniformitarian principle. His uniformitarianism is what Professor Dr. R. Hooykaas has called a 'methodological principle'[4], but not one that pretends to have 'eternal validity'. In the 3rd Volume of the first edition of his *Principles*, Lyell wrote on page 6:

> In our attempt to unravel these difficult questions, we shall adopt a different course, restricting ourselves to the known or possible operations of existing causes; *feeling assured that we have not yet exhausted the resources which the study of the present course of nature may provide, and therefore that we are not authorized, in the infancy of our science,* to recur to extraordinary agents.

Now, in order to do justice to Lyell, it is necessary to know what he meant when he wrote these lines, and what he meant by extraordinary agents. The answer is not difficult, because on p. 3-6 of the same volume he offers examples. First of all, Lyell refers there to the controversy "respecting the origin of fossil shells and bones—were they organic or inorganic substances?" To this point he remarks:

> That the latter opinion should for a long time have prevailed, and that these bodies should have

> been supposed to be fashioned into their present form by a plastic virtue, or some other mysterious agency, may appear absurd; but it was perhaps, as reasonable a conjecture as could be expected from those who did not appeal, in the first instance, to the analogy of the living creation, as affording the only source of authentic information. It was only by an accurate examination of living Testacea, and by a comparison of the osteology of the existing vertebrated animals with the remains found entombed in ancient strata, that this favourite dogma was exploded, and all were, at length, persuaded that these substances were exclusively of organic origin.

As a second example, the controversy concerning an aqueous or igneous origin of basalt and other crystalline rocks in mentioned. This was an essential point in the early controversy between Neptunists and Plutonists. Lyell says:

> All are now agreed that it would have been impossible for human ingenuity to invent a theory [the Neptunist theory] more distant from the truth; yet we must cease to wonder, on that account, that it gained so many proselytes, when we remember that its claims to probability arose partly from its confirming the assumed want of all analogy between geological causes and those now in action.

And then Lyell put the important question concerning the methodological principle in these words:

> By what train of investigation were all theorists brought round at length to an opposite opinion, and induced to assent to the igneous origin of these formations?

And the answer is:

> By an examination of the structure of active volcanoes, the mineral composition of their lavas and ejections, and by comparing the undoubted products of fire with the ancient rocks in question.

He concludes with a third example, the question of whether the great alteration of the level of sea and land, proved by the occurrence of marine fossils in strata forming some of the loftiest mountains in the world, has resulted from the drying up of an ocean covering the whole earth or from the elevation of the solid land. "A multitude of ingenious speculations" failed to explain the former hypothesis. But when "in the last instance" the

> question was agitated, whether any changes in the level of sea and land had occurred during the historical period . . ., it was soon discovered that considerable tracts of land had been permanently elevated and depressed, while the level of the ocean remained unaltered. It is therefore necessary to reverse the doctrine which had acquired so much popularity, and the unexpected solution of a problem at first regarded as so enigmatical, gave perhaps the strongest stimulus to investigate the ordinary operations of nature. For it must have appeared almost as improbable to the earlier geologists, that the laws of earthquakes should one day throw light on the origin of mountains, as it must to the first astronomers, that the fall of an apple should assist in explaining the motions of the moon.

After having given these examples, Lyell says that the geologists of his time are, for the most part, agreed on questions "as to what rocks are of igneous and what of aqueous origin—in what manner fossil shells, whether of the sea or of lakes, have been imbedded in strata" etc. and are "unanimous as to other propositions which are not of a complicated nature; but when we ascend to those of a higher order, we find as little disposition

First, the over-all impression one gets from reading this article is that (finally!) here is a widely experienced professional geologist, who—even though an evangelical Christian—accepts the findings of modern geology, and who carefully explains why the pseudo-scientific flood-geologists are wrong (in terms which most informed laymen will understand). I believe that it is very important to put the views of such men as van de Fliert before the Christian public, so that they are not so likely to be misled by the erroneous view of people (like the flood geologists) ignorant of modern earth science.

Second, van de Fliert makes a number of points in the course of his article which I believe are important to get across to non-geologist Christians. He indicates the stunned disbelief that so many of us have had when we have seen how the flood-geologists, instead of being properly laughed out of court, were widely accepted in the intelligent Christian community. (This, incidentally, is leading many geologists, both Christian and non-Christian, to think that our general-science-type courses have been total failures if the average college-educated person can't recognize as big a blunder as this one when he encounters it.) He also indicates the absolute philosophical inescapability of some sort of uniformitarianism or actualism when thinking about past events (whether of a few years or a few eons ago). Simultaneously, he clearly shows that uniformitarianism is a general guiding principle, rather than a philosophical/theological "law" which is rigidly applied to every situation encountered. Finally, he stresses quite nicely the fact that the use of fossils to indicate geologic time is a matter of repeatable, verifiable observation; such use is not a circular-reasoning device based on a preconceived bias for evolutionary explanations of life history.

In conclusion, van de Fliert's article represents a significant contribution to one of the current controversies in the area of religion-science interactions.

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as formerly to make a strenuous effort, in the first instance [repeated here!], to search out an explanation in the ordinary economy of Nature".

Sound Theorizing in Geology and the "Spirit of Speculation"

In chapter I of Volume III of his *Principles*, entitled "Methods of Theorizing in Geology", Lyell simply distinguishes two opposite ways of thinking. One starts from scratch with geological reasoning without first making a careful study of the "ordinary economy of nature". This method has led to untenable speculations and even absurdities; the history of geology provides several examples. This lesson of history should finally be accepted, not merely on incidental points (such as the nature of fossils, the igneous origin of various crystalline rocks, etc.), but as a principle. The second method in contrast starts with a careful study of the present economy of nature, and then sees if the results of the geological processes of the past are really different from those of those going on at present. This methodological principle has to be applied to every aspect of geology and his reproach to Cuvier and his school, for example, is that they apply it only partially but not consistently. Such critics are described in the following:

> We hear of sudden and violent revolutions of the globe, of the instantaneous elevation of mountain chains, of paroxysms of volcanic energy, declining according to some, and according to others increasing in violence, from the earliest to the latest ages. We are also told of general catastrophes and a succession of deluges, of the alternation of periods of repose and disorder, of the refrigeration of the globe and of sudden annihilation of whole races of animals and plants, and other hypotheses *in which we see the ancient spirit of speculation* revived and a desire manifested to cut, rather than patiently to untie, the Gordian Knot.

I repeat that Lyell's uniformitarianism was not dogmatic; he did not exclude the possibility that paroxysms or processes differing from those presently operating might have taken place in geological history. Note the important restriction in his words, "in the infancy of our science".

This restriction we also find in the concluding remarks of the Chapter:

> But since in our attempt to solve geological problems we shall be called upon to refer to the operation of aqueous and igneous causes, the geographical distribution of animals and plants, the real existence of species, their successive extinction, and so forth, we were under the necessity of collecting together a variety of facts, and of entering into long trains of reasoning which could only be accomplished in preliminary treatises. These topics we regard as constituting the alphabet and grammar of geology; *not that we expect from such studies to obtain a key to the interpretation of all geological phenomena*, but because they form the ground work from which we must rise to the contemplation of more general questions relating to the complicated results to which, in an indefinite lapse of ages, the existing causes of change may give rise.

Lyell had indeed been looking for the methodological basis on which a sound geological science could be built, rather than a geology full of the uncontrollable speculations which had been current for a long time prior to his writing.

Basic Uniformitarianism and the Authors of *"The Genesis Flood"*

Lyell's starting point, like that of Cuvier and many others, is the constancy of law, of structural order in created things. This, of course, is the only basis on which we can hope to speak reliably on the geological past. On this point, the authors of *The Genesis Flood* stand on exactly the same methodological basis as does Lyell. A few examples will illustrate.

There is no doubt that they consider fossils to be remnants of animals and plants which actually lived on earth under circumstances comparable to those we know presently. It is only on the basis of structural constancy that the authors can suggest that huge, but in form superficially human-like, footprints in Cretaceous strata are considered as evidence for the contemporaneity of man and dinosaurs!

Any attempt to harmonize the historical geology of today with the account of the first chapters of Genesis represents a colossal overestimation of science—as well as a misunderstanding of the Genesis record—an overestimation which is as great as that of those scientists who completely reject God as the Creator.

A second example is the way in which the authors of *The Genesis Flood* argue in favor of what they call "the most significant of these Biblical inferences", which is "a universally warm climate with ample moisture for abundant plant and animal life"[5] before the deluge. For the sake of confirming this inference, the results of present day geology concerning ancient climates are good enough apparently to indicate that there were some periods when there existed a mild and warm climate over the greater part of the world. But these results are based entirely on uniformitarian reasoning. How can we ever infer a warm climate in the geological past, except on the basis of criteria which we derive from studies of the fauna and flora, or physical or chemical processes, which are characteristic of areas of warm climate we know on earth today? The distribution of coral or other reefs, for example, in the marine environment, and the absence of annual rings in the secondary wood of trees, are only two of these criteria.

A third example to show how the authors of *The Genesis Flood* depend in their reasoning on the priori assumption of the constancy of law, structure and even processes, is found in their speculation that the "superficial appearance of evolution" of similar organisms in successively higher strata could be the result of the "hydrodynamic selectivity of moving water". After a reference from Krumbein and Sloss[6] about criteria on which the settling velocity of large particles is dependent, they write:

> These criteria are derived from consideration of hydrodynamic forces acting on immersed bodies and are well established.

> Particles which are in motion will tend to settle out of proportion mainly to their specific gravity (density) and sphericity. It is significant that the organisms found in the lowest strata, such as the trilobites, brachiopodes, etc. are very "streamlined" and quite dense. The shells of these and most other marine organisms are largely composed of calcium-carbonate, calcium phosphate and similar minerals, which are quite heavy; heavier, for example, than quartz, the most common constituent of ordinary sands and gravels. These factors alone would exert a highly selective sorting action, not only tending to deposit the simpler (i.e., more nearly spherical and undifferentiated) organisms nearer the bottom of the sediments but also tending to segregate particles of similar sizes and shapes, forming distinct faunal stratigraphic "horizons", with the complexity of structure of the deposited organisms, even of similar kinds, increasing with increasing elevation in the sediments.

And further:

> Of course, these very pronounced "sorting" powers of hydraulic action are really only valid statistically, rather than universally. Local peculiarities of turbulence, habitat, sediment composition, etc., would be expected to cause local variations in organic assemblages, with even occasional heterogeneous agglomerations of sediments and organisms of wide variety of shapes and sizes. But, on the average, the sorting action is quite efficient and would definitely have separated the shells and other fossils in just such fashion as they are found, with certain fossils predominant in certain horizons, the complexity of such "index fossils" increasing with increasing elevation in the column, in at least a general way.[7]

These are only three out of a hundred or more examples which could be given of this use of uniformitarian (the present is the key to the past) reasoning to argue for a catastrophist conclusion!

The geological nonsense in the above reasoning is so flagrant that I don't want to discuss it. Speculative hypotheses are dangerous enough already when brought into connection with the Bible, but this is even worse than speculation. What the authors of *The Genesis Flood* should learn from Lyell's example is the fear of speculation and the necessity of a serious search for the foundation on which a reliable geological science could be based!

A little-noticed fact is that the antagonism between uniformitarianists and catastrophists (like, for example, Lyell and Cuvier) is not nearly so fundamental as it would seem. Both geologists agree that the laws of chemistry, physics, and biology—as we know them—are applicable also for historical-geological times.

This is an unavoidable a priori for a science that presumes to speak at all about the history of the earth. How paradoxical it may sound; only on the basis of the constancy of law and structure can we reliably speak about changes in the development of the earth's crust and its fossil content. In other words, the processes of which the geologist studies the results must be (perhaps not in intensity and scale) essentially of the same created order as that which we actually live in and form part of. If this were not so, the whole of historical geology would be in principle beyond the scope of human scientific possibilities.

On this fundamental point, the authors of *The Genesis Flood* agree with modern geologists, at least as far as the process of forming the fossil-bearing strata in the earth's crust is concerned. The tragedy is that they have not realized that in this way they have fused the dynamite under their pseudo-scientific building, exploding their so-called 'Scriptural framework for historical geology'.

On the basis of this principle, the fundamental question is to be answered by careful observation and analysis of the world's sedimentary strata and structural relationships. Are these the result of a catastrophic process, such as the authors of *The Genesis Flood* conceive? Or are they the result of processes whose intensity and scale are generally comparable to those going on today, as modern historical geologists have concluded?

There is no doubt about the answer in the present state of our knowledge; the broad lines of present-day historical geology are to be considered as well observed facts.

Although I object to one minor point, I find the overall treatment excellent. If anything, however, the case could be made much stronger than van de Fliert makes it (that is, circular reasoning is *not* involved in the geological context; it is merely inferred, by those who are not knowledgeable). Hence van de Fliert's position is quite moderate, rather than extreme.

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The Trustworthiness of the Geological Time-Scale Disputed

Let us now turn to a few fundamental facts and principles of present-day geology. First of all, consider those that concern the stratigraphic column and the geologic (relative) time scale.

As an introduction, note a few quotations from the summary of the chapter, "Modern Geology and the Deluge" in *The Genesis Flood.*

We read on page 206:

> The geological time series is built up by a hypothetical superposition of beds upon each other from all over the world.

That this superposition should be "hypothetical" (which here clearly means "not factual") is argued with a quotation from a geological text book:[8]

> If a pile were to be made by using the greatest thickness of sedimentary beds of each geological age, it would be at least 100 miles high . . . It is, of course, impossible to have even a considerable fraction of this at one place. The Grand Canyon of Colorado, for example, is only one mile deep . . .
>
> By application of the principle of superposition, lithologic identification, recognition and unconformities, and reference to fossil successions, both the thick and the thin masses are correlated with other beds at other sides. Thus there is established, in detail, the stratigraphic succession for all the geologic ages.

Then the authors of *The Genesis Flood* continue:

> This frank statement makes the method by which the geologic time scale was built up quite plain. Since

> we have already noted that lithologic identification is unimportant in establishing the age of a rock, it is clear the "fossil successions" constitute the only real basis for the arrangement. And this means, in effect, that organic evolution has been implicitly assumed in assigning chronological pigeonholes to particular rock systems and their fossils.

There follows a second quotation from Von Engeln and Caster, which apparently should confirm this conclusion:

> The geologist utilizes knowledge of organic evolution as preserved in the fossil record, to identify and correlate the lithic records of ancient time.[9]

This is commented on as follows:

> And yet this succession of fossil organisms as preserved in the rocks is considered as the one convincing proof that evolution has occurred! And thus have we come round the circle again.

The trend of this reasoning is clear: Historical geology is basically unsound because it has been trapped in circular reasoning. First, geologists determine the order of succession of fossils in the earth's crust on the basis of the superposition of the strata, but at the same time they declare the position of the strata reversed—by some tectonic process—when at another place the succession of fossils is found reversed! What is more, and even worse: Behind this is the 'hypothesis' of evolution, of "a gradual progression of life from the simple to the complex, from lower to higher" (pp. 132, 134).

Moreover:

> . . . quotations from outstanding evolutionary authorities both in geology and biology, demonstrate the great importance of the paleontological record to the theory of evolution. In turn, the principles of evolution and uniformity are seen to be of paramount importance in the correlation of the geologic strata. These principles are absolutely basic, both from the point of view of the history of the development of modern geology and from that of present interpretation of geologic field data. The circular reasoning here should be evident and indeed is evident to many historical geologists (p. 134).

How corrupted and preconceived present-day historical geology really should be is then formulated in the following words:

> The basis for the apparent great strength of the present system of historical geology is here clearly seen. Provision is made ahead of time for any contrary evidence that might be discovered in the field. The geologic time scale has been built up primarily on the tacit assumption of organic evolution, which theory in turn derives its chief support from the geologic sequence thus presented as actual historical evidence of the process. Fragments of the sequences thus built up often appear legitimately superposed in a given exposure, but there are never more than a very few formations exposed at any one locality, occupying only a small portion of the geologic column. Formations from different localities are integrated into a continuous sequence almost entirely by means of the principle of organic evolution (p. 136).

I give these rather long quotations in order to show in what light such a sentence as "The geological time series is built up by a hypothetical superposition of beds upon each other from all over the world" should be read, and furthermore to give an example of the mixing up of truth and untruth in the way of arguing of the authors of *The Genesis Flood* when it concerns one of the fundamentals of geological science.

The Natural Exposure of Normally Superimposed Rock Sequences

The actual situation is that the geological time-scale is based on a factual superposition of rocks yielding a factual superposition of paleontological criteria which has been proved to be the same all over the world. In order to make this clear, we will have to deal first with natural exposures—with the way nature exposes the sedimentary rocks, which contain those documents of the history of the earth's crust which the stratigrapher investigates.

When Von Engeln and Caster state that "if a pile were to be made by using the greatest thickness of sedimentary beds of each geological age, it would be at least 100 miles high" and that it is "of course impossible to have even a considerable fraction of this at one place", it should be noted that they are speaking of "the *greatest* thickness of *each* geological age".

Two qualifying remarks should be made about this point. First, the *average* thickness of sediments of a certain age is far less than the value of the greatest thickness. Second, if at one place a geological age is represented by its greatest thickness, it is very unlikely that sediments of another age would attain their maximum thickness at the same locality.

However, it is extremely unlikely—virtually impossible—to have a considerable fraction of a pile of sediments reduced in this way, and representing all geological ages, at one place.

Lyell's starting point, like that of Cuvier and many others, is the constancy of law, of structural order in created things. This, of course, is the only basis on which we can hope to speak reliably on the geological past. On this point, the authors of The Genesis Flood *stand on exactly the same methodological basis as does Lyell.*

For example, consider the world famous example of the Grand Canyon of the Colorado River, where Paleozoic rocks, still in horizontal position, unconformably overlie tilted Algonkian or intensely folded and metamorphosed Archean Rocks at one locality. As a result of what geologists call epeirogenic movements, this area has been uplifted vertically without changing the original horizontal position of the Paleozoic rocks. Following the uplift, the Colorado River has cut deeply into the rocks to expose, in the steep walls of the canyon, the beautiful vertical succession of more than 1000 meters of Paleozoic strata. In this exposure of a normal uncomplicated succession, the superposition is simple and clear. The Archean basement rocks lie at the bottom of the canyon. Progressively higher up on the walls within the canyon we found the Algonkian sedimentary rocks, then the older Paleozoic rocks, and finally—around the canyon rims—the younger Paleozoic rocks.

Very often, however, things are more complicated. Frequently, the original subhorizontal position of the

sediments at the time they were deposited has not been preserved; as a result of differential movements in the earth's crust, the sedimentary sequences have been tilted, broken, or folded, so that the layers usually show a dip (varying from a few degrees up to a vertical position). Topographically, these differential movements may give rise to subaerial elevations (mountains) and depressions (lowlands). The mountainous areas are subjected to erosion, which results in the development of new topographic surfaces cutting the bedding planes of the layered sedimentary rocks at an angle. Eventually, erosion may lead to so called "peneplains" or subhorizontal erosion surfaces of vast extent. These peneplains thus may expose thick sequences of sedimentary rocks, in thickness far exceeding those of the Grand Canyon and of which superposition is as undoubtedly established.

In the Grand Canyon, we find a sequence (some 1000 meters thick) of horizontal Paleozoic rocks exposed—in the steep canyon walls—in only the very short lateral distance traversed as we ride from the bottom of the canyon to the high rim overlooking the canyon.

In a large region of subhorizontal topography (a peneplain) underlain by nonhorizontal—dipping, folded, or basinal—sedimentary layers, on the other hand, nature may have exposed sequences of rocks amounting to many thousands of meters in thickness. In such a situation, we can no longer speak of a *local* superposition. We can, for example, walk for hundreds of kilometers across a series of low-dipping sediments in the "Paris Basin", from Triassic rocks in Luxemburg to Middle Tertiary rocks in Paris. Local differences in topographic elevation (a few up to perhaps 100 meters) are insignificant compared to the distance of a few hundred kilometers and the thickness (about 2000 meters) of the sediments which are exposed at or near the surface. In the case of the Paris Basin, which covers a great part of France, we have a huge bowl-shaped structure, consisting of strata dipping gently towards the centre, which implies of course that the younger strata are exposed in the central, the older in the peripheral, parts of the basin. There can be no doubt about the superposition of the strata in the Paris Basin. The formations are only very gently deformed, and a tectonic reversal is entirely excluded.

A comparable but much larger structure, with low-dipping Mesozoic and Tertiary strata, is found in the Gulf Coast Area of Mexico, Texas, Louisiana, and Florida in North America. This is a huge structure of low-dipping strata, in which the superposition is unquestionably normal and also very well known (as a result of thousands of bore holes which have been drilled in the search for oil in these areas). Again, here we cannot reasonably speak of just one locality or one place. But surface and subsurface data permit an unquestionable correlation, layer by layer, and thus the establishment of the sequence of normally superimposed strata attaining a thickness of many thousands of meters.

No evolutionary theory whatsoever could or would ever suggest a reversed position of the strata in the Paris Basin in Europe or in the Gulf Coast Basin in North America! The paleontologist would thereby saw through the branch on which he sits.

The stratigraphic column has been built up essentially on the basis of sedimentary sequences in many relatively stable areas where tectonic disturbances and metamorphism played a minor role and where therefore a reversed position of the strata could a priori be eliminated. On the basis of solid knowledge from these simple areas, the tools have been obtained which permit us to understand more complicated regions. This is an example of the procedure followed by every geologist when he enters a new or unknown area; he first looks for the simpler structures which permit the establishment of the stratigraphic sequence, which in turn is a basic tool for unraveling complicated tectonic structures.

In summary, I want to emphasize that the way nature exposes huge sequences of strata is usually not by cutting deep canyons or valleys into highly upheaved horizontal strata at one place, but instead by differential crustal movements followed by peneplaining erosion (which uncovers older strata in mountainous areas and also furnishes sedimentary materials which are then deposited—often containing fossils—to form younger strata). As a result of such tilting and other crustal movements, great areas of dipping, but unquestionably normally superimposed, strata are now found at or near the surface, and are therefore accessible to the geologist. The huge sequences of sedimentary strata which can be studied in such relatively undisturbed positions over great areas all over the world form the solid factual basis for the establishment of the time stratigraphic column.

It is time for scientists who are Christian to speak up and be counted in regard to "flood geology" and interpretations of the Scriptures. Van de Fliert is absolutely right when he says that "We deal a deathblow to the Christian religion when we bring the Holy Scriptures down to scientific level by teaching that the Bible should give us a kind of scientific world-picture or axiomata of historical geology, or of Western science of history or of physics, biology, jurisprudence or whatever science it be." I do not think this means that we cannot rely on the Scriptures to be scientifically correct, but we cannot make the teaching of the Bible dependent upon scientific knowledge.

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The Primary Superposition in Highly Disturbed Areas

However, much more is to be said. When discussing what they called "Methods of resolving contradictions", the authors of *The Genesis Flood* write:

> Furthermore, even where superposed strata are exposed, it rather often happens that the fossils appear to be in reverse order from that demanded by the evolutionary history, which paradox is commonly explained by the assumption that the strata have been folded or faulted out of their original sequence (p. 135).

It is an old story which is told here. It was already elaborated in Professor Aalders' book[10]. And it seems that this favorite argument of professors of Old Testament is supported even by some geologists; the authors of *The Genesis Flood* give the citation of C. H. Rastall, lecturer of Economic Geology at Cambridge University, saying:

> It cannot be denied that from a strictly philosophical standpoint geologists are here arguing in a circle. The succession of organisms has been determined by a study of their remains embedded in the rocks, and the relative ages of the rocks are determined by the remains of organisms that they contain (p. 135).[11]

Now, Mr. Rastall may be a good economic geologist; he is definitely not a good philosopher because his statement is simply not true!

What are the facts? A reversed position of strata is the result of strong disturbing movements after deposition. Complicated tectonic deformation occurs when the sediments are deposited in an area which is or becomes highly mobile, in contrast with relatively stable regions.

Since the reversed position of the layers, and, of course, the inverted succession of fossils, is not of primary or stratigraphic origin, but of secondary or tectonic origin, we should find (and we do) completely independent tectonic evidence (in addition to the fossil evidence) for a reversed position of a sequence of strata. Surely, we prefer simple structural relations when establishing a stratigraphic column in an area, but we do not finally depend on them.

In many instances, we can follow a certain sequence of strata from a less to a more intensely disturbed area, and observe, for example, how in this direction the dips increase to a vertical position, and somewhat further on have turned more than 90° from the original horizontal position so that they are then "overturned" and the sequence of layers has become in fact inverted or reversed. A gradual transition from a normal to an inverted position is in fact a phenomenon which is often encountered in folded areas. It has nothing to do with theory; it is just a matter of observation.

When in a mobile area we find with the help of fossils that a sequence of strata lies in reverse position, this conclusion if reliable implies that the strata are folded and that there must be a hinge zone along which the layers have been turned up. Such hinges, along which layers are sometimes turned over 180 degrees so that they are now in a perfect upside-down position, are perfectly visible, for example, in some deep valleys in the Swiss and Austrian Alps. Now, if our index fossils are reliable, the paleontological evidence, the succession of the fossils, must be in accordance with the tectonic-structural evidence for whatever, normal or reversed, position the strata are in. But if this is the case, and this is in fact what we find, then both evidences do mutually confirm each other. The reversed sequence in which the fossils are found locally therefore does not invalidate, but, on the contrary, fortifies their value as time markers, because we know from independent tectonic evidence that the layers there are in overturned position.

The same situation holds when, as a result of tectonic causes following differential movements in the earth's crust, rock masses are pushed up and over on top of neighboring areas; in this way also, older rocks will lie on top of younger strata. If such an abnormal succession is of tectonic origin, we should find the fault plane, the overthrust plane, exactly at the place where the older strata appear above the younger formations. Such a situation will usually be characterized by tectonic criteria related to the overriding phenomenon. At such an overthrust plane, we often find a tectonic breccia, consisting of broken and crushed rock fragments of usually heterogeneous material. In other instances, depending on overburden and fluid pressure at the overthrust plane, friction may have resulted in such high temperature that the anomalous contact indicated by our fossils is characterized by a 'burned' or a dynamometamorphically altered zone. And here again, this is exactly how we find it. Tectonic and paleontologic evidence point in the same direction. Instead of contradicting, they confirm each other, and here again we may speak of convergent evidence.

Top and Bottom Engraved in Individual Layers

To find an answer to the question of whether we are dealing with strata in normal or reversed position, a third criterion can usually be found. It is of stratigraphic-sedimentologic character, and involves sedimentary structures found in individual layers.

Let me give a few simple examples to demonstrate the principle. On a sandy bottom, running or waving water may cause characteristic ripples in the sand which we call ripplemarks. They are often found in a fossil state. Wave ripplemarks, for example, form sharp ridges and rounded troughs. When we find in a sequence of layered strata that these sharp ridges point downwards, we therefore know that this sequence lies in an overturned position. In case the external form is not clear, the internal lamination may provide decisive evidence.

Another example, seen by almost everybody at some time, is that when a puddle or a muddy ditch desiccates, a pattern of cracks appears in the drying mud, the so-called "mud-cracks". Such mud-cracks also have often been fossilized as a result of the filling of the wedge-shaped openings between the polygons with other material, e.g., sand. In this manner, again, the layer was marked for top and bottom during the process of sedimentation. The points of the wedges indicate the direction in which the older layers are to be found.

A great number of comparable stratigraphic-sedimentologic criteria, so-called top-and-bottom features, are known. Usually very small structures, they often give an unmistakable answer to the question whether the position of a layered sequence is normal or not, completely independent of tectonic or paleontologic evidence. In practice, the field geologist working in complicated areas is constantly concerned about the question "normal or reversed position?" He therefore is very keen on finding such top-and-bottom features, the more so when fossil evidence is not immediately, not sufficiently, or not at all available.

It will be clear that when we add the stratigraphic-sedimentologic evidence of the sedimentary structures to the already convergent evidence of tectonics and paleontology, there remains no trace, not even a glimpse, of circular reasoning whatsoever. Quite the opposite is true; the reliability of the fossils for relative age determination of geological formations is not denied by local occurrences in reversed order, but on

the contrary confirmed. For with the help of two other criteria, independent from each other and independent of those fossils, we can irrefutably demonstrate that the layers there indeed occur in overturned position.

The Question of Correlation

With the possibility of establishing the normal succession of strata in the earth's crust, we have in principle a factual basis for the establishment of the order of succession of the fossils they contain. In order to make clear now that the order of succession is the same all over the world, and that fossils therefore may be used as time-characteristic index-fossils I have to go into a little more detail about the local and regional successions of geological formations, the gaps they necessarily contain, and the question of regional and intercontinental correlation.

The actual situation is that the geological time-scale is based on a factual superposition of rocks yielding a factual superposition of paleontological criteria which has been proved to be the same all over the world.

When we look at a geological map of France, we can see that the relatively undisturbed sediments of the Paris Basin overlie more intensely folded sediments of Paleozoic age outcropping in various areas around the actual basin boundary. When we look now at the succession of rocks from Paris, then moving outward from the centre of the Paris Basin, to Charleroi in Belgium, we observe that the lowermost sediments of the Paris Basin, unconformably overlying the folded Paleozoic strata of the Ardennes Massiv, are Upper Cretaceous. Around the basin's edges, at the surface of this angular unconformity there is in this sequence a huge gap, because practically the whole Mesozoic and part of the Paleozoic are missing. But when we follow this contact, the outcrop of this important unconformity, in an East-South-Easterly direction we gradually encounter successively older formations appearing in the Paris Basin above the unconformity surface; these formations have been called: Lower Cretaceous, Jurassic, and then Triassic.

When we look at the geological map of the United States, we see that (in Tennessee, Alabama, and Georgia) the folded Paleozoic sediments of the Appalachians plunge down underneath essentially undisturbed sediments of the Atlantic and Gulf Coastal Province, the oldest of which are here Cretaceous, at least at the surface.

There is a striking similarity in the position of the Coastal Plain sediments as regards the folded Paleozoic rocks of the Appalachians on one side of the Atlantic and those of the Paris Basin with respect to the folded Paleozoic Rocks of the Ardennes on the other, particularly when we look at the Paris-Charleroi section.

That identity is not only structural; it is much more complex. There is a succession of Upper Mesozoic and Cenozoic strata which, notwithstanding all kinds of differences due to locally differing sedimentation conditions, can be compared and correlated with that in the Paris Basin, on the basis of the fossil faunal contents of the sediments. That is to say, when we compare the sequences of strata on both sides of the Atlantic Ocean, where the superposition is unquestionably known, there appear to be differences in the faunal content of successive layers; these differences allow for a descriptive stratigraphic subdivision, and they occur in the same order of succession. And when we look now at the underlying folded rocks and establish therein the stratigraphic superposition, we find, first of all, that the faunal content of these layers is totally different from the overlying strata, but very similar to that of the folded Paleozoic formations of the Ardennes. Furthermore that comparison of the sequence in the United States and in Europe *also* reveals faunal characteristics for a subdivision *in the same order* in America and Europe. All this has nothing to do with evolutionary theories. We simply find a factual superposition of faunal elements (in the strata) which occurs in the same order on both sides of the Atlantic. On the basis of such experience in comparing or correlating stratigraphic columns all over the world, we can then finally say that fossils may be used for indicating the place of the formation in the sequence. This experience of correlating the superposed strata all over the world is essential; every index fossil is constantly being checked on its guide value by new stratigraphic field work, by the many boreholes of the oil companies, etc., all over the world and every day.

The basis of our subdivision of geological time is found in the fact of a worldwide complex identity of the succession of sedimentary strata. The 'older' or 'younger' can without any doubt be established in both the locally and the regionally exposed strata. The 'as old as', the 'time correlation', on a regional to continental scale has its base in the identity in the complex succession of stratigraphic series in different places, a complex succession which practically eliminates any other interpretation than that of 'same age' (on a certain scale and with a certain degree of accuracy, of course).

We take the example of the Paris Basin/Ardennes and Gulf Coastal Plain Province/Appalachians again. It is clear that the unconformable superposition of unfolded Cretaceous and Tertiary sediments on folded Older and Younger Paleozoic sediments (which, both in relative detail, show comparable faunistic similarity on both sides of the Atlantic) reveals a complex identity structurally and stratigraphically to the effect that a geologist can give no other interpretation than: an older period (Paleozoic time) in which sedimentation took place in the areas; then folding, mountain building and erosion at or towards the end of this time; finally, renewed sedimentation in at least part of these areas in Mesozoic and Cenozoic times.

We could go a little bit further now and ask about so-called Jurassic and Triassic sediments which appear under the Cretaceous of the Paris Basin. What about their equivalents in the Southeastern States of the United States? Do they really exist, and are they in a position comparable to those in Europe? The map shows that the oldest deposits of the Gulf Coastal province outcropping at the contact with the Appala-

chians are of Cretaceous age, which implies a gap here for Jurassic and Triassic. Is this implication correct? Yes, because for example away from this surficial contact, from Yucatan to Florida, the oil-well bore has struck older deposits underneath the Cretaceous, showing paleontological characteristics of Upper Jurassic age. Normally underlying sediments, possibly Lower Jurassic, Triassic or Permian, could not be identified as such because of lack of fossils. But when we go, for example, to the Southwestern part of the United States we find a normal superposition of dated Permian, Triassic, Jurassic and Cretaceous sediments covering very large areas in Utah, Colorado, Arizona and New Mexico. The same order of paleontologic criteria in the succession of strata—in Europe, in America, in Asia, Africa and Australia, all over the world—this is a fact which simply cannot be denied except by those who do not know or do not want to know. But the factual situation is there for everyone who wants to to go and see.

Parenthetically, I want to point out that therefore evolution (in the descriptive sense that flora and fauna on earth have been subject to change almost continuously in the course of geologic time) is also to be considered as a well observed fact, which is of course something quite different from a theory of evolution and from an evolutionistic philosophy.

Reworking: Mixing of Fossils of Different Age

But, the authors of *The Genesis Flood* might react by saying that we are still dishonest with our representation of the fossil succession as an observed fact, because in several instances mixed faunas are found, which would therefore represent a mixture of older and younger fossils. Then, they might say, we come along with a complicated interpretation of reworking or comparable phenomena, but that interpretation is only an interpretation, and the *fact* is that these fossils do occur together in the same bed. And we would have to answer that that is true, but truth and simplicity do not always go together.

When fossil-bearing sediments become subject to erosion, one must expect not only redeposition of the inorganic components but also those of organic origin. This general consideration already implies that a mixing of fossils of differing ages as a result of reworking processes must occur. But, reworking or redeposition in general results in characteristic features by which it can be determined as such.

In the Netherlands, we find silicified Cretaceous sea urchins as elements in Pliocene fluviatile gravels. Marine animal remains in fluviatile beds is of course already anomalous, but furthermore the silicified tests are rounded by their having been transported, and we know the place where they have been washed out of the sediments in which they were originally embedded.

A second example is that, in muds of the Wadden Sea, Cretaceous Foraminifera are found together with the recent foraminiferal assemblage. These Cretaceous elements, however, are found in the smallest fraction (smaller than 0.15 mm) of the washed residues. They are washed out of Cretaceous deposits of the Paris Basin exposed in the Channel, sorted by longshore current action, and only the finest material reaches the Dutch Wadden Seas. Here, although differing preservation already demonstrates the correct conclusion, the uniform size indicates sorting and proves the allochthonous character of these elements in the faunal assemblage.

We found a very interesting example of mixed faunas when working as stratigraphers for an oil company of the Royal Dutch Shell group in North Borneo. The washed residue of a shale sample appeared to contain a normal assemblage of beautifully preserved Paleocene (Lowermost Tertiary) Foraminifera, but also a few very poorly preserved *Miogypsinas*, larger Foraminifera of Miocene (Lowest part of Upper Tertiary) age. At first sight, the perfect preservation, absence of sorting, and normal assemblage of these Paleocene Foraminifera, mixed with some 30-40 million years younger *Miogypsinas* which were in part pyritized and very badly preserved, was astonishing. From the field geologist, we knew that big 'exotic' blocks of probably Paleocene age occurred scattered in the shale. We then looked at the part of the sample which had not been washed, and the solution of the problem was found. The sample consisted of a dark grey shaly matrix, in which a great number of angular fragments of a light coloured marl were disseminated. It was clear that the angular fragments were redeposited fragments of an older formation and that they appeared indeed to contain the Paleocene fauna. The autochtonous sediment—the dark shaly matrix—was apparently formed under more or less anaerobic conditions, as a result of which sulfuric acid was formed, which in turn attacked and in part pyritized the calcaeous shells of *Miogypsina* during or shortly after deposition. The Paleocene Foraminifera in the original sediment of the angular elements were perfectly protected against such chemical activity in the Miocene basin.

Stories like this may sound complicated, but in fact they are not. Again here, the way in which the resedimentation process was written down in the structural relationships of the younger sediment did not deny, but on the contrary again confirmed or corroborated the reliability of the fossils—in this case pelagic and larger Foraminifera—as index fossils.

Structural Uniformity and Actual Experience

Within the scope of this article it is impossible to deal with everything which the authors of *The Genesis Flood* have presented. There is one important and fundamental thing, however, concerning which I want to spend a few sentences—the practical meaning of the so-called uniformitarian and actualistic principles in geology.

As a first remark, I don't like -isms. A term ending in -ism usually means an overestimation of the aspect, modus, state of affairs or whatever is meant by the term. The question which has to be answered, however, is this: have those people who are considered to be the fathers of uniformitarianism or actualism seen something fundamentally essential for our geological scientific knowledge, even if they may not have correctly defined, not fully understood, or over- or underestimated what they had seen?

As a historical geologist, who always has to do with *documents* of a geologic past in the earth's crust, I cannot pretend to speak even one reliable word about geological history except on the basis of what I called above "structural constancy". "Structural" is meant in a very large, generalized sense. The only way to distinguish differing processes in the documents is by means of the differing structures they may reveal.

Sedimentary processes produce typical, characteristic structures, and tectonic processes produce other differing, but also characteristic structures in the rocks of the earth's crust. There are, of course, also many kinds or types of sedimentation processes, the results of which can be differentiated on the basis of the differing structural characteristics produced—such as lithologic and paleontologic criteria, texture and structure (in a restricted sense).

The general rule will be that the more detailed the interpretation, the more detailed also our structural analysis will have to be. The general starting point for an interpretation of the sedimentation processes in geologic history on a really, and the only possible, scientific basis will therefore be the assumption that a catastrophic sedimentation process would have to show characteristic structural relationships, and that, on the other hand, the normal, actual sedimentation processes necessarily result in different characteristic structural features. In other words, when our analysis of fossil sediments reveals in great detail the same structural relationship as that which is actually formed under present day condition, the only conclusion which can honestly be drawn is, "It is the same process!" Ascribing comparably structured sediments to catastropic processes would be something like declaring that fossil fish which we have found on the basis of fossil remains to look in detail like actual fish, were not really fish living in water but birds flying in the air!

The reliability of the Word of God spoken in this world through His prophets and apostles is beyond the reach of scientific control, because the Bible is not a scientific book. As such, it is not vulnerable to the results of science. Therefore, Christian astronomers, geologists, and biologists can work without fear as long as they respect the limits of their own scientific field.

The example may sound silly, but it clearly shows the basic role of structural *uniformity* even for the determination of fossil remains, and demonstrates also the link with actual life' *experience*. What could we say about the function of the organs of fossil fishes, or about the environment they lived in, if we did not know the living fish in its environment today?

Now, in view of the need for more detailed reliable interpretation of depositional environments of fossil sediments, one branch of geological sciences, called sedimentology, has grown very rapidly during the last decades. A major part of the work done by the sedimentologist was and still is a detailed analysis of actual sedimentation processes and their results in modern depositional environments. Of course, when we want to know what the characteristic features are of sediments found in a middle neritic marine environment (the zone of approximately 40-100 meters depth [20-50 fathoms] on the shelf), we shall first of all have to obtain samples of the modern sediments in this area, examine them in detail and study all kinds of physical, chemical, and biological conditions in the zone. In addition, we shall also have to study the bordering (inner neritic, and outer neritic) environments to be able to specify their characteristics also in a differential diagnosis.

Modern analyses of these sediments 'in formation' are done in very great detail, in both the physicochemical and biologic criteria, with the result that a very detailed classification of sediments as related to their depositional environment appears to be possible. But it also appears that this "key of the present" indeed fits into the sediments of the past, because most of them show, often in astonishing details, the same structural relationships. The identity is there. The uniformity is written down in the fossil sediments themselves. There is no way out unless one wants to declare, to pick up the above examples, that the fish is a bird. The identity may exist on a small scale (e.g., the number of Foraminifera per gram of sediment, and the percentages of different species or genera with respect to the total foraminiferal assemblage) but also on a large scale. To conclude I would like to give one example of the latter.

The authors of *The Genesis Flood* try to deny the evidence for deposits which required a very long time to form, such as coral reefs. Some of them at least are explained as being redeposited during the Flood (pp. 408,409).

Now there are different types of reefs and different organisms which can build reefs, in addition to corals. Reefs have played a very important role in the geological history of the earth's crust, and sedimentologic research is particularly active in investigating the depositional environments of reef limestones and those immediately related to the reefs.

Let's look at a barrier reef. It lies at a certain distance from a shore, and separates a lagoonal environment (between barrier-reef and shoreline) from the open marine environment. At the sea-side of the reef body, we distinguish a fore-reef area, on the landside a back-reef zone. The reef-body itself consists of a core of unlayered, massive limestone, built up by the sedentary reefbuilding organisms still in original life position; it is bordered by coarse, and farther away finer reef detritus, which, particularly the latter, are often very well bedded. Now, we do find barrier- and other reefbodies at many different levels in the stratigraphic column. But we do not find, say, the core of a barrier-reef body, as a strange element in other deposits. On the contrary, in Silurian reefs in Gotland, in Devonian and Lower Carboniferous reefs in Belgium, the Jurassic reefs in the Jura Mountains, and Cretaceous reefs in the Apennines, etc., etc., we can recognize and locate, in addition to the reef bodies themselves, the associated depositional environments with their characteristic sediments and faunas: the lagoon, the fore- and the backreef zones, and the open marine environment.

On a small scale and on a large scale, there is no question whatsoever of some catastrophic mixing-up; on the contrary, everything is found exactly in the place where it should be, compared with actual sedimentation conditions in reef and associated environments. We find structural constancy in detail, even when we consider variation as a result of different

reefbuilding organisms (such as calcaceous algae, stromatoporoids, bryozoans, corals, rudistids, or combinations).

These are the facts of stratigraphic and sedimentologic research, which are at the basis of the major results of the geological sciences. This basis makes it possible indeed to say that the broad lines of present-day historical geology, dealing with the formation of the earth's crust in geological times in the order of hundreds of millions of years, are correct, and are to be accepted as a well established fact.

Science and the Bible: Not the Fundamentalistic Way

It may seem as if I have written very little about fundamentalism so far. However, I was fighting against it all the time, but silently and indirectly until now.

The book of Whitcomb and Morris was written on the basis of what we usually call a fundamentalistic or biblicistic viewpoint. This standpoint implies the belief that the Bible teaches us principles, fundamentals or elements of human science in general and of historical-geological science in particular.

For the fundamentalist, therefore, the reliability of the Bible as the Word of God is related to *scientific* reliability. For him this is particularly true with respect to the first eleven chapters of Genesis. This conception, however, implies inevitably that science and God's Revelation in the first chapters of the Bible are placed on the same (scientific) level, on the basis of which scientifically obtained data about the history of the earth and man will have to fit into the 'Biblical scheme or framework'.

The 'question' of the reliability of the Holy Scriptures can thus be fought out on the scientific field, and, as a consequence, we then see theologians enter this field, as Professor Whitcomb now does, as Professor Aalders did in Holland a few decades ago, and as so many before them have done since the end of the Middle Ages.

But these 'scientific' battles for an infallible Word of God have been lost right from the start. In constant retreat, the theologians have had to surrender every position they had once taken in this struggle. That's what the history of the warfare between science and theology should have made conclusively clear. The tragedy of men who wanted to defend the reliability of the Word of God 'scientifically' should have taught us that this entire approach was wrong. It should have convinced us that this science is a very bad ally, because its word had only temporal and no eternal value.

The most tragic aspect of the fundamentalist conception seems to me that his standpoint requires *scientific* proof, so that he must somehow live in fear of the results of developing scientific work, because indeed this development could then also *disprove* the reliability of the Holy Scriptures. And this leads to the cardinal question whether in this way the fundamentalist's conception does not reveal an implicit faith in science, which is far more dangerous for Christian religion than is the scientific development itself.

A few years ago, I was speaking to a conference of Reformed ministers in the Netherlands about some fundamental facts of geology. In the discussion, one of them arose and declared that, if he were convinced that what I had told them was true, he would immediately abandon his ministry. But I ask myself what kind of a religion is Christianity when scientific geological facts can prove or disprove the reliability of God's Revelation to man? What then do we really believe in? In *our* own 'image', conceptions or ideas about an infallible Bible? In an interpretation of the first chapters of Genesis with the help of current natural scientific knowledge just as earlier theologians did with the help of a world picture, incidentally, usually already out of date in their own time?! Does the message of the Bible then really necessarily change with the changing world picture? It surely does as long as we continue trying to accommodate Genesis and geology.

Instead of giving human scientific work its proper place in the light of Scripture, fundamentalism indeed implies, as I indicated already in the beginning of this article, a colossal overestimation of natural science. Neither geology nor any other natural science can ever be a direct exegetical tool, as they have been used, and still are used in fundamentalistic conceptions.

However, the history of the natural sciences and the results of modern geology, for example, could play a far more modest role, the role of an indirect exegetical tool. Such would be not a tool to test, to prove or to disprove the reliability of Scriptures, but to test the reliability of our ideas and conceptions about the Bible, the inspiration, and the historicity of the first chapters of Genesis.

The reliability of the Word of God spoken in this world through His prophets and apostles is beyond the reach of scientific control, because the Bible is not a scientific book. As such, it is not vulnerable to the results of science. Therefore, Christian astronomers, geologists, and biologists can work without fear as long as they respect the limits of their own scientific field.

Our ideas and conceptions concerning the Bible may indeed appear to be vulnerable to the results of scientific development. This state of affairs seems to be difficult to accept, particularly for many evangelical Christians. It cannot be denied, however, that there is 'revelation' (be it of a different kind than that of the Bible) in the development of this created world, also in the results of human scientific and technical advances during the last centuries. It cannot be denied and should not be denied that, as a result of this development, our (scientific) world picture (Weltbild) has obtained huge dimensions, both in time and space and has become entirely different from that of the authors of the Bible. But, this is the world God has wanted us to live in, we and our children.

The fundamentalistic view, conservative in an erroneous sense, requires us to accept a so-called "biblical world picture" which should be normative for scientific work. This is a poor predicament indeed for contemporary Christianity, because it tends to transform twentieth century Christians into aliens, standing, as it were, in Old Testament times. Since this is, of course, not possible, the fundamentalistic view tends to deprive them of their belief in a reliable Bible. It alienates us from the Words of Eternal Life, which we understand through *faith* and not through *science*, and which stand firm in this rapidly changing world.

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Social Problems and Social Issues

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In a dynamic society such as ours, one can no longer clearly expect to share opinions on social questions with other persons. Often the Christian feels threatened when he finds his views to be in discrepancy with those of his fellows. In order to appreciate the implications inherent in such differing viewpoints, one must first understand the differences between social problems and social issues.

A well accepted definition of social problems refers to them as "conditions which affect sizable proportions of the population, which are out of harmony with the values of a significant segment of the population, and which people feel can be improved or eliminated".[1] The important point here is that social problems reflect social values. To agree with the mass of society, then, on the definition of a social problem produces an apparent agreement with its values. If one sees our society to be secularized as a result of the separation of the religious and secular spheres, it is to be expected that the Christian will, on occasion, find himself to be in a minority position.

What is more important, however, is that when the Christian agrees with the majority he also asks himself why he is in agreement. For instance, smoking and gluttony are viewed as social problems by many in our society, thanks to the support provided by modern medicine. The Christian has held this view for some time. It is important, however, that he keep the reasons for this position clearly in mind, otherwise the majority position might be held merely because it is supported by the majority.

The fundamental question, then, is to ask why the Christian is in agreement with the majority view on social questions. It may be because Christian traditions have been strongly aligned with the majority view in this country. It may also be that the individual seeks to avoid the minority position which appears to represent the forces of evil. Only in those cases where the minority position has been traditionally supported by a Christian apologetic may there be willingness to argue against the mass.

The critical point being developed here is that the secularization process in contemporary society cautions us not to assume that the majority position on a social problem is the appropriate one for the Christian. In fact, it might be preferable for him to join the deviant minority. This has been done by the Christian in isolated circumstances. Generally, however, the dichotomous circumstances which have existed in our society provided the Christian with a readily discernible perspective.

The critical point being developed here is that the secularization process in contemporary society cautions us not to assume that the majority position on a social problem is the appropriate one for the Christian.

The world in which we are living, however, can no longer be simply dichotomized. Social problems are increasingly being replaced by social issues in which there are no clear distinctions between majorities and minorities. Capital punishment, birth control, violence, and race relations are all representative of these issues. On such questions, it is imperative that the Christian clarify his position. As is true with social problems, basic social values are being questioned in social issues. The need for the Christian to find himself engaged in the arena of social issues is based on the need to sharpen and strengthen those values which are being stretched by those issues.

It may very well be, however, that the Christian takes no position on social issues, not only because

he is uncertain of what his position should be, but also because he fears that he will find himself in support of a deviant group as a result. The issue of "police brutality" is an appropriate one to refer to at this point. The individual may be reluctant to support criticism of the police because he feels that such an action would be in support of revolutionaries. What he overlooks, of course, is that he supports the majority group and the values which it espouses, whether those values are consistent with a Christian perspective or not.

One can say with a degree of confidence that the Christian scientist is particularly vulnerable on this point, since science has been the major factor in moving social problems into the sphere of social issues. Population problems, birth control, leisure, and war have all been made more complex as issues because of the influence of science. Thus, it is no longer possible for the scientist to say that he is "value free" in his science. He supports some group in society which desires his services.

It is critical to note, then, that in supporting values we also give positive recognition to groups by implication. In our attempts to remain "unspotted from the world", we have usually shunned those groups which appeared to take the non-Christian position on issues, as ambiguous as it might have been. By default, the Christian found himself comfortably ensconced in what is referred to as the Establishment or the power structure. For quite a long period of time, this bastion of the majority could be defended. This is no longer true. The weakening of a dichotomized society in which social problems were clearly understood brought with it a weakening of the power base which represented the majority.

The Christian is no longer sheltered by traditional social enclosures. Increasingly, the power structure has been taken over by secular forces, often in the name of Christianity. These forces maintain "an official position" of morality. In the attempt to maintain power, this morality has been propped up by traditional religious imagery. By implication, to question the power structure is to question the morality and the reality behind the imagery.

In this sense, then, the Christian can appreciate the needs of minorities which represent "unofficial positions". Their voices do not speak with the authority of tradition. Such a position is taken by the black community when it charges police with brutality and a corresponding attitude of permissiveness toward crime. Some legal authorities, representative of the official position, however, would have us believe that such claims are unwarranted. On the other hand, the criticism directed against the white Christian by the black man for the early support of the slave trade by the religious establishment is justified. Such accusations are, however, no longer clearly appropriate, since the secularization of the power structure has resulted in a separation from much Christian influence. Nevertheless, the Christian remains guilty by association.

This is not to say, of course, that the white Christian is guiltless today. Since he has often avoided asking the uncomfortable question, his discriminatory attitudes, reflective of values which can no longer be supported by doctrine or reason, still prevail. What is critical, however, is that he need not feel that he has to hold those attitudes. No longer is he in a clear majority. No longer does the majority represent an apparent virtue. Indeed, the Christian may find the unofficial position to be worthy of his support.

From this all too brief presentation, it should become apparent that the Christian needs to review his position on social issues. No longer can he take the majority side with assurance because he will often find himself in a secularized camp which simply desires to maintain its own power. Nor can he avoid contact with the minority position because it represents "the world". Society is too complex to allow for such a ready solution. Finally, it is necessary that he reevaluate the traditional reasons for holding views on questions which have separated him from the world. Lacking such a reevaluation, the Christian may find himself sleeping with very strange bedfellows indeed.

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I have had the privilege of meeting Max Planck and Albert Einstein, Niels Bohr, Max von Laue, Max Born, James Franck, Edwin Schrödinger, Wolfang Pauli, Werner Heisenberg, and other heroic figures in modern physics. They were human, too; they had competitive ambitions and personal weaknesses. Some of them had love affairs, some were passionate mountain climbers or enthusiastic sailors, many were good musicians. But what motivated all of them, what they struggled with, was the dark chaos of nature and the urge to find order in this chaos – not the hope of getting a Nobel prize or of beating a competitor at his own game. In the face of the great mysteries of nature, they felt modest – the greater, the more modest and reticent.

Eugene Rabinowitch
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The Tragedy of the Commons*

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The tragedy of the commons develops in this way. Picture a pasture open to all. It is to be expected that each herdsman will try to keep as many cattle as possible on the commons. Such an arrangement may work reasonably satisfactorily for centuries because tribal wars, poaching, and disease keep the numbers of both man and beast well below the carrying capacity of the land. Finally, however, comes the day of reckoning, that is, the day when the long-desired goal of social stability becomes a reality. At this point, the inherent logic of the commons remorselessly generates tragedy.

As a rational being, each herdsman seeks to maximize his gain. Explicitly or implicitly, more or less consciously, he asks, "What is the utility *to me* of adding one more animal to my herd?" This utility has one negative and one positive component.

1) The positive component is a function of the increment of one animal. Since the herdsman receives all the proceeds from the sale of the additional animal, the positive utility is nearly +1.

2) The negative component is a function of the additional overgrazing created by one more animal. Since, however, the effects of overgrazing are shared by all the herdsmen, the negative utility for any particular decision-making herdsman is only a fraction of −1.

Adding together the component partial utilities, the rational herdsman concludes that the only sensible course for him to pursue is to add another animal to his herd. And another; and another. . . .But this is the conclusion reached by each and every rational herdsman sharing the commons. Therein is the tragedy. Each man is locked into a system that compels him to increase his herd without limit—in a world that is limited. Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. Freedom in a commons brings ruin to all . . . .

In an approximate way, the logic of the commons has been understood for a long time, perhaps since the discovery of agriculture or the invention of private property in real estate. But it is understood mostly only in special cases which are not sufficiently generalized. Even at this late date, cattlemen leasing national land on the western ranges demonstrate no more than an ambivalent understanding, in constantly pressuring federal authorities to increase the head count to the point where overgrazing produces erosion and weed-dominance. Likewise, the oceans of the world continue to suffer from the survival of the philosophy of the commons. Maritime nations still respond automatically to the shibboleth of the "freedom of the seas." Professing to believe in the "inexhaustible resources of the oceans," they bring species after species of fish and whales closer to extinction.

The National Parks present another instance of the working out of the tragedy of the commons. At present, they are open to all, without limit. The parks themselves are limited in extent—there is only one Yosemite Valley—whereas population seems to grow without limit. The values that visitors seek in the parks are steadily eroded. Plainly, we must soon cease to treat the parks as commons or they will be of no value to anyone.

What does "freedom" mean? When men mutually agreed to pass laws against robbing, mankind became more free, not less so. Individuals locked into the logic of the commons are free only to bring on universal ruin; once they see the necessity of mutual coercion, they become free to pursue other goals.

What shall we do? We have several options. We might sell them off as private property. We might keep them as public property, but allocate the right to enter them. The allocation might be on the basis of wealth, by the use of an auction system. It might be on the basis of merit, as defined by some agreed-upon standards. It might be by lottery. Or it might be on a first-come, first-served basis, administered to long queues. These, I think, are all the reasonable possibilities. They are all objectionable. But we must choose—or acquiesce in the destruction of the commons that we call our National Parks.

Pollution

In a reverse way, the tragedy of the commons reappears in problems of pollution. Here it is not a question of taking something out of the commons, but of putting something in—sewage, or chemical, radioactive, and heat wastes into water; noxious and dangerous

*This article is a collection of *partial* selections from the paper with this title published in *Science* 162, 1243 (1968), copyright 1968 by the American Association for the Advancement of Science.

fumes into the air; and distracting and unpleasant advertising signs into the line of sight. The calculations of utility are much the same as before. The rational man finds that his share of the cost of the wastes he discharges into the commons is less than the cost of purifying his wastes before releasing them. Since this is true for everyone, we are locked into a system of "fouling our own nest," so long as we behave only as independent, rational, free-enterprisers. . . .

How To Legislate Temperance

Analysis of the pollution problem as a function of population density uncovers a not generally recognized principle of morality, namely; *the morality of an act is a function of the state of the system at the time it is performed.*[2] Using the commons as a cesspool does not harm the general public under frontier conditions, because there is no public; the same behavior in a metropolis is unbearable. A hundred and fifty years ago a plainsman could kill an American bison, cut out only the tongue for his dinner, and discard the rest of the animal. He was not in any important sense being wasteful. Today, with only a few thousand bison left, we would be appalled at such behavior. . . .

Freedom To Breed Is Intolerable

The tragedy of the commons is involved in population problems in another way. In a world governed solely by the principle of "dog eat dog"—if indeed there ever was such a world—how many children a family had would not be a matter of public concern. Parents who bred too exuberantly would leave fewer descendants, not more, because they would be unable to care adequately for their children. David Lack and others have found that such a negative feedback demonstrably controls the fecundity of birds[3]. But men are not birds, and have not acted like them for millenniums, at least.

If each human family were dependent only on its own resources; *if* the children of improvident parents starved to death; *if*, thus, overbreeding brought its own "punishment" to the germ line—*then* there would be no public interest in controlling the breeding of families. But our society is deeply committed to the welfare state[4], and hence is confronted with another aspect of the tragedy of the commons.

In a welfare state, how shall we deal with the family, the religion, the race, or the class (or indeed any distinguishable and cohesive group) that adopts overbreeding as a policy to secure its own aggrandizement[5]? To couple the concept of freedom to breed with the belief that everyone born has an equal right to the commons is to lock the world into a tragic course of action. . . .

Conscience Is Self-Eliminating

It is a mistake to think that we can control the breeding of mankind in the long run by an appeal to conscience. Charles Galton Darwin made this point when he spoke on the centennial of the publication of his grandfather's great book. The argument is straightforward and Darwinian.

People vary. Confronted with appeals to limit breeding, some people will undoubtedly respond to the plea more than others. Those who have more children will produce a larger fraction of the next generation than those with more susceptible consciences. The difference will be accentuated, generation by generation. . . .

THE COMING CATASTROPHES: CAUSES AND REMEDIES

Many of our colleagues, particularly those in academic teaching and research, are viewing the prospects for the future of mankind with growing alarm. Often they sound like "prophets of doom" that make the predictions of the apocalypse sound all too real and imminent. Barry Commoner[1] warns of the far-reaching and catastrophic effects of thermonuclear war and environmental pollution. The Paddock brothers[2] tell us that we are now entering the "Age of Famine". Paul Ehrlich[3] announces that the battle against overpopulation and famine is already lost and that we must prepare to salvage what is left after catastrophe decimates the human race. Harold Cassidy[4] and Lamont Cole[5] agree with these grim predictions and provide additional evidence that mankind is rapidly moving toward a day of reckoning. Cassidy talks about "Incipient Environmental Collapse" and Cole asks: "Can the World be Saved?" These are but a few of the grim prognostications voiced by many of our more vocal and concerned associates. Many who have neither taken up the pen nor hit the lecture trail would add to the growing clamor of alarm for the *immediate* future of man.

Two men who have presented analyses of the human dilemma are Lynn White[6] and Garrett Hardin[7]. White, an historian, has attempted to determine the historic basis for the problem. Hardin, a biologist, suggests what he considers to be the inevitable outcome of the population crisis in terms of political necessity. The conclusions of both men have serious Christian implications.

The Historic Roots of our Ecologic Crisis

White blames "orthodox Christian arrogance" for most of our environmental problems. He reasons that God gave man dominion over the earth, man used this dominion to exploit and pollute and, therefore, we arrive at the mess in which we now find ourselves. As evangelical Christians we may not like the sound of that reasoning but an honest analysis of human history provides too much support for White's logic. It is futile to attempt, in the name of "orthodox" or "conservative" Christianity, to deny that there is much uncomfortable truth in the charge. The most serious weakness I see in White's position is that it lumps too much into the one pot of "orthodox Christianity". He fails to recognize that probably the greatest exploitation was done by people who had only the vaguest, most perfunctory association with any form of Chris-

Recognition of Necessity

Perhaps the simplest summary of this analysis of man's population problems is this: the commons, if justifiable at all, is justifiable only under conditions of low-population density. As the human population has increased, the commons has had to be abandoned in one aspect after another.

First we abandoned the commons in food gathering, enclosing farm land and restricting pastures and hunting and fishing areas. These restrictions are still not complete throughout the world.

Somewhat later we saw that the commons as a place for waste disposal would also have to be abandoned. Restrictions on the disposal of domestic sewage are widely accepted in the Western world; we are still struggling to close the commons to pollution by automobiles, factories, insecticide sprayers, fertilizing operations, and atomic energy installations.

In a still more embryonic state is our recognition of the evils of the commons in matters of pleasure. There is almost no restriction on the propagation of sound waves in the public medium. The shopping public is assaulted with mindless music, without its consent. Our government is paying out billions of dollars to create supersonic transport which will disturb 50,000 people for every one person who is whisked from coast to coast 3 hours faster. Advertisers muddy the airways of radio and television and pollute the view of travelers. We are a long way from outlawing the commons in matters of pleasure. Is this because our Puritan inheritance makes us view pleasure as something of a sin, and pain (that is, the pollution of advertising) as the sign of virtue?

Every new enclosure of the commons involves the infringement of somebody's personal liberty. Infringements made in the distant past are accepted because no contemporary complains of a loss. It is the newly proposed infringements that we vigorously oppose; cries of "rights" and "freedom" fill the air. But what does "freedom" mean? When men mutually agreed to pass laws against robbing, mankind became more free, not less so. Individuals locked into the logic of the commons are free only to bring on universal ruin; once they see the necessity of mutual coercion, they become free to pursue other goals. I believe it was Hegel who said, "Freedom is the recognition of necessity."

The most important aspect of necessity that we must now recognize, is the necessity of abandoning the commons in breeding. No technical solution can rescue us from the misery of overpopulation. Freedom to breed will bring ruin to all. At the moment, to avoid hard decisions many of us are tempted to propagandize for conscience and responsible parenthood. The temptation must be resisted, because an appeal to independently acting consciences selects for the disappearance of all conscience in the long run, and an increase in anxiety in the short.

The only way we can preserve and nurture other and more precious freedoms is by relinquishing the freedom to breed, and that very soon. "Freedom is the recognition of necessity"—and it is the role of education to reveal to all the necessity of abandoning the freedom to breed. Only so, can we put an end to this aspect of the tragedy of the commons.

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tianity. Furthermore, these exploiters were interested in their own selfish gain, a motive distinctly contrary to the self-denial of true Christian love. Unfortunately, we must admit that even real, fervent Christians have sometimes been guilty as well. In short, we have another example of the old problem of confusing —and we all do it—the ideal toward which we strive and the faltering, pathetically imperfect level of actual performance. There seems to be little question, however, that God's command to rule the earth has been the *sine quo non* of most scientific research and its technological application. Far eastern and other nature religions seem to inhibit, through pantheistic worship of nature or through actual fear of natural phenomena, scientific and technological endeavors. The biblical picture of man, as but "little lower than the angels" and the supervisor of the earth that God created, is much more conducive to inquiry and mastery than religious reverence of all life because of belief in re-incarnation or other intimate mystical association of man and the rest of nature.

However, the misuse of a God-given gift by the recipient does not in itself condemn either the gift or the giver. That some people use television to deaden or corrupt their minds does not mean that television is all evil. To the Christian, the exalted position of man in nature is a basic concept in our understanding of both God and man. This might sound like "arrogance," but if we are so charged, we must admit the charge. On the other hand, the Christian must be the first to recognize, again on the basis of the biblical picture of man, that sinful man—ourselves included—all too often acts as the despoiler of nature and all too seldom as the reverent, responsible conserver and steward.

White recommends St. Francis as a kind of a compromise between orthodox Christianity and the pantheistic nature religions. It might be well to study this suggestion carefully to see just what aspects of St. Francis were compatible with biblical Christianity. I have little doubt but that we would benefit from such a study. It would certainly bring into focus some aspects of twentieth century, western culture that we have all to glibly accepted as "Christian" but which are badly tarnished with selfishness, materialism, and "the love of money".

White oversimplifies the problem by ignoring the variety of reactions, in different groups of Christians, to the divine command to rule the earth. However, my own reflections on White over the past two years lead me to conclude that, unpleasant though his conclusions are, Christians must accept a considerable measure of guilt to the charge of abusing and exploiting our God-given domain. This divinely ordained authority is a much more awesome thing than we have realized. It is basic to the Christian faith, but we must admit that we have seriously neglected it. And, others have made matters worse by accepting the gift with

no thought of the Giver nor of their own responsibility to their fellow man.

The Tragedy of the Commons

Hardin's consideration of the population problem is based on the assumption that the population explosion is one of a class of problems (along with national security in a nuclear world) for which *no technical solution is possible*. Such an assumption is highly unorthodox in a generation in which there has been no question but that, given enough time and money, the human mind could conquer all problems. Actually, the significant difference between the optimists and the pessimists about the future of man is on precisely this point. The optimists focus on the significant progress of research in fertility control and in food production and then talk of the future in glowing terms. The pessimists are convinced that we cannot pull technological rabbits out of the hat fast enough to avert catastrophe. To all of us, trained in the years of research affluence, it comes as a shock to be told that NSF or NIH projects might not be able to solve all problems of technology, health, and survival. As Christians, however, we should have realized long ago that sinful man, alienated from God, is unable to solve the really basic problems of human existence and even survival. It should be no surprise to us that there are problems that defy technological solution and which require a drastic change in human moral and ethical structures in order that man might survive. We should have recognized long ago that even our most dramatic successes—such as, the manipulation of atomic energy or the control of human genetic mechanisms—have moral and spiritual implications of the gravest nature.

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Hardin tells us that, in the face of the population problem, "freedom to breed is intolerable". Furthermore, we need to agree to a "mutual coercion" to limit human births. "The only way we can preserve and nurture other and more precious freedoms is by relinquishing the freedom to breed, and that very soon."

The freedom to breed, to have and to raise children, has been one of mankind's most cherished possessions. Indeed for many people in this world it has often been the only freedom they have had. Now we have reached the point in human history where uninhibited breeding is threatening the very existence of mankind. Even the most zealous supporter of the biblical directive to "be fruitful and multiply and replenish the earth" must realize that the earth has been replenished for some time. The continued, unrestricted participation in the "commons" of human reproduction can only bring disaster. To refuse to restrict, by incentive or by edict, the natural propensity to breed, will inevitably and quickly lead to world-wide famine, to disease epidemics, to unrest, and to war. To force or to encourage people to "let nature take its course" in the name of sentiment or theology will certainly result in millions of horrible, unpleasant deaths from starvation, disease, and violence. It seems clear to me that the advocates of this "freedom" or this "responsibility" will be guilty of mass murder, and that before many years have passed.

Hardin has described his solution in forceful but non-specific terms. Ehrlich[3] has spelled out some of the details. He suggests: paying people for *not* having children and/or penalizing them when they do; sterility capsules for all women, capsules that can be removed under carefully controlled conditions; and the introduction of sterilizing chemicals into food and water with antidotes being allowed as a special privilege. We are certainly faced with some sweeping and unconventional proposals. What are Christians to think and do about all of this?

Our first task is to decide if there really is a problem that requires such drastic solutions. My own study of the problem over the past few years has convinced me that there is little basis for optimism. Even if Hardin is wrong in his assumption that no technological solutions are possible, I see little likelihood that such solutions will actually be forthcoming. The growing unrest throughout the world, the lack of concern by affluent Americans (including Christians), the shift toward irrationalism and anti-intellectualism even in educational institutions, all tend to guarantee that any achievements will be far too little and far too late. Therefore, I have been forced to conclude that the problem is real, and that only the most drastic solutions could possibly work. However, I find that I cannot, at this time, comfortably accept the morality of the proposed solutions. Rather, I am inclined to accept such catastrophe as inevitable. Restrictive laws, if instituted must be obeyed because the morality of disobedience to such laws seems clearly worse than the alternative of not having such laws. I cannot, however, bring myself to enthusiastically promote such laws.

In a more positive and constructive vein, I feel that, as in the New Testament church, we need to become more concerned with serving the individual needy people with whom God brings us into contact. Awareness of approaching catastrophe should constantly haunt us to be more zealous in this task. And, if we view such catastrophe in terms of divine judgment on a rebellious world, we are even more obligated to be more active in "doing good". After all, are we not urged to "encourage one another, all the more since you see the Day of the Lord is coming near"? Such an attitude is far better than the sometimes comfortable "involvement" in the grandiose problems of all mankind or all the poor people. It requires the much more demanding, personal involvement with individuals in our everyday lives. It seems to me that this is the kind of involvement seen in the New Testament church and in the earthly ministry of our Lord Jesus Christ.

In short, it seems to me that the situation is far too serious for us to be satisfied with picking apart the theological flaws of White and Hardin or others with similar views and concern. They are trying to tell us something of cataclysmic proportions, something that is not too different from the biblical apocalypse.

If there ever was a time for the church of Jesus Christ to be about the Father's business, this is it.

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Current Challenges for Christian Professors

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Many of us who hold simultaneous citizenship in the world of science, the university community, and the Christian church may feel that all our foundations are being shaken at once. Strong loyalties bind us to institutions that have been relatively stable in the past, yet we sense that stability based on inflexibility has little survival value. Great wisdom is required now to know when to instigate change, when to accept it, and when to resist it. There are times when we disagree profoundly on these questions, so great love is also required.

Paul wrote to Christians at Colossae: "As you live this new life, we pray that you will be strengthened from God's boundless resources, so that you will find yourselves able to pass through an experience and endure it with courage. You will even be able to thank God in the midst of pain and distress because you are privileged to share the lot of those who are living in the light. For we must never forget that he rescued us from the power of darkness, and reestablished us in the kingdom of his beloved Son, that is, in the kingdom of light." Children of light should not be afraid of the dark, but we should learn to be careful where we step.

The future of *science* seems to have dimmed noticeably. Research budgets have been cut both by government agencies and by industry after years of generous support for training young scientists. Inevitably the competition stiffens for good positions and for grant funds. We now do our jobs amid sharp conflicts over priorities between research and other national needs, between different areas of science, between "big science" and "little science," and between project support and institutional support for academic science.

On the *university* horizon dark clouds appear along with flashes of light. At the same time that desire for higher education has become almost universal, the value of much that now passes for it is gravely doubted by many. The insistent demand is for greater efficiency to teach more knowledge to more students, but our consciences cry out for something else as well. Views of the primary function of a university vary from conservator of traditional ideas to instrument for radical social change. The noise level rises on campus, but who is listening?

Helping conservative Christians understand science . . .
Blending philosophical insights of science and Christian faith . . .
Setting our personal priorities . . .
Public vs. private witness . . .
Social sensitivity in scientific research . . .
Ambition vs. humility . . .
Showing love through life . . .

In the realm of the *church,* too often we live in shadows cast by venerable structures, institutions whose upkeep drains our energies and whose design is seldom functional in the modern world. What shall we do? Some would be continually remodeling, others would bulldoze and rebuild, some simply abandon the institutions to decay.

There is clearly much to challenge us in each of these areas, and we could easily devote our full attention to any one of them. Let us here concentrate, however, on what we can do that overlaps all three at once. We may not be fully successful, but let us

try to live one single life; if we speak three different languages, we can at least try to say the same thing in each one. As a basis for discussion, here are some questions that occur to me:

1. What more can be done to help theologically conservative Christians appreciate the value and limitations of science? On the one hand we find science and other forms of scholarship looked down upon, and on the other we continue to see science and pseudo-science used to justify questionable or erroneous interpretations of Biblical passages. Can we counter gullibility with skepticism without appearing to be the enemies of faith to the hyperorthodox?

2. What kinds of forum are appropriate for blending the philosophical insights of science with those of the Christian faith? In a day when students demand a loosening of the curriculum, wholeness and relevance in their education, are we ready and able to provide these insights? Have we participated in experimental or interdisciplinary courses in the regular curriculum, in "free university" courses, in seminars, or in dialogues with colleagues that express our own wholeness? Have we done our homework well? Have we written letters or articles for campus publications on these subjects? Do we encourage others to express their views openly, and do we try to learn from them?

3. How do we go about setting our own priorities between, say, scholarship and campus evangelism, or teaching and research, or speaking and writing, or time spent with students and time spent with our own children? Should we try to be the best in our field of study? How can we shoulder our full responsibilities in our profession, department, university, Inter-Varsity chapter, church, political party, neighborhood, family, etc.—and still maintain a sense of joy in whatever we do? Is there something we can do as Christians to be creative and redemptive within professional life, something extra that our non-Christian colleagues won't bother to do or wouldn't be able to do? Can we demonstrate that we know Jesus Christ without having to advertise it?

4. Is it important to seek opportunities for public witness, or is it more important to spend our time quietly with individuals? If we agree that research papers should not reveal a personal bias, what about our lectures? What about our comments in staff meetings, administrative committees, oral examinations? Do students and colleagues with personal problems come to us for encouragement and help? Do we treat our technicians as though we also were under a Research Director, our students as though we were under a great Teacher? Do we know how to exercise critical judgment without withdrawing personal support? What do we pray for when *our* research paper is sent to a referee, and also when *we* have a paper before us to referee? Do we have a reputation for fairness?

5. Have we really examined the value of what we are doing in research and compared it to what we might be doing? Are we sufficiently sensitive to human needs, or are we having too much fun in the lab to give much thought to public problems? What value judgments do we actually exercise in choosing the course of our work? Do we think about the constructive or destructive potential of what we are doing? Do we care enough about the effects of technology on people? On how broad a scale do we exercise stewardship of natural resources? Are we helping to solve urgent ecological problems, or are we part of the problem?

6. Are we sufficiently ambitious to do good work, yet without having inflated ideas of our own importance? Do we know how to appreciate good work in the social sciences, the humanities, the arts, even in the non-scholarly pursuits of business, politics, labor, athletics? Do we welcome insights from other fields when we deal with social, economic, or ethical problems arising from our own field? If Christian professors in American universities are predominantly in the pure or applied sciences (see IVCF Faculty Directory), is it time to begin counseling bright evangelical students out of science and into fields with more critical needs? Does this imply that we have circumscribed the area of our witness among scholars too narrowly? Is it time for some of us to redefine our own area of scholarship to broaden our contacts? Have we done all we can to cross racial barriers, sex barriers, international barriers within our profession?

7. Do we ourselves demonstrate a love of all science, of all scholarship, of all life, of all people, and of God to our students? Have we found effective ways of transmitting that love to them, and of nurturing it in those who have come to know God in Jesus Christ? Is our own inner peace strong enough to enable us to live joyfully in the midst of tension? Can we ever accomplish anything as peacemakers without learning how to survive in a combat zone?

Creation is an act of divine freedom, done solely because of the divine purpose of love. This is the most fundamental knowledge that Christians have of God and of the character of His actions, and it is also the most important affirmation they could make about the ultimate origin of their own existence. To know the process by which things came to be would be only interesting; to know that it came from a will which unites its power with a creative love is to be able to answer with confidence all our most crucial questions about the meaning and intelligibility of our existence.

BOOK REVIEWS

BETWEEN SCIENCE AND PHILOSOPHY: An Introduction to the Philosophy of Science by J.J.C. Smart, Random House, New York, 1968

A dearth of viable textbooks plagues undergraduate courses in philosophy of science. Even the main contenders are not without fault. Nagel's *Structure of Science* is a bit heady for undergraduates, Pap's untimely death kept his *Introduction* from perfection, and Wartofsky gives far too much of too many good things for such a course. Smart takes a step in the right direction. His book is a sophisticated piece of analytical philosophy which is surprisingly accessible to a general reader. And even though it treats current and serious scientific issues, it is not abstruse.

Smart strikes a nice balance between the teaching and the doing of philosophy, two activities which are best kept together. For example, after a sympathetic presentation of philosophical views on the nature of physical theory, he turns to the current problem of what noticeable effect our philosophical views can have on current developments in quantum theory. Smart takes his philosophical position without befogging his presentation of the issues and responses to them. He leads the student right into the midst of controversial topics currently appearing in the journals; for example, the vindication of induction, and the nature of explanation. Of course, this is not without its disadvantages; because the very issues which now make a book relevant will in time brand it as *passé*. But, supposedly eternal life is not one of the requirements of a good textbook.

The main topics in the book—explanation, induction, laws, and theories—are smoothly united by Smart's pervasive arguments for realism; that is, by his claim that a scientific theory can actually be true, that it is not just a useful fiction, but that it says something about the world. As is bound to happen, he fails to establish realism once and for all. He cannot make a strong enough case for the existence of the theory-neutral brute facts with which really true theories accord. All he can establish is that science progresses nicely if we treat theories *as if* they were pictures of reality. With that contention, even the most adamant instrumentalist would agree. Still, against our current vogue for instrumentalism, Smart's defense of realism is well-taken, at least as a worthwhile pedagogical gambit.

What is perhaps of greatest interest for students, is that after his philosophical analysis of problems within science, Smart turns the searchlight of scientific philosophy upon such issues as mind and matter, freedom of the will, and the nature of time and space. After all, if

> . . . it is agreed that it is science which has fashioned our world view, surely it must be agreed that science has something to tell us about some of the large questions about man and the rest of the universe with which metaphysicians have traditionally been concerned. (p. 11)

Smart treats the biological sciences as well as the physical ones, though he omits the social sciences. Each chapter of his book contains a good bibliography with brief comments on the entries, a feature that is very useful for students. An optional chapter introduces logical and semantical technicalities.

Smart's book is currently the best-qualified text for a one-semester undergraduate course in the philosophy of science.

Reviewed by Peter Anton Pav, Department of Philosophy, Florida Presbyterian College.

THE ENCOUNTER BETWEEN CHRISTIANITY AND SCIENCE: Edited by Richard H. Bube. William B. Eerdmans Publishing Company, Grand Rapids, Michigan, 1968. 318 pp. $5.95

Encounters between Christianity and six fields of science are evaluated by six scientific authorities with Christian insights. Apparent conflicts are exposed, analyzed, and exploded. Honest exposition of the truth in both Christianity and science is the book's major thrust, and it strongly witnesses that Christians can be effective scientists (and vice versa).

Richard Bube, author of five of the ten chapters, succeeds in his "attempt to sum up" the nature of science and Christianity. His insight into the operations and scope of science makes the first chapter relevant for the scientist as well as the non-scientist. His ability to define the nature of Christianity makes the second chapter vital for the Christian as well as the non-Christian. Pertinent sections on the proper role of science, evidence for God in natural revelation, miracles, and an enlightening view of natural vs. supernatural (body vs. soul) phenomena highlight Chapter 3. A perceptive discussion of the purposes of Biblical revelation sets the tone of Chapter 4. He chooses lively Scriptural examples to point out principles for interpretation of the verbal Word and places major emphasis on the principle of deriving revelational content of the Biblical message according to its revelational purpose. He concludes that discovery of errors in the Bible results from using non-Biblical criteria to judge Biblical inerrancy and that formulation of "Biblical" mechanistic concepts of the physical world, in conflict with current science, follows from asking questions inconsistent with the guiding principles of revelational purpose.

In Astronomy (Chapter 5) Owen Gingerich analyzes

problems Christians have gotten into as a result of attempting to harmonize specific astronomical and biological theories with Genesis 1 and other passages. Geology (Chapter 6) by F. Donald Eckelmann weaves together encounters in geology, paleontology, and anthropology, and meets head-on the questions that evolution poses for Christians. He outlines the boundary conditions set by scientific data and Christian theology that must be honored in attempting to reconcile the natural and Biblical records. These chapters are well-documented and command attention.

Bube describes striking parallels between Christianity and his field, physical science (Chapter 7), since encounters may not appear to exist. Just as quantum physics has made common sense inadequate as a means for interpreting the physical world, he suggests that common sense is also inadequate for interpreting the mysteries of Christianity. Instead, complementarity and paradox provide the most useful means of correlating apparently irreconcilable truths. Some of the problems in understanding the concepts of physics and of Christianity result from inability to "crack the code of terminology" that verbalizes these concepts. Bube describes events leading to the downfall of classical determinism and the development of relativity, quantum mechanics, and indeterminacy, and then reviews Pollard's *Chance and Providence.*

Walter R. Hearn spends the first half of Chapter 8 patiently explaining how patterns of specialization and tensions within the biological sciences have contributed to tensions between biology and theology. He shows that evolution and life are inseparably linked at the population, organismic, and cellular levels. In view of this, Hearn states that biological science can contribute to Christianity by freeing theology from speculation on mechanisms, "so that theology can devote its energies to consideration of what more the world of life may be." He points out the opportunities for Christians to communicate the Good News of Jesus Christ to biologists caught in the tensions of this rapidly changing area.

Stanley E. Lindquist suggests in Chapter 9 that psychology, perhaps more than biology, is splintered into independent subfields, which makes it difficult to discuss the interaction between psychology and Christianity. However, problem areas that psychology poses to the Christian are described: determinism vs. individual responsibility, existentialism, behaviorism, child rearing, the conscious and unconscious, self-denial, guilt feelings, mental breakdown, withdrawal, mind control, personality development, and elements of mental health, Christian faith and beliefs.

David O. Moberg in Chapter 10 examines tensions Christians experience as they study the basic philosophical orientations supporting social-science theories: 1) naturalism—explaining religious experiences on the basis of man's being a social animal; 2) social determinism—negating individual free will (Moberg suggests that this problem is best solved by considering the exercise of free will within the limits of biological, physical, and social circumstances:) 3) cultural relativity—describing the nature of human societies and questioning the validity of the cultural basis of Christianity (this is not inconsistent with Christian faith, but becomes an anti-Christian perspective when accepted as a description of the essential nature of the universe); 4) ethical relativity—questioning the validity of absolute standards of morality (this is not a problem if Christians accept the type of ethical relativism presented in the New Testament, which is alluded to by Moberg as the ideal of moral conduct; he does charge social scientists with overstepping boundaries of their science in promoting relativism); and 5) social Darwinism—equating survival with goodness (he attacks this as contrary to the Gospel of love taught by Jesus Christ, although, ironically, many Christians in American society hold on to perspectives of social Darwinism). Moberg sees the equating of progress with secularization as a fatalistic view that is opposed to Biblical teachings. He also describes various theoretical and ethical problems that may have arisen from the methodological procedures of social science. Moberg then discusses contributions that Christians in social science can make toward improving effectiveness of church work and promoting scientific ethics. The ethics of the scientific method are shown to accord with the ethics of Christianity. He includes an excellent section on reasons for the religious skepticism of scientists, although scientists do have a "faith" and a set of postulates from which they operate, and some even extend this faith into religious scientism.

In contrast with a 1959 ASA publication, *Evolution and Christian Thought Today,* the six scientists in this book have independently reached a consensus in their evaluation of encounters between their scientific field and Christianity. This consensus is that science and Christian (Biblical) theology, properly understood and used, are compatible and complementary instead of contradictory (mutually exclusive) or "harmonized" (meshed together unrecognizably).

Richard Bube has done a remarkable job of editing and incorporating the other authors' chapters. Cross references to similar topics in earlier chapters are helpful. Subjects, names, and Scripture references are compiled in separate indices, and suggestions for additional reading are listed. This stimulating and timely book could serve the ASA as a springboard for further discussion of current encounters between Christianity and science. I highly recommend it to all members.

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THE BIOLOGICAL TIME BOMB by Gordon Rattray Taylor, The World Publishing Co., Cleveland, 1968. 240 pp. $5.50.

Although this book is not written for any particular segment of society, it seems to have a great deal to say to the Evangelical Christian layman as well as to the scientist. It is a book full of projected biological breakthroughs for the next half century. Contrary to most such publications, Mr. Taylor carefully documents the present research which he feels will lead into future discoveries. There is even an attempt to foretell when the various technical achievements will be accomplished, but fortunately the author predicts that some of these might not come to pass.

Perhaps one of the more difficult areas for the Evangelical will be discoveries involving reproductive physiology. What will the church say to its constituents about frozen sperm banks? Once a month abortion pills? Choosing the desired sex or characteristics for a child from three or more fertilized eggs and then

implanting that one while destroying the rest? One's imagination could begin to run away in this area. What will be defined as moral when birth control becomes 100% effective and venereal diseases are under control or easily cured? Mr. Taylor mentions that governments may become more interested in birth control as they realize that masses of people alone do not make a nation strong. As advances occur in this area, the only deterrents to immorality as defined by the Bible will be the fear of God and local cultural mores. Will the church have something positive to say to its young people as such discoveries become available for public use?

Mr. Taylor uses several other areas in trying to illustrate why the time bomb is about to explode in our faces. There are discussions on the transplantation of various organs, methods for prolonging life, development of babies outside the uterine environment, control of the mind, changing of genetic material, and the creation of life. The author questions why there are research interests in prolonging, temporarily freezing, or creating life when living organisms are already so abundant on the earth. The time may come, he thinks, when older people may need to have the right to die peacefully. Would the church be able to support this?

The total picture leads the author to a seemingly controversial proposal. He suggests that we begin to think about clamping controls on certain types of biological research until we are socially and judicially ready to receive them. Otherwise, discoveries may control us or be used to our detriment by unscrupulous individuals. He thinks that scientists ought to consider the social implications of their work before embarking on a problem. Are Christians working in science willing to support such a proposal and think of ways to bring about such controls? Mr. Taylor proposes some ideas along this line in a final chapter entitled, "The future, if any." Is the American Scientific Affiliation membership willing to speak out when the uses of biological discoveries run counter to the Bible as we understand it? Would we be heard if we did?

Reviewed by Donald Munro, Professor of Biology, Houghton College, Houghton, N.Y.

THE HUNGRY PLANET by Georg Borgstrom, Collier Books, New York, 1967. 507 pp. $2.95 (paper).

You will have difficulty believing this book after a hearty meal, but the author marshals an imposing array of tables, data, and references as evidence that this planet is heading for trouble if its present rate of increase in population continues and its inability to provide for its food shows no more promise than at present. ". . . . we seem to face the alternative of nuclear annihilation or universal suffocation." We do not feed adequately the billions now living and we can look forward to a doubling of our population by the year 2000.

Countries threatened with hunger and a lowering of living standards resort to war, such as Japan, Italy, and Germany. But the world is approaching the state of having little undeveloped land to conquer. Borgstrom considers the possibility of new acreage in Australia, Siberia, and Amazonia and the hope of getting more food from the sea or from algae culture or even synthetic foods and finds that these will alleviate but not completely supply our future needs. Increased costs of sending desalinated water inland, and salt water seeping into the continent from the ocean filling in the space evacuated by the fresh waters, suggest that the ocean cannot make up for our tremendous withdrawal from our water sources. "In order to produce one single ordinary slice of bread, thirty five gallons of water are required."

So "a common battle against starvation, disease, and misery, and above all against ignorance, requires a radical change in the goals of world science." "If the present gigantic armament race may be called the great squanderer of millions, space research belongs in the same category and so also to a large degree does atomic research." Research projects against world starvation amount to a fraction of the sums used for atomic and rocket research.

Reviewed by Russell L. Mixter, Biology Department, Wheaton College, Wheaton, Ill.

Twenty Years Ago in the Journal

The first issue of the Journal *appeared on January 7, 1949. For the first year of its existence it was called the* ASA Bulletin, *and Marion D. Barnes was the Editor. Until* 1952 *the* Journal *was mimeographed rather than printed. The ASA membership was 73; 30% of the members were teachers in Christian schools, 15% were physicians.*

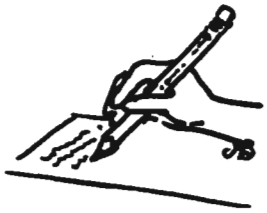
The two papers appearing in Vol. 1 No. 1 were "A Christian View of the Development of Science," by Marion D. Barnes, and "The Meaning of Mathematics," by H. Harold Hartzler. Both papers had been presented at the Third Annual Convention of the ASA, held at Calvin College, September 1-3, 1948 (attendance of 25).

Dr. Laurence Kulp was elected to the Executive Council. The ASA symposium, Modern Science and Christian Faith, *edited by F. Alton Everest, was newly published.*

Vol. 1 No. 2 contained "A Physicist's Glimpse of God," by Paul Bender, and "The Eye as an Optical Instrument," by Frank Allen, to be reprinted for many years as an ASA monograph.

Vol. 1 No. 3, the last number in Vol. 1, was published in June 1949. It contained, "The Science of Heredity and the Source of Species, by Russell Mixter, "The Scientifico-Logical Structure of the Theory of Evolution," by Bernard Ramm, and "Some Presuppositions in Evolutionary Thinking," by E. Y. Monsma. The last paper precipitated considerable discussion when presented at the Annual Convention, this discussion filling 10 *pages of this issue of the* Journal. *A major contribution to this discussion was provided by Dr. Kulp's defense of the physical and chemical evidence for an aged earth. It is the first instance recorded in the annals of the ASA of that basic geologic-paleontologic-evolutionary debate which was to continue in various forms for the next 20 years.*

Communications*



Significant Theological Implications

As a stranger to the fields of science, I enjoy reading and attempting to comprehend articles in the *Journal of the American Scientific Affiliation*. The March 1969 issue is especially challenging and interesting. . . .

Both articles ("Faith and Human Understanding," *Journal ASA* 21, 9 (1969), and "The Three-Storied Universe," *Journal ASA* 21, 18 (1969)) seem to have significant theological implications and deserve attention if both the science and the theology contained therein are reliable.

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Schonfield's Contribution

I was interested in reading Mr. Yamauchi's review of the *Passover Plot*, (*Journal ASA* 21, 27 (1965)) since I just finished reading the book myself.

While the reviewer is correct in his assessment of the weaknesses of Schonfield's critical theories, he misses what seems to me the greatest contribution Schonfield makes.

Schonfield's whole argument is based on the remarkable fulfillment of Old Testament prophecies in the life of Jesus, so much so that the author is forced to choosing between the authenticity of divine prediction and a *conscious*, though human, attempt by Jesus to fulfill those predictions by a plot.

If Schonfield's plot theory is untenable, there remains a powerful witness, from the mouth of a non-Christian, of the uniqueness of Scripture as pointing in fine detail to the life of our Lord.

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National Bible Week

National Bible Week will be observed during Thanksgiving Week (Nov. 23-30) this year. It is co-sponsored by the Laymen's National Bible Committee, the American Bible Society and the Catholic Biblical Association of America.

All three organizations also are co-sponsoring Worldwide Bible Reading, which extends from Thanksgiving to Christmas.

My reason for writing you is to call your attention to these events, which are conducted on an interfaith basis, in the hope that you can plan to carry in your publication a reference to Bible Week and Worldwide Bible Reading or a special feature or article.

Claire Cox
Laymen's National Bible Committee
71 West 23 St., New York 10010

Fides et Historia: A New Journal

One of the primary aims of this publication will be to encourage communication, dialogue, and discussion among evangelical Christians deeply interested in the study of history. This can be done in a variety of ways; articles, essays, book reviews, counter-reviews, dialogues, debates, and other imaginative means. Hopefully, when we disagree vigorously over certain issues, we will do so in a professional manner and keep our Christian "cool." It seems to me that there are a number of areas of potential disagreement, especially when one keeps in mind the rich variety of evangelical emphasis.

Fides et Historia will serve as the official organ of the Conference on Faith and History. It will appear twice yearly.

Robert D. Linder
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The Typical Modernistic View of Scripture

For some weeks I have intended to write you my reaction to the article, "The Three-Storied Universe," by Paul H. Seely (*Journal ASA* 21, 18 (1969)). I suppose this article does not speak for the Society, but it seems to be presented without any *caveat*. I am so sorry to see such an article presented this way in the magazine. I fear that it actually does express the leading view in the ASA at present.

This, of course, makes me very unhappy inasmuch as the original purpose of the ASA was to show the concord between science and Scripture, with Scripture recognized as infallible. As you know, the basis of the ASA has been changed a couple of times, but even so, it was my understanding that there was still a claim that science and Scripture agreed. This article makes a flat statement that "the Bible gives redemptive truth through the scientific thoughts of the times without ever intending that those scientific thoughts should be believed as inerrant."

There are several things wrong with the article. First, of course, I seriously object to Seely's interpretation of the Bible. The idea that the Bible teaches that

*Communications of all sorts: letters, short comments, poems, responses. reactions and just plain sharing—are invited for this section of the Journal. Such contributions should not exceed *one page* in length. The Editor reserves the right to publish here all letters addressed to him, unless specifically requested otherwise by the author.

there is a three-story universe is prominent in Bultmann's theology, and I have heard him present it myself with the claim that consequently the Bible must be demythologized. Albright has strongly objected to Bultmann in that he does not adequately utilize our knowledge of the views and ideas of antiquity. It is interesting to have Seely argue that Matthew suggests that the world is flat when the circumference of the earth had been measured by Eratosthenes 250 years B.C. and the astronomer Ptolemy gives the standard argument for the sphericity of the earth about 150 A.D.

His whole argument on the three-story universe depends on exegesis with which many Bible scholars would not agree. To argue for such an idea from the "etymological meaning of the Hebrew word for firmament" is strange indeed in view of our modern ideas that etymology is quite deceptive in the interpretation of words. That the bottom story must be the subterranean realm of the dead has been much debated and he surely cannot prove his idea from Numbers 16:30-33. In Missouri in the great earthquake of the last century many objects were engulfed by the earthquake and lots of people were buried alive, just as Korah was.

However, it is not my purpose to answer his exegesis in detail. I would simply point out that his view is the typical modernistic view of Scripture that has been held for many years, usually with the additional point that the Bible is a book of religion and not of history. The history is objected to by critics as much as the science.

I hardly feel that the inerrancy of Scripture is an *a priori* doctrine read into the teachings of the Bible. It is a doctrine that comes to us from an exegesis of the statements of Christ. The question is, was Christ correct when He spoke of heaven, of hell, of Adam and Eve, of Noah and the flood, of Jonah and the whale, or was He not? In those areas where the doctrine of inerrancy of Scripture is given up, the authority and truthfulness of Christ is soon given up as well, and this is quite logical for even the critics admit that Christ taught inerrancy. Theology then is faced with a Christ who was a child of His time, and these are the conclusions of Bultmann and other critics. Such a religion is extensive today, and many scholars defend it. It has not been the historical faith of the Christian church and is far from the original position of the ASA. It leaves us with a Christ who cannot be trusted. I think we should realize what Seely's position really is. For myself I must heartily protest against it.

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(*Editor's Comments*: *The implication in Dr. Harris' letter that the article, "The Three-Storied Universe," by Paul H. Seely, should never have appeared in the* Journal, *i.e., that it should have been withheld by editorial censorship, or that at most it should have been published only with apology, is based upon a faulty conception of the function and publication policy of the* Journal. *It is not the function of the* Journal *to propagate a crusade for any particular interpretation of many questions in which science and Christian faith are mutually involved. Any article, judged to be consistent with the Constitutionally-stated purposes and doctrine of the ASA and to exhibit sound scholarship in respect to factual basis and exercise of interpretation, is acceptable for publication in the* Journal. *If an author is guilty of gross scientific or exegetical error, we are confident that readers will quickly set the record straight, thereby increasing general understanding of the truth. Given Dr. Harris' strong convictions, exactly what is needed is an "answer" to Mr. Seely's "exegesis in detail."*)

Infallible Inspiration Taught by Scripture Itself

Regarding the article by Paul H. Seely, "The Three-Storied Universe," (*Journal* ASA 21, 18 (1969)), I would like to make some comments concerning the interpretation of Scripture in general and specifically certain scientific statements therein.

As regards the former, those of us who hold to infallible inspiration do so because we feel that this is the teaching of Scripture itself, not an *a priori* principle brought in from outside. The passages from which this doctrine is drawn do not make a distinction between "religious" facts and other (say, scientific or historical) facts. Thus we are not justified in ascribing inspiration only to parts of the Bible on the basis of its own teaching.

The incident of Jacob and the spotted sheep in Gen. 30: 37-43 and 31:10-13 shows that a good man in Biblical times had a mistaken view regarding a "biological" fact, but that God's view was correct and He was able to (and did) transmit it to the man. There is abundant evidence that the Bible makes statements, in areas now called "scientific," which were far beyond the human knowledge of the time.[1] We should therefore be careful not to attribute error even to speakers merely quoted in Scripture if no disclaimer is made in the text (e.g., "The *fool* has said in his heart, 'There is no God,'" Psalm 14:1).

In respect to specific details of Mr. Seely's article, let me confine myself to his discussion of the "firmament." Biblical scholars today determine the meaning of Old Testament words from their usage in context, not from their etymology. If "firmament" was a technical term already in use among the Hebrews when Genesis was written, it would be dangerous to use its etymology in defining the Scriptural teaching in this area. The same can be said today regarding the use of the term "sunrise" even in astronomical journals, and the Bible is not a technical journal!

The major point on which Mr. Seely builds his case for a solid "firmament" is Job 37:18, translated in the Authorized Version, "Hast thou with him spread out the sky, which is strong and as a molten looking glass?" and in the Revised Standard Version, "Can you, like him, spread out the skies, hard as a molten mirror?"

The word rendered "sky, skies" is the plural form of *sahaq*, which is also translated "cloud(s), small dust, heaven" elsewhere in the Authorized Version. The lexicon of Brown, Driver and Briggs indicates the word is derived from the verb (*sahaq*), meaning "to pulverize," and the noun is listed with the meanings "dust, cloud." "Sky" is listed only as a usage under "cloud."[2] Having examined all usages of this word in their Old Testament contexts, I suggest that all can be rendered either "dust" or "cloud(s)." Elihu's previous use of

the word in Job 36:28 demands the translation "clouds," and the context of Job 37:18 concerns present meteorological phenomena, not the activity of God in creation.

The translation of *re'iy* by "mirror" is even stranger though almost universal among English versions of the Bible. Brown, Driver and Briggs cite no other occurrence of the word but here.[3] However, vowels are a late addition to the Hebrew text of the Old Testament, being incorporated in the tenth centry A.D. by Masoretes. By changing one vowel to get *ro'iy*, we obtain a word meaning "looking, sight, appearance."[4] This word appears several times in Scripture, of which Job 33:21 (Elihu speaking) and Nahum 3:6 are noteworthy. That this suggestion is not merely a modern attempt at harmonization with science is clear from the fact that the ancient Greek Septuagint translation uses *horasis* here,[5] meaning "sight, appearance," not "mirror."[6]

Hence we find that this verse can be translated, "Can you, with him, spread out clouds, which are strong, as an appearance of being cast?" or even, "Can you, with him, spread out mighty clouds, as an appearance of being poured out?" In the light of such possible (even better) translations, Job 37:18 is a poor proof-text for a solid "firmament."

Thus Mr. Seely's contention that the Scripture contains scientific error is in opposition to the teaching of Scripture itself; his use of etymology is not proper as a method of establishing the Scriptural use of "firmament"; and Job 37:18 does not support his interpretation when examined in the original Hebrew and in context.

REFERENCES

[1]e.g., see S. I. McMillen, *None of These Diseases*, (Westwood, N.J.: Fleming H. Revell Co., 1963).
[2]Francis Brown, S. R. Driver, and C. A. Briggs, *A Hebrew and English Lexicon of the Old Testament*, (Oxford: Clarendon Press, 1966), 1007.
[3]*Ibid.*, 909.
[4]*Ibid.*
[5]Alfred Rahlfs, ed., *Septuaginta*, (2 vols., 7th ed.; Stuttgart: Wurttembergische Bibelanstalt, 1962), II, 334.
[6]W. F. Arndt and F. W. Gingrich, *A Greek-English Lexicon of the New Testament and Other Early Christian Literature*, (Chicago: University of Chicago Press, 1957), 581.

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Reply by Seely

Thank you for the opportunity to reply to Drs. Harris and Newman. Dr. Harris appeals to guilt by association, name-dropping, glittering generality, ad hominem argument, begging the question, name-calling, and a series of unsubstantiated generalities and logical non-sequiturs. If I am wrong in my understanding of God's written Word, I sincerely desire correction. But, is it too much to ask that before recanting I be shown from Scripture, lexica, linguistics, or logic that the Biblical firmament is not solid, and that Sheol is not conceived in part as a subterranean realm of the dead?

Dr. Newman's response to my article seems sincere but a little too facile. No one disagrees that all the Bible is inspired, but the nature of inspiration is subject to definition. And orthodox systematic theology has ever made distinctions that the Bible does not explicitly make. The question is, which direction does the evidence move the distinctions?

As for etymology, Old Testament scholars often use it for presumptive evidence, even though it is a broken reed. However, I scarcely depend on etymology to define "firmament." Nor is Job 37:18 "the major point" of my case. I build my case on the gestalt and cumulative weight of a number of arguments, particularly as seen against the total lack of arguments for a non-solid firmament.

Concerning Job 37:18, one must realize that serious linguistics does not see words as univocal. The word *sahaq* does mean cloud in other places, but previous usage does not determine its meaning in Job 37:18. The word *sapah*, e.g., literally means "lip" in other places; but in Job 12:20, it means "speech", and in Psalm 81:5, "language." One could translate Job 12:20, and Psalm 81:5 "lip"; and even we understand, "Don't give me any of your lip." But even if one insists on such a rigid and literal translation one cannot argue that the qualitative nature of "lip" in Job 12:20 or Psalm 81:5 is fleshly with blood and nerves. Most translators also will translate less literally in the first place, realizing that since "lip" is so closely associated with "speech" and "language" in some cases this word really refers to speech or language rather than to a literal lip. Similarly one can translate Job 37:18 with "clouds," but even then one cannot argue that the qualitative nature of that which is spead out is not solid, but airy. For clouds in the Old Testament are so closely associated with heaven or firmament that in some cases "cloud" really refers to heaven or the firmament rather than to a literal cloud. One can see the close association that clouds have with heaven in the parallelism of Job 20:6, Isaiah 14:14, and Jeremiah 51:9, so close that the word *sahaq*, "cloud," is better translated "skies" or "heaven" or "firmament" in Pss. 36:5, 57:10 and 89:6, not to mention Job 37:18. To many Hebrew minds, the clouds were about as high as one could go, bordering on the firmament itself. Deny the translation of "cloud' by "firmament" in the name of literalism, and one ends up with the embarassing theology that says that God's faithfulness reaches to the clouds, Psalm 36:5—the clouds, so low that even the moon is still thousands of miles higher, not to mention the upper limits of the universe. Since God's faithfulness reaches so much higher than the clouds, univocal literalism would make Psalm 36:5 blasphemous.

Really now, if it weren't for *a priori* commitment to an untraconservative tradition, would there be any who would argue against the Biblical picture of a three-storied universe?

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What Do You Think of THAT?!*

Scientists as Moral Judges

Dr. Leach, Provost of King's College in Cambridge, England, recognizing that scientists now have the power to redesign the earth and to decide what kind of species will survive, asks who shall provide the moral judgments necessary in such a situation. He does not hesitate to answer that there can be no source for moral judgments except the scientist himself. He dispenses with Christianity because of the anthropomorphic nature of the Judaeo-Christian Deity, and because of the impossible perspective of some of its most unbending medieval and Victorian theologians. Scientists must decide what is sin and what is virtue on the basis of their superior modern knowledge. (*The Church Herald* 26, 17, 9 (1969))

Trees vs. Lumber

Representatives of the timber industry are reported to be arguing that "we are to the point as a Nation where people will have to decide whether they want more recreation, more parks, more wilderness, or whether they want houses to live in and forest industry products to use in daily living." Conservationists respond by pointing out that in the four Pacific Northwest states which have the largest supply of softwood timber, those areas sought for additional park and wilderness protection comprise only 1.2% of the total available. (*Sierra Club Bulletin* 54, No. 4, 16 (1969))

Defending* Genesis *in Space

Mrs. Madalyn Murray O'Hair so objected to the reading of Genesis from outer space by the astronauts on Christmas Eve 1968 that she has circulated petitions to influence public officials to ban Bible reading and prayer from the Space Program. A counter movement has been launched by the Christian Action Group (17945 Rose St., Lansing, Illinois 60438) to find signers of a petition to NASA that reads, "We and millions of other Americans want to thank you Astronauts Borman, Lovell, and Anders for the inspiring message from God's Word in Genesis during your historic voyage." Their goal is more than a million signatures.

When Science and Theology Were One

The first English translation of Galen's treatise on the "Usefulness of the Parts of the Body", written in Rome between A.D. 165 and 175, was published in 1968 (Margaret Tallmadge May, Cornell University Press). The fundamental objective of this large (over 800 pages) treatise was to show that the structure of the human body was the direct result of divine creative design. Its immediate motivation was to serve as a rebuttal to the atheistic materialism of the Greek atomists. Written at a time when anatomical descriptions could not be based upon regular dissection of the human body, the treatise argues that anyone who approaches the human body with an open mind will find there real evidence of a wise Creator. (*Science* 163, 1439 (1969))

*This feature is intended to stir reader reaction in the hope that these topics may be explored in more detail in future issues of the Journal. Contributions are warmly invited.

In September, 1941, five scientists of deep Christian conviction met together in Chicago. They found that they shared mutual concerns in the relationship of science and Christian faith. The **American Scientific Affiliation** is an outgrowth of that meeting.

ASSOCIATE MEMBERSHIP is open to anyone with an active interest in the purposes of the Affiliation.

MEMBERS hold a degree from a university or college in one of the natural or social sciences, and are currently engaged in scientific work.

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DUES for these three types of membership are: Associate $7.00, Member $10.00, and Fellow $12.00, per year. A member in any of these three categories can take the *special student rate* of $3.00 per year as long as he is a full time Student.

PUBLICATIONS include the ASA News (sent to all members four to six times each year); two symposia: *Modern Science and Christian Faith*, F. Alton Everest, Editor, Van Kampen, Wheaton, Illinois (1950) (out of print), and *Evolution and Christian Thought Today*, Russell L. Mixter, Editor, Eerdmans, Grand Rapids, Michigan (1960). Individual authors are also encouraged to publish independently when this seems desirable.

LOCAL SECTIONS of the American Scientific Affiliation have been organized to hold meetings and provide an interchange of ideas at the regional level. Information may be obtained from the persons listed below or from the national office.

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Membership application forms, ASA publications and other information may be obtained by writing to: AMERICAN SCIENTIFIC AFFILIATION, 324½ So. Second St., Mankato, Minnesota 56001.

What Do You Think of THAT?!

The Anti-Evolution Position

W. T. Tier, board member of the Evolution Protest Movement in England, has a chapter, "Creation is the Only Reasonable Explanation for All Natural Phenomena," in a forthcoming publication by Baker Book House, *Symposium on Creation II*, edited by Donald W. Patten. The arguments presented for the anti-evolutionary stand are: (1) the Bible tells us how God created the living plants and creatures, (2) contrary conclusions of science are held only by misinformed people who do not really have adequate knowledge of the problem, (3) attempts to reconcile evolution and Christianity produce a multiplicity of problems, (4) it is possible for God to create by fiat, (5) if God can create by fiat, why should He use such an indirect method as evolution? (6) detailed arguments for design in the universe all argue for creation rather than chance. Until the anti-evolutionist realizes that creation and evolution are not antithetical, that the alternative to fiat creation is not atheistic chance, little headway can be made in such discussions.

Solving Problems with Mao's Thought

Success in the achievement of sixteen important goals in China's chemical industry was attributed to the influence of Mao Tse-tung's thought on the participating scientists and technicians. They reported their discovery that the "all-conquering thought" of Mao was applicable not only to ideological problems, as originally believed, but also to solving the problems of science and technology. They admitted that Mao's thought could not really solve specific technical problems, but they argued that it so revolutionized their thinking, gave them courage, wakened their intelligence, and encouraged them to work for the sake of the people and the revolution, that they were provided with a source of incomparable potency. (*Bulletin of the Atomic Scientists* 25, 2, 82 (1969).

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