EDITORIAL COMMENT

By now you have all received the plea for contributions for the Textbook Committee. This work under the able direction of Dr. Barnes continues to progress.

Dr. Howe, who has just finished his research work at Cornell University, is writing the chapters on botany which will about conclude all the manuscripts needed. Dr. Klotz is in El Paso, Texas, helping Mrs. Ward integrate these into a well ordered presentation.

Already serious criticism of the expensive ($8,000,000.00) BSCS series is under way as may be noted by reading an article in the June issue of *Bioscience* entitled, "The Accidental Century and Biology." by William G. Houk (June, 1966, pp. 393-395.)

Anyway we have a need to fill and your help is needed both financially and from the viewpoint of helping with illustrations. If you are good at photography please contact Mrs. Rita Ward, 3600 Alturas Avenue, El Paso, Texas, 79930, and she will give you lots of work.

After hearing so much about the marvelous adequacy of the evolution theory as regards explaining anything and everything that walks, runs, swims or flies, it is refreshing to read Dr. Klotz's article and realize how really inadequate, philosophically, this theory really is.

Dr. Harold Clark does a fine job in presenting some idea of the vast extent of the sedimentary rocks of the Colorado Plateau. This article ties in very well with the one written by Clifford Burdick (1966 Annual). This should be read in conjunction with Burdick's paper to get a clear picture of just why this area, so often appealed to by evolutionists as being a marvelous proof for their theory actually is a marvelous proof of the Flood.

The paper by Dr. Gentry on polonium isotope halos certainly puts some severe restrictions on those who wish to theorize about how the earth was formed, particularly, those who like to think in terms of billions of years with the granitic structure undergoing formation during periods of millions of years.

Several fine papers reached the galley proof stage before we realized that so many other items of news were scheduled for this issue that we have run out of space. So they will be held until the October issue.

Walter E. Lammerts,
Editor

THE PHILOSOPHY OF SCIENCE IN RELATION TO CONCEPTS OF CREATION VS. THE EVOLUTION THEORY

JOHN W. KLOTZ, PH.D.

Concordia Senior College, Fort Wayne, Indiana

Evolution is defined as the theory that all forms of life are descended from one or a few ancestors by natural processes operative today. As an adequate scientific theory it should (1) be verified by experimentation, (2) be fruitful in terms of promoting useful research and (3) have predictive value. Evolution, as defined, cannot be verified by experimentation or observation, has shown little predictive value, and has led to many incorrect phylogenetic conclusions, as well as sterile embryological concepts such as Haeckel's. Geological science is shown to be returning to LOCAL *catastrophic theories in order to try and explain many observed facts. Similarities in the plant and animal kingdoms do not necessarily indicate descent as shown by the innumerable* PARALLEL *variations in unrelated organisms. The lack of favorable mutations occurring under natural conditions is a serious difficulty in explaining evolution by natural selection. Fossil evidence for evolution is very meager and limited at best to micro-evolutionary change, or what might more properly be called simply variation within limits. This is particularly true as regards the study of human fossils.*

I should probably begin by defining what I mean by evolution. I do not equate evolution with change. It is obvious that change has taken place in the past and is taking place today. Organisms become extinct; new species develop. I am not suggesting a static world in which the species on our time level have existed unchanged since creation: nor does Scripture teach this.

By evolution I mean the idea that life came into existence by purely natural processes according to the principles which we find operative on our time level, that given the conditions which existed in the primitive world life might come into existence today, that no special supernatural activity or intervention was necessary, that all of the forms of life we know today have descended from a single, or at most a few, common ancestors, and that man is descended from

animal ancestors.

It is my conviction that life came into existence by God's almighty power in a miraculous way that does not lend itself to scientific description or scientific study and examination, that life from the beginning existed in a wide variety of forms, some relatively simple, others extremely complex, and that all human beings are the descendants of Adam and Eve, who were not the descendants of animals.

I believe that the observational evidence gives no more support to evolution than it does to special creation. I believe there are observations which fit better the theory of evolution than they do special creation, but I also believe there are observations which do not fit the theory of evolution.

In order to see evolution in its proper perspective it might be desirable to explore first the nature of the scientific method, how the scientist proceeds, what his objectives are, what his assumptions are, and what he believes that he achieves. Modern science is a relatively new phenomenon. It developed when the logical methods of the Greeks were wedded to the experimental methods of the alchemists and metallurgists. The Greeks were competent individuals and in a real sense competent scientists, but they failed to employ some of the techniques of modern science, particularly the experimental method, and consequently did not make the progress that modern science has made.

Let us recognize at the outset that science has contributed immensely to the society of which we are members. No Christian can be antiscientific, for science has been a means God has employed in bringing blessings to us. Science is a gift of God. Through it God has enabled us to exercise greater control of the environment than He has given to any previous generation. To reject evolution is not to reject science.

Controlled Experimentation in Science

The chief technique of the scientist today and the technique which he has used successfully in developing modern science has been the experimental method. If we examine the science of the ancient Greeks and modern science, this seems to be the only significant difference. The Greeks were certainly our peers and possibly even our superiors in their intellectual equipment; they made careful observations, but they failed to use the technique of the controlled experiment, for they were prejudiced against the use of experimentation.

It is generally agreed that controlled experiments are of critical importance in the progress of science today. Ideally the experiment enables the investigator to assign a given effect to a given cause. He is able to eliminate causes which are irrelevant and in this way he seeks to determine the correctness of the explanation which his theory presents.

It is at once obvious that experimentation can only be used with phenomenon on our time level. It is simply impossible to conduct controlled experiments regarding the past. This is also true of direct observation. Since evolution is supposed to be a process requiring long periods of time, it is not possible to observe changes of the magnitude required for the development of the higher categories. And it is in this area–the past–that the difference of opinion between those who accept special creation and evolution arises. Dr. Conant discussed this is his *Science and Common Sense* (Page 259 ff) and calls attention to the fact that there is no basic controversy between science and the Church on our time level. He says that these controversies deal chiefly with the phenomena of the past. I am convinced that the reason for this is the impossibility of using experimentation and direct observation in discussing most aspects of the theory of evolution. We simply do not have available to any appreciable extent these very important tools and resources. We cannot test the theory and therefore we lack the reasonable certainty we have in dealing with phenomena on our time level.

The Scientific Method

How does the scientist work? In most cases he begins by gathering his facts. He may do this by carrying on observations or he may set up experiments of discovery which will assist him in "getting the facts." After he has gathered his facts, he arranges them in a logical order through correlation, classification, mathematical manipulation, and the like, Next comes the great leap of the scientific method, the formation of a hypothesis or a theory. Once the scientist has gathered his facts, he tries to relate them and to explain them. This is the function of a hypothesis or a theory—to relate facts to one another and to explain them.

After the theory or hypothesis has been formulated the scientist works deductively and asks himself this question: If my theory is correct, what are the logical consequences of the theory? He then proceeds to test these logical consequences by means of a second type of experiment, an experiment of confirmation. If his experiments confirm his theory or hypothesis he is happy. If they do not, he restructures his theory or hypothesis to fit these additional observations which he has made.

It is at once evident that the scientist deals with two kinds of "things''-facts and theories. A theory is never a fact, and it cannot be a fact. This does not mean that theories are unimportant: they are of the utmost importance. Evolu-

tion cannot be dismissed because "it is only a theory." As a matter of fact it is generally agreed that progress in science comes not by gaining new facts but by developing new theories. Theories are also of immense practical importance. George Washington died because of a wrong theory. He lived at a time when disease was explained according to the humoral theory and it was thought that disease was due to imbalances in the body humors, one of which was the blood, and he was treated accordingly, with fatal results. Let me say then that while I would argue evolution is not a fact, I am not saying it is unimportant.

Characteristics of a Good Theory

What are the criteria by which we judge the adequacy of a theory? It is generally agreed (1) that a theory must be testable by experimentation, (2) that it must be fruitful, and (3) that it must make possible predictions. Gruenberger in his discussion of the scientific method *(Science* **145 :** 1414) lists the various criteria, putting these three first and indicating points that are to be assigned to the different criteria. The fact of the matter is that the theory of evolution does not meet these three most important criteria.

The theory of evolution cannot be checked by experimentation and direct observation.

In addition, it cannot be used to predict to any greater degree than the theory of special creation. Very often evolutionists point to the similarities either in structure or in physiology that can be predicted from the theory of evolution. But it is possible to predict these same similarities from what we might call the theory of special creation. There are at least as many instances in which predictions from the theory of evolution break down as there are instances when the predictions from special creation break down.

In addition the theory of evolution has not been particularly fruitful in stimulating biological research. It has stimulated some research but not nearly so much as some of the other theories.

Therefore, the theory of evolution fails to meet three of the most important criteria for a good theory: capability of being examined by controlled experimentation, predictability, and fruitfulness.

Assumptions of Science

The scientist makes a number of assumptions and imposes a number of limitations on himself. One of his assumptions is the assumption of uniformity. He assumes that the natural laws and principles which he discovers in his laboratories hold throughout time and space. He believes that matter is the same everywhere in the universe and behaves in the same way. He also assumes that matter has always been constituted in the same way and has always behaved in the same manner throughout time. He assumes that this has been true of the past and that it will be true of the future.

Actually it is only by making this assumption that the scientist is able to work at all. Were he to assume that matter did not obey the same general laws and principles there would be no point in his carrying out his work. If matter were erratic and chaotic, if the scientific laws and principles which we have been able to discover do not hold throughout time and space there would be little purpose in carrying out the scientific enterprise.

At the same time we must recognize that the principle of uniformity is an assumption and nothing more. What is even more interesting is that some scientists and philosophers of science have been inclined to question it. William S. Beck in this *Modern Science and the Nature of Life* says,

> When all is said and done there seems to be evidence that even the 'laws of nature' are changing. Modern physics suggest the possibility that changes are taking place in the speed of light and in the rates of chemical reactions. In other words the universe is changing, and it becomes hazardous to attempt calculations concerning the very remote past and future. It appears that eternal natural stability is as improbable as its psychological corollary, eternal truth. This should worry no one except the seeker of eternal certainty. It may turn out that fundamental change and uncertainty are the nearest things we have to eternal principles. (Page 170.)

Closely associated with the principle of uniformity is the principle of uniformitarianism. Uniformitarianism started among the geologists. Perhaps its greatest exponent was Charles Lyell who argued that the present is the key to the past. His particular interest was the rate of deposit of sedimentary rock and the formation of the various rock strata. He was arguing against the theory of catastrophism promulgated by a number of his contemporaries who believed that the rock strata and the fossils which they contained were the products of sudden catastrophes rather than of slow gradual processes. Lyell argued that the strata were the products of the gradual processes which he and other geologists were able to observe on their own time level. Lyell greatly influenced Darwin.

Actually uniformitarianism is something different from uniformity. It deals with rates rather than with fundamental physical processes and Beck points out there is good reason for believing that rates at which processes take place may change. Uniformitarianism has come under con-

siderable attack among geologists since the end of World War II. Norman Newell of the American Museum of Natural History was recently quoted as saying,

> Geology suffers from a great lack of data and in such a situation any attractive theory that comes along is taken as gospel. That is the case with uniformitarianism. Geology students are taught that 'the present is the key to the past' and they, too, often take it to mean that nothing ever happened that isn't happening now. But since the end of World War II, when a new generation moved in we have gathered more data and we have begun to realize that there were many catastrophic events in the past, some of which happened just once.

Dr. Newell went on to say,

> I am in favor of junking both of the terms, catastrophism and uniformitarianism, completely. They are just too confusing.

The scientist assumes that his senses do not deceive him, that the picture they present is true and correct. Once more it would appear that this is a reasonable assumption and one that is necessary for the existence of any body of scientific knowledge. It does not necessarily follow that the interpretation of these observations is correct. It is important that we recognize this in considering the evidences for evolution.

Sometimes the argument is advanced that evolution must be true since there are so many evidences which seem to support the theory of evolution and God would certainly not deceive us. It is argued that if we deny evolution in the light of its acceptance by unbiased observers we are implying that God is a god who plays at cat and mouse games with us, teasing and tormenting us with things which appear to us to be true but which are not. Actually the situation is somewhat different.

True, God does not deceive us, but we may misinterpret the evidence of our sense organs. The fault lies not with God but rather with the limitations of the human mind. Who would argue that God is a god who deceives because He created a world which appeared for thousands of years to be geocentric but which seems actually to be heliocentric. Would we say that God deceived because the world which He created appeared to the best scientists of the day to be geocentric? Rather would we not argue that the men who studied the solar system were deceived because of the limitations of the human mind?

Hanson, in writing on "Galileo's Discoveries in Dynamics," says something quite similar:

> Facts are always facts about or with respect to or set out in terms of some theoretical framework. Should the framework deliquesce, the objects, processes, and facts will dissolve conceptually. Where are the 'facts' of alchemy, of the phlogiston theory? Or must we grant that no observations ever really supported such frameworks of ideas? . . . They are actually once-descriptive references whose supporting rationale has disappeared. Their articulators were, in their way, dedicated empiricists, groping, struggling, to delineate *the facts* concerning intricacies of a near incomprehensible world. May not the solid acquisitions of our own laboratory performances yet grow pale before the chilling winds of new doctrine–doctrine opposed to our presently accepted theories? *(Science* 147:472 ff.)

Perhaps "the facts" which are supposed to support evolution are not so overwhelmingly impressive after all.

Paradigms in Science

In this connection it is worth calling attention to a recent article by E. G. Boring, Professor Emeritus of Psychology at Harvard *(Science* 145:680-5). Boring speaks of changing paradigms in science. Paradigms are essentially fundamental hypotheses or points of view. He cites as an example of a paradigm the Ptolomaic point of view which was supplanted by the heliocentric system of Copernicus; and the creationist point of view which was opposed by evolution. He says that paradigms are fundamental to the thinking of men until something better comes along, They work best for the time being, and their influence is profound. However, he points out, they are not permanent and inevitably they are replaced by another paradigm.

Now what I am saying is that science on any time level does not have the certainty which is popularly assigned to it. Science is an ever-changing thing and the fundamental paradigms —and evolution is one of these—are likely to be replaced, even though at the time they may seem permanent and may answer many questions and provide many explanations.

Science and Faith

Many people make much of the fact that acceptance of special creation is based on faith, whereas the acceptance of the theory of evolution, they believe, is based on observation. We must recognize that all science is based on a great deal of faith—faith in the correctness of basic scientific assumptions, faith in the integrity of other scientists, faith in the accuracy of their observations. It is not true that the Christian walks by faith and the scientist by sight, It is very obvious that also the scientist walks much of the way by faith. Aldous Huxley writes,

> All science is based upon an act of faith—faith in the validity of the mind's logical processes, faith in the ultimate explicability of the world, faith that the laws of thought are laws of things. In practice, I repeat, if not in theory, such conceptions are fundamental to all scientific activity. For the rest, scientists are opportunists. They will pass from a commonsense view of the world to advanced idealist theories, making use of one or the other according to the field of study in which they are at work. Unfortunately, few scientists in these days of specialization are ever called upon to work in more than one small field of study. Hence there is a tendency on the part of individual specialists to accept as true particular theories which are in fact only temporarily convenient. *(Ends and Means* page 258.)

The Objectivity of Science

Another point that requires comment is the supposed objectivity of science. The scientist is often pictured as a cold, unemotional, objective person who accepts facts and lets the chips fall where they may. Yet Boring insists that scientists cling tenaciously to conceptual schemes even in the light of mounting evidence against them. He has coined the term "egoism" for this trait. He says that while the very life blood of scientific progress is change, scientists form an emotional attachment to the hypotheses and theories which they have come to accept. There is a pride of authorship, a fearsome loyalty, to the conceptual schemes which the individual espouses, The longevity of a pet theory is directly proportional, he says, to the hero status of its proponent: yet in the course of time, all conceptual schemes are doomed either to be modified or replaced completely,

Boring is not alone in his point of view, James B. Conant says, "The notion that a scientist is a cool, impartial, detached individual is, of course, absurd. The vehemence of conviction, the pride of authorship, burn as fiercely among scientists as among any creative writers," *(Modern Science and Modern Man,* page 67.)

Now I am not trying to deny that this happens to theologians: I am simply trying to point out that contrary to the popular image of the objective scientist, it happens also to scientists.

Emotionalism in Evolution

The theory of evolution is one in which there has been a great deal of emotion, and consequently it has been difficult to discuss the theory objectively. Charges and counter-charges flew in the late 19th century when Darwin presented his *Origin of Species.* Darwin, the mild-mannered man that he was, was deeply disturbed by the controversy that his theory raised. When the theory was discussed at the Oxford meeting of the British Association for the Advancement of Science in 1860, Darwin was not even present because he did not want to become embroiled in the controversy which he knew a discussion of his theory was bound to arouse. Unfortunately it was a British bishop who assumed the responsibility for attacking the theory, and what is even more unfortunate, he chose to attack personally Thomas Huxley, who in Darwin's absence found himself cast in the role of apologist for the theory. Instead of discussing the theory and the evidence for and against it, he chose to attack Huxley personally and to ridicule him.

Later the teaching of evolution was forbidden by law in some of the states of the United States. Most of these laws were passed at the insistence of churches and churchmen. When the Tennessee law which forbade the teaching of evolution in the public schools of the state came under attack and John Scopes was arrested for teaching evolution in the schools of Dayton, Tennessee, it was a Christian layman, William Jennings Bryan who assumed the responsibility of prosecuting Scopes.

Bryan was poorly prepared for the task: he had not tried a case for 25 years. Moreover, he was critically ill at the time and died five days after the conclusion of the trial. He assumed a very grave responsibility in agreeing to represent the Church, and did a poor job in the role which he accepted. Both these episodes reflected unfavorably on the Church. The Church was placed in the position of using personal attacks and the authority of the State to interfere with science and to hamper the search for scientific truth. Consequently any attack on evolution, even today, raises a red flag and resurrects the controversies of the past. It is very difficult to get an objective discussion of evolution: the subject continues to be an emotional one. Personally, I believe this has been one of the most unfortunate aspects of the whole creation-evolution controversy.

Lest anyone think that only the evolutionists have been the victims of emotionalism and personal attacks it is only necessary to consider what happened in the State of Washington about five years ago. Dr. John M. Howell, Supervisor of Curriculum Guides and Courses of Study for the State of Washington, was asked to express his opinion of evolution in a letter addressed to him by a freshman at the University of Puget Sound who was writing a theme on Darwinism. His answer in which he expressed doubts as to the correctness of the theory, and in which he states that acceptance of evolution implied a denial of the Bible, was published in the student newspaper. As a result Howell lost his job

and found himself shifted to another position in the state Department of Education.

It will not be possible for us to analyze in detail all of the so-called "evidences" for evolution. Suffice it to say there are many observed facts which can be interpreted as indicating relationship, but these same facts can also be interpreted as indicating a single general plan or pattern such as one would expect in a scheme in which life came into being in a wide variety of forms.

Similarity and Descent

The general argument employed is that similarity is evidence of descent from a common ancestor. This represents a slight modification of a common everyday observation, but a modification which is significant. It is readily observable that siblings tend to resemble one another in their external appearance, but it does not follow that individuals who resemble one another are closely related by descent. We all know instances of individuals who resemble one another to such a degree that they might well be taken for identical twins but whose common ancestor is either completely unknown or found only in the far distant past.

Moreover there is evidence which casts doubt on the assumption that similarity is the function of descent from a common ancestor. The phenemonon of parallel mutations is a well-known one. This is the occurrence by mutation of similar characteristics in different species. For instance, the fruit fly, *Drosophila melanogaster* and *Drosophila simulans,* two separate species, have both experienced mutations of eye color to prune, to ruby, and garnet; of body color to yellow; of bristle shape to forked and boxed; of wings to cross veinless, vesiculated, and rudimentary, It might be assumed by those who regard similarity as proof of descent from a common ancestor that two flies, both of which have ruby eyes, have inherited this trait from a common ruby-eyed ancestor, but this is not necessarily the case, The same type of mutation has occurred in both species, and the two ruby-eyed flies may not be related at all.

This phenomenon of parallel mutations is not confined to *Drosophila.* It is a wide-spread phenomenon and has been clearly established in a number of forms.

It is often argued that parallel mutations are indeed evidence of close relationship since the fact that they occur indicates similar genetic material which is capable of such parallel mutations. Thus it is argued that the phenomenon of parallel mutations instead of being a problem for evolution is actually an evidence for it. Dobzhansky cautions against such a line of argumentation, pointing out that similarities do not necessarily indicate similar genetic material. He says,

> But here is a caveat–phenotypically similar, or mimetic mutants are produced also at different, fully complementary and not even linked genes within a species. Among the classic mutants in *Drosophila melanogaster* there are several non-allelic but visibly similar changes of the eye color, the eye surface, the bristle shape, etc. A few of these mimetic genes may conceivably have arisen through the reduplication of the same ancestral genes. But for the majority such a supposition is quite gratuitous. Our powers of observation are, limited, and what to our eyes are phenotypically similar changes may actually be due to different genes. *(Cold Spring Harbor Symposia on Quantitative Biology,* Vol. 24, p. 22.)

Later Dobzhansky says, "The presence of homologous organs is, then, not necessarily evidence of persistence of identical, similar, or even homologous genes. The genetic system which brings about the development of an eye in a fish is probably quite different from that of an eye in a bird or in man."

He goes on to say: "What has been said above concerning organs applies as well to their chemical constituents and to enzymes. To an evolutionist the fact that certain "enzymes are widely distributed in most diverse organisms is very impressive. But to conclude that these chemical constituents are produced everywhere by the same genes is going far beyond what is justified by the evidence."

Actually the evolutionist selects his similarities. Those that fit his theory are presented as evidences for evolution, those similarities which do not fit with the theory of evolution are cited as examples of parallel evolution and convergence; that is, the development of similar traits by organisms who are not closely related. For instance, there are many resemblances between the duckbill, or platypus, an Australian monotreme, and the ordinary duck. If these were related by supposed evolutionary descent, I am sure that these resemblances would be regarded as due to descent from a common ancestor. But since they are not supposed to be closely related these evidences are completely ignored.

There are also many instances in which resemblances do not fit the supposed phylogenetic evidence. Sanger *et al* are quoted as saying that, on the basis of insulin composition, sperm whales are identical with pigs and are quite different from sei whales. *(Science* 146:1537)

In studying hemoglobin similarities, Buettner —Janusch and Hill, find some unusual similarities in hemoglobin. They find, for instance, that hemoglobin of the Ceboidea–the New World

monkeys-appear to resemble human hemoglobin rather closely. This, they say, is most interesting for the Ceboidea are not closely related to man. They appear, they say, as a completely distinct lineage in the Miocene deposits of South America. The authors believe that this similarity is due to convergence. *(Science* 147:841 ff.)

To cite just one more example, an extraordinarily powerful neurotoxin called Tarichatoxin, has recently been isolated in crystalline form from the eggs of various Western American newts as well as in newt eggs and embryos. It is very different chemically and pharmacologically from other known salamander toxins. This toxin, however, is identical to a toxin which occurs in the Japanese fugu or puffer fish. Thus this substance appears to occur in only one family of the amphibia and in one sub-order of the fishes. It is highly questionable whether this is evidence of a descent from a common ancestor. (Science 144:1100) Instances of this sort could be multiplied.

The Mechanism of Evolution

Let us turn now to a discussion of the mechanism for the changes which evolution requires. Darwin postulated a variation in living organisms on which natural selection worked, selecting the fit to survive and killing off those that were not fit. To this day, evolutionists have not developed what to my way of thinking is a satisfactory explanation for the mechanism whereby the variation postulated by Darwin could arise. Darwin himself did not deal with this problem: he apparently was unacquainted with Mendel's work or at least did not appreciate its importance and developed a rather bizarre and far-fetched theory for the origin of variation.

Today, two methods are suggested for these changes: (1) chromosomal changes or chromosomal aberrations and (2) gene changes or mutations. Chromosomal changes do not appear to be of too much importance in providing the variation required by progressive evolution. Chromosomal changes have only a very slight chance of survival because they upset a great deal the delicate balance of the gene complex. The most favorable type of chromosomal change so far as the possibility of survival is concerned, is probably polyploidy, but this is regarded as an evolutionary dead end. Cameron says that ultimately polyploids succumb because they cannot go back to the diploid condition, and their gradual change of genetic variation seems to be hampered by the high number of chromosomes. *(Evolution, Its Science and Doctrine,* page 121.)

Strict autopolyploids–polyploids derived from a single ancestor—are rare in nature. (Ehrlich and Helm, *The Process of Evolution,* page 190.) Polyploidy in general, according to Ehrlich and Helm is generally disadvantageous in the very long range view. They believe, however, that because they are extremely common in both plants and animals they must result in a selective advantage. (An example of a rather common type of circular reasoning.)

The other chromosomal changes are either so lethal that they can hardly be of any importance in progressive evolution or they actually decrease the genetic material. In aneuploidy, for instance, usually there is a decrease rather than an increase in chromosome number, which would hardly provide for the increase in genetic material that progressive evolution would presumably require.

Mutation as a Mechanism

So far as mutation is concerned, evolutionists will have to agree that there are many, many unsolved problems. One of the really critical problems is the fact that most mutations are either lethal, semi-lethal or subvital and in the ordinary course of events will be eliminated by the very natural selection which is postulated as the guiding factor of evolution. It is usually argued that natural selection works with those mutations which are favorable. While this is theoretically possible, it would certainly increase substantially the amount of time required for evolution. Some evolutionists feel that even the billions of years postulated by evolutionists are not enough for evolution if this is to be the guiding factor.

Even favorable mutations are likely to be eliminated. Fisher calculates that out of 10,000 mutations which have a one percent selective advantage, 9,803 will eventually be eliminated. This means that only 197 out of 10,000 favorable mutations can be expected to survive.

Generally, evolutionists have felt that most mutations important in evolution have had an even smaller advantage which would increase the probability of extinction. This poses a real dilemma. Large changes with large selection coefficients (which would provide for relatively rapid evolution) would probably upset the delicate balance of the gene complex and would be lethal for this reason. Consequently, evolutionists believe that small changes are the only possible mechanism, a point of view with which Ehrlich and Helm disagree. Small changes, however, are so time consuming that they are unlikely to provide the diversity needed by progressive evolution. This dilemma has still not been solved.

Another problem of evolution is the fact that the changes provided by mutation do not necessarily bring about sterility which is necessary presumably in the development of new species.

Nor do they provide the kind of changes that progressive evolution needs. Carson, in the *Cold Spring Harbor Symposia on Quantitative Biology,* Vol. 24. "One of the great dilemmas that modern evolutionary theory has had to face is the fact that most of the mutations found repeatedly for instance, within populations of different *Drosophila* species, do not constitute the kind of differences which distinguish species." (Page 95.) If this is the case they certainly do not provide the kind of change required by progressive evolution.

The Evolution of Man

Another problem area for the evolutionist is the evolution of man. There is a wide gap between man and the anthropoids in spite of the emphasis that is often placed on the similarities between man and the anthropoids, and progress in studying the evolution of man has been very slow. This is all the more remarkable in the light of the fact that there is considerable interest in man's evolution and consequently considerable incentive to study this area.

One of the problems has been the paucity of fossil material. While fossils in general are very common; and while we have a great many fossils of various organisms, the number of human and prehuman fossils is very limited. Evolutionists explain this on the basis of the fact that man is believed to have been a tropical organism who very early in his history practiced earth burial. Under these circumstances we are likely to have very few fossils. But the fact of the matter is that we do have some fossils from non-tropical areas which would indicate that man was found in these regions..

This paucity of fossils has resulted in a real problem. Dobzhansky says, "Investigators often submit to the temptation of speculating on the basis of scanty bone fragments (and it goes without saying, virtually all finds are fragmentary)," *(Mankind Evolving,* page 171.) Herberer in the *Cold Spring Harbor Symposia* says, "Despite all progress made by primate paleontology, especially since the end of World War II, documentation is still sparse and more material is greatly needed; that is any reconstruction must use the methods of comparative morphology and physiology." (Vol. 24 page 235 ff.)

As indicated above, most of the fossils are quite fragmentary. Often the entire find consists of a skullcap or a piece of lower jaw or even a few teeth. Much of the classification has been done on brain box size. At first glance this seems to be a very valid method of determining relative evolutionary development, but the fact of the matter is that it does not work out quite so easily. Bennett, Diamond, Krech, and Rosenweig say,

> In the 19th century the measurement of the size and weight of the brains of men were made in an effort to discover differences that might relate to the degree of intellectual attainment. The first results were encouraging, since men of distinction were usually found to have larger brains than those of inferior intellect. Gradually it was realized, however, that men of different stations in life often differed in health and nutrition as well as in intellect and that the former factors might affect brain weight. There were also striking exceptions to the general relation-idiots with larger brains and geniuses with smaller brains. The hypothesis of an intrinsic relation between brain size and cerebral exercise or ability was therefore generally abandoned. In its place there were suggestions of more subtle factors involving neural inter-connections, or chemical changes in the brain. The difficulty of working with such factors discouraged research, and the problem largely reverted to the speculative realm. *(Science,* 146:610).

Skerlj raises many of the same objections when he says, "Brain size does not seem to me a proper measure since we know in modern man the variability goes from 800 to 2000 cc. and covers all the range from Java to modern man. Furthermore why not mention the Neanderthalers who had on the average a somewhat larger brain size than modern man?" *(Cold Spring Harbor Symposia,* Vol. 24, page 215).

Actually the evidence for human evolution is not nearly as conclusive as one would be led to believe from the number of named forms. The fact of the matter is there are far more named forms than are justified. Dobzhansky says, "A minor but rather annoying difficulty for a biologist is the habit human paleontologists have of flattering their egos by naming each find a new species, if not a new genus. This causes not only a needless cluttering of the nomenclature but is seriously misleading because treating as a species what is *not* a species beclouds some important issues." *(Mankind Evolving,* page 171.)

Another writer says,

> High physical and dental variability in given species of man and apes has long been known, but it is clear that this has not been taken into account by the majority of past and recent describers of fossil Hominoids. Beginning with Mayr in 1950, taxonomists have drawn attention to the extreme over-splitting of the known varieties of Pleistocene Hominoids. Since the late 19th century this erroneous approach to

taxonomy has produced approximately 30 genera and almost countless species.

At the other extreme from this taxonomy prolixity, stand such workers as Mayr and Dobzhansky who, drawing on their knowledge of modern speciation, have adduced evidence for a single line of but a few species successive through time in this particular lineage. To alter their view it would only be necessary to demonstrate the occurrence of two distinguishable species of Hominids in a single zone of one site, but despite much discussion of possible contemporaneity, in my opinion such contemporaneity has not been satisfactorily established. There is fair morphological evidence that there were two species of *Australopithicus* but their synchronous existence has not been confirmed by finds at the same level in one site. (Simons, *Science* 141:880)

Concluding Remarks

In conclusion, it would seem to me that evolution is far from "proved." The scientific method is, itself, limited to approximations and reasonable certainty. In studying evolution we do not have the major tool of modern science, experimentation. We must recognize that scientists, too, are human, that they are emotional, and that they are conservative in the sense that they like to keep the theories they have come to accept. Evolution presents a great many problems.

True, there are many evidences and observations which seem to support the idea of evolution, but there are also many which do not fit with the general Darwinian scheme. Fair-minded evolutionists—and most evolutionists are fair-minded—have come to recognize this. Ehrlich and Helm ask,

> Is our current explanation of evolutionary processes without a flaw? Hardly; even the most sanguine evolutionist would admit there is much to learn. The fine theoretical structure of population genetics has not been thoroughly tested in natural populations–although the broad outlines of the spreading processes in evolution seem to be understood adequately, no general mathematical treatment has been possible, and many of the details are obscure. (Page 310.)

Mayr says,

> Yet in spite of all these advances numerous unsolved problems remain. Let me single out only four aspects of natural selection which raise doubt in my troubled mind. 1) The selection of genes vs. the selection of genotypes. Selection places a considerable strain upon populations. Too rapid a rate of simultaneous selection against too many genes might eliminate the entire population. 2) The measure of fitness. It is crucial to find an objective yardstick, 'Is it not a basic error of methodology to apply such a generalized technique as mathematics to a field of unique events such as organic evolution?' 3) The population as a unit of selection. 4) Reproduction success. Natural selection may be defenseless against certain genes." (page 5 ff.)

Mayr quotes Lerner as saying, "What we have learned so far about natural selection is obviously only the beginning. What remains to be learned is immeasurably more."

Ehrlich and Helm say,

> The most obvious aspect of evolutionary theory that may be at least partially explained as a reaction to the Bishop Wilberforce approach has been the development of a rather stringent orthodoxy. This orthodoxy is easily detected in the compulsion of biologists to affirm *belief* in evolution (rather than to accept it as a highly satisfactory theory) and to list *proofs* that evolution has occurred. It is, of course, a matter of debate as to where healthy conservatism leaves off and dogma begins. Suffice it to say that the discipline is at least close enough to the danger area to call for some critical reexamination of its basic tenets. (Page 309.)

Elsewhere Ehrlich and Helm say,

> The strong urge to believe in present evolutionary theory, which is so evident among workers in the field seems to stem partly from a very common human error, the idea that one of a number of current explanations *must* be correct. One usually finds the theory of evolution being contrasted with that of special creation, a one-sided contest to say the least. The demonstration that the idea of special creation is scientifically meaningless does not however 'prove' that the theory of evolution is correct. Current faith in the theory is reminiscent of many other ideas which at one time were thought to be self-evidently true and supported by all available data—the flat earth, the geocentric universe, the sum of the angles of a triangle equalling 180 degrees. It is conceivable, even likely, that what might facetiously be called a non-Euclidean theory of evolution will be developed. Perpetuation of today's theory as dogma will not encourage progress toward more satisfactory explanations of observed phenomena. (Page 310.)

Sylvio Fiala writes,

> With all due recognition to the greatness of Darwin's achievement, we cannot remain blind to the fact that not a single step in the evolu-

tionary mechanism has been clarified. Evolution means primarily an increase in the content of information in the case of DNA, but natural selection means only the elimination of error in information or mutation (in the most favorable case, only a modification of the information), not an increase in the quantity of information. Correcting a misspelled word or substituting one word for another is after all something quite different from writing down a sentence, an article, a whole book.

It would seem to me premature to reject the clear account of Genesis in favor of this theory. The evidence is not so overwhelming that reason insists on this approach.

Bibliography

Beck, William S., *Modern Science and the Nature of Life,* New York: Harcourt, Brace, 1957.

Bennett, Edward L.; Diamond, Marian C.; Krech, David; and Rosenzweig, Mark R., "Chemical and Anatomical Plasticity of Brain," *Science* 146: 610.

Boring, Edwin G., "Cognitive Dissonance: Its Use in Science," *Science* 145: 680-5.

Buettner-Janusch, John and Hill, Robert L., "Molecules and Monkey s," *Science* 147:841 ff.

Cameron, Thomas (Editor), *Evolution, Its Science and Doctrine.* Toronto: University of Toronto Press, 1960.

Carson, Hampton L., "Genetic Conditions Which Promote or Retard Species," *Cold Spring Harbor Symposia on Quantitative Biology* 24:95.

Conant, James B., *Modern Science and Modern Man.* New York: Columbia, 1952.

Conant, James B., *Science and Common Sense.* New Haven: Yale University Press, 1954.

Dobzhansky, Th. "Evolution of Genes and Genes in Evolution," *Cold Spring Harbor Symposia on Quantitative Biology* 24:22.

Dobzhansky, Th., *Mankind Evolving.* New Haven: Yale University Press, 1962.

Ehrlich, Paul Ralph and Helm, Richard W., *The Process of Evolution.* New York: McGraw-Hill, 1963.

Fiala, Sylvio, "Letter," *Science* 135: 975.

Gruenberger, Fred J., "A Measure for Crackpots," *Science* 145:1414.

Hanson, Norwood Russell, "Galileo's Discoveries in Dynamics," *Science* 147: 472 f.

Heberer, G., "The Descent of Man and the Present Fossil Record, *Cold Spring Harbor Symposia on Quantitative Biology* 24:235.

Hough, Jack L., *Geology of the Great Lakes.* Urbana, Illinois: University of Illinois Press, 1958.

Huxley, Aldous, *Ends and Means.* London: Chatta, 1938.

Mayr, Ernst, "Where Are We?", *Cold Spring Harbor Symposia on Quantitative Biology* 24:1.

Mosher, H. S.; Fuhrman, F. A.; Buchwald, H. D.; and Fischer, H. G., "Tarichatoxin-Tetrodotoxin: A Potent Neurotoxin," *Science* 144: 1100.

Newell, Norman. Quoted in *Newsweek,* December 23, 1963, p. 48.

Rostand, Jean, *Can Man Be Modified.* New York: Basic, 1959.

Sanger *et al.* Quoted in Simpson, George Gaylord, "Organisms and Molecules in Evolution," *Science* 146: 1537.

Simons, Elwyn L., "Some Fallacies in the Study of Hominid Phylogeny," *Science* 141: 880.

Skerlj, Bozo, "Discussion," *Cold Spring Harbor Symposia on Quantitative Biology* 24:215.

Sparberg, Esther, "Letter," *Science* 135:982.

THE MYSTERY OF THE RED BEDS

HAROLD W. CLARK

Professor Emeritus of Biology and Geology, Pacific Union College, Angwin, Calif.

The extensive formations, canyons and erosion of the Colorado Plateau region are described and illustrated. Succession of these sedimentary rocks and their lithology is presented with notation of their great 200,000 square mile expanse. The relative lack of erosion at the various horizons in comparison with the amount that has occured on the PRESENT *surface of the plateau is used to argue for a relatively short period of time for their formation. A general lack of sources for these vast deposits of sandstone, shale and conglomerate is shown as being critical to a satisfactory explanation of them from the viewpoint of uniformitarianism. Conclusions are (1) sediments were brought in from great distances (2) great sweeps of water instead of local river or flood action were necessary to spread out these sediments over this vast area, and (3) the various formations were laid down one after the other in rapid succession.*

Probably nowhere else in America are to be found more interesting and puzzling displays of rocks than in the Colorado Plateau region, which covers more than 200,000 square miles in Utah and portions of surrounding states. For a number of years I have made observations here and there in the region, and have covered it quite thoroughly, I have also read widely in the literature dealing with the region, and this paper is the result of these travels and studies. The points presented will, I hope, be of value in interpretation of geology from the viewpoint of the Flood.

The accompanying figures, showing the relation of the strata over this region, have been prepared from various publications, from private