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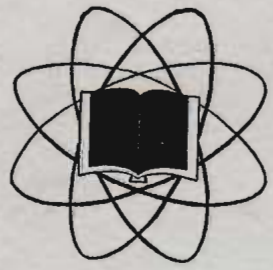

The fear of the Lord is the beginning of wisdom. Psalm 111:10

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The American Scientific Affiliation

(INCORPORATED)

The American Scientific Affiliation was organized in 1941 by a group of Christian men of science. The purpose of the organization is to study those topics germane to the conviction that the frameworks of scientific knowledge and a conservative Christian faith are compatible.

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EXECUTIVE COUNCIL

The Journal Of The American Scientific Affiliation

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TABLE OF CONTENTS

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*Fossils And Their Occurrence**

CORDELIA ERDMAN BARBER

Definition

Some years ago a man brought a rock into one of the famous museums of our country and asked to have one of the scientists in that place examine it. Having been directed to the proper office, he at once laid his rock down on the desk and announced with pride, "I've got a fossil potato here."

The curator was accustomed to this sort of interruption of his work. He smiled, picked up the rock and expressed his regret that it was nothing more exciting than a brown and rounded chunk of a very common mineral. The owner was somewhat crestfallen, but after a further bit of conversation he thought of an argument which for him established his position and closed the case.

"It must be a fossil potato," he insisted. "I found it right in my vegetable garden."

The man with his "potato" obviously did not understand very much about the subject of paleontology, which is the study of fossils. For benefit of those readers who wish to be better informed than he, the first portion of this chapter will be devoted to basic considerations of the subject.

The remains of, or the record made by an ancient living thing, constitute a fossil. The catch in this definition is the word "ancient," which is a very flexible one. In this context it is generally conceded to mean "Originating before the time of written history." Thus the footprint of some prankster in a cement sidewalk is not a fossil, but the footprint of a dinosaur is one.

Conditions Favoring Fossilization

Ordinarily when an animal dies, its flesh is eaten by scavengers, its hide and bones crumble under the combined attack of sun, rain, bacteria and chemicals. Dead plant material also decomposes and vanishes quickly. Under these conditions no fossil could form. But if the dead organism were to be protected from such thorough destruction, there would be the possibility that some record of it might remain through the ages. Quick burial in a favorable medium affords such protection. The sedentary clam living in an estuary, and overwhelmed with mud during a spring flood; the hapless beast mired in an asphalt pool; the unwary insect trapped in a secretion of resin: all of these are potential fossils. Dry sand and cave deposits also may provide protective environments. Some fossils have been preserved in more rare media, such as ice and its opposite extreme, lava. This latter occurrence is almost incredible, but it happened at least once, for a Washington rhinoceros engulfed in molten rock left behind some charred bones and the imprint of its skin in the cavity which marks where it once lay.

Those animals which possess hard parts stand the best chance of leaving behind some documentation of their existence. Fossils of entirely soft-bodied creatures have been discovered, but it is more surprising that any such animals have escaped total destruction than that so few of them have been preserved.

Categories of Fossilization

All fossils belong to one of two categories: they are either the direct remains of living things, or they are less direct evidence of this previous existence.

Remains.—The great museums of natural history in our country display reconstructions of many prehistoric animals. Often the animals have a setting which portrays the sort of enviroment in which they most probably lived. In order to make such scenes accurately it is necessary for scientists to study in detail every clue that the fossil record will yield. This is very painstaking work, and it would be a great convenience if more animals had been preserved in their natural condition. Unfortunately, actual remains are among the most rare of fossils. Perhaps the best known example is the hairy mammoths, ancient relatives of the elephant, which have been found in arctic countries with their very flesh perfectly preserved in ice and frozen soil.

By far the majority of fossils belong to the category of altered remains. These are the bones and shells which have been subjected to chemical processes in nature and have been slightly or entirely changed in composition. It is easiest to think of alteration as always involving either chemical addition or subtraction or a combination of these. What happens in any given situation depends upon the particular chemicals which waters moving through the ground carry to the potential fossil.

Bones seem to be particularly susceptible to chemical addition. This means that spaces in the bone become filled in with new material so that the end product weighs considerably more than the original, which it may otherwise resemble closely.

Shells, like bones, may remain chemically intact; but very often they are subject to "subtraction," which leaves a beautiful network of crystalline lace. Leaves and soft parts of animals, and sometimes even hard parts, may be subject to chemical subtraction which results in a thin film of carbon, often showing in faithful detail the structure of the original.

When subtraction and addition are combined, the resulting fossil is called a "replacement." The majority of direct remains exhibit some degree of this process.

*Preliminary draft of one chapter in a forthcoming Symposium to be published by the American Scientific Affiliation.

The end result may show forth the details of the original, but it is not uncommon for the details to become obscured or obliterated.

Evidences.—A certain little-used trail in the Grand Canyon of Arizona leads the hiker across an area of great sloping slabs of cream colored sandstone. Here he discovers that he is not the first living thing to cross that sand. His feet make no imprint on the long-hardened rock, but impressed distinctly into its surfaces there are footprints, tiny impressions of scurrying four-footed animals, made when the sand was soft. Although the lizards responsible have long since vanished, so clear is the record of their presence here that one can almost imagine them hiding under a sheltering bush until the intruder passes by. Foot-prints, tracks and trails, baked by the sun and buried beneath new layers of sand and mud, reveal important information about animals of bygone days.

Footprints are in reality a type of mold, an impression produced in some receptive material so as to correspond to the contours of a particular object. However, there are other sorts of molds, such as impressions of the inner and outer surfaces of a shell. Internal impressions are particularly valuable in conveying information about the soft parts of long extinct animals.

The Distribution of Fossils

Fossils are not equally distributed throughout the rocks of all time. The very oldest rocks, belonging to what is called the first era of geologic time, have never yielded any fossils. Those of the second era have scarcely more to contribute. But from the opening of the third era and onward the rocks bear testimony to the existence of abundant and diversified living things.

Fossils are found all over the world. Of course they are embedded for the most part in sandstone, shale and limestone layers, since such rocks were once sediment favorable for burying the organisms. However, the density of fossil distribution varies greatly from place to place, even within the same layer, and some sedimentary layers contain few or no fossils. There is a thick formation of sandstone which has been traced from Wisconsin to Missouri and studied rather thoroughly by experts, and yet in all that volume of rock only a meagre handful of fossils has turned up.

HISTORIC ATTITUDES

Ancient and Middle Ages

Down through the centuries men have regarded fossils as objects of special interest and have speculated with much imagination as to their origin. The ancient Greeks often attributed fossils to some sort of inorganic "plastic" force which had produced them in the rocks. However, some minds were ahead of their times. As early as the sixth century B. C. the philosopher Xenophanes, having seen shells and fish skeletons in mountains and quarries of Mediterranean islands, came to the conclusion that there must have been former advances of the sea over the region. Other thinkers independently attributed sea shells found far inland to periods of oceanic flooding. It is plain that such men regarded fossils as of organic origin, but their reasoning seems to have made little impact on others.

The notion of a plastic force persisted through the centuries and flourished during the Middle Ages when other similar ideas also gained favor. Many people thought that fossils were casualties of nature's struggle to produce living things by one method or another.

Renaissance

It was really Leonardo da Vinci, the artist and engineer, who touched off the great controversy whereby fossils came into their own. In the year 1500 while he was directing canal digging operations in northern Italy, he came across great quantities of ancient shells. These, he argued, must have belonged to animals once living there. Successive generations apparently had been overwhelmed by mud, and da Vinci described a process of replacement whereby the shells had been preserved. Perhaps because of the thorough consideration he gave these shells, the "organic theory" of fossils attracted attention as never before. Others began to write on the subject, and in 1565 a Swiss, Conrad Gesner, published what has been called "the first account of 'fossils' in essentially the modern sense,"[1] although he did include items which would not fall within the definition of fossils today.[2]

The times were ripe for scientific advance, but the new science of paleontology met head-on with the accepted teaching that the earth was but a few thousand years old, a span of time which apparently left no room for the slow process of fossilization. Many people clung to the old beliefs or invented new ones. Perhaps "God, Himself, while learning the trade of creating, first made models out of earth; those which satisfied Him were changed into living beings and the rest, or sketches, became stony fossils."[3] Or perhaps fossils were the work of the Devil to delude man. At any rate, as late as 1696 a German medical faculty declared certain fossil bones to be merely a "freak of nature," and more than one hundred years later the same sort of opinion was being taken very seriously in the New World.

As facts of geology and paleontology were amassed, attention was focused upon the possibility of attributing all fossils (and thus their enclosing rocks) to the great flood described in Genesis. This was very acceptable, for each fossil discovery could now be hailed as confirmation of the Scriptures instead of as a threat to their integrity.

"Flood geology" has continued to find favor in some

religious circles down to the present time, but it has long since been considered untenable by the great body of geologists, and by the students of Genesis, unwarranted.

Modern Period

The century from 1758 to 1859 (Linnaeus to Darwin) was crucial in the development of paleontology. It was the time of rapid accumulation of biological data, without which there could be no real understanding of fossils. The concept that living things fall into groups-within-groups was developing, and the Swedish botanist, Linnaeus, succeeded in crystallizing this into a workable system of classification which still stands today. The Linnaean classification proved to be equally applicable to both living and fossil forms, but it eventually pointed up the fact that in spite of over-all resemblances, fossils generally could not be placed in the same species as present-day types of life. In other words, the fact of the rise and extinction of species made its first impact on the scientific world and paved the way for an acceptance of evolutionary theory.

Geology, too, was advancing rapidly during this period. The discovery that the various layers of rock contain their own distinctive association of fossils raised legitimate doubt concerning the occurrence of a single chaotic period of drowning and burial as accounting for all fossils. The new knowledge also meant that scattered outcrops of rock could be recognized as belonging to the same layer by their fossil content as well as by other features. This knowledge was first applied in 1815 for tracing cross country appearances and relationships of certain English strata. With that particular study fossils passed from their old status as relics of judgment to that of valuable tools in building up the geologic picture of the world.

FOSSILS AND EVOLUTIONARY THEORY

Emergence of the Theory

The Fixity of Species Concept.—Before the eighteenth century, men were easily persuaded to believe in the frequent spontaneous generation of living things from non-living. Another favored idea of the time was that off-spring could be totally different in kind from the parental type. Not until scientific experimentation had advanced sufficiently to demonstrate, for example, that drops of water could not turn into "little green frogs" were such ideas overthrown. When it could no longer be doubted that plants and animals bred true to type, scientists rebounded to another extreme in their thinking and postulated that each of these types originally had come directly forth from the hands of God and had experienced no variation from that time to the present. This is the concept of fixity of species.

This doctrine seemed easily compatible with the Genesis record of Creation, and it was thus in a position to receive ardent support from devout men of science. Accordingly, it became very popular.

Linnaeus, whose system of classification we have mentioned above, was one of the outstanding advocates of fixity of species, and he "constantly endeavored to strengthen this opinion by his classification of fauna and flora, yet his work, in the end, had just the opposite effect."[4] As more and more plants and animals were collected in newly up-springing museums, students found that it was no simple matter to determine what actually constituted one definite species. Strong resemblances and intergradations were found to occur frequently, necessitating the drawing of arbitrary lines of separation. This did not lend support to the idea that all kinds of living things had been created distinct and had persisted without change to the present.

Undaunted by these difficulties, Baron Cuvier, a most capable and outstanding French zoologist, continued to affirm faith in the fixity of species. He was thoroughly familiar with vertebrate animals, and although he could not deny that strong resemblances did exist among them, he refused to admit that resemblance was any indication of physical relationship between groups. He preferred to regard them as variations on a theme by the Creator. Under his forceful leadership the concept of fixity was slow to die, even though more and more evidence was accumulating which made it a highly vulnerable position.

Such a divided state of affairs could not continue indefinitely. There was great need for the appearance of some sort of unifying theory which might reasonably explain the intergradation of species, as well as their rise and extinction with the passage of time. The appearance of the theory of evolution was inevitable.

The Role of Fossils in Evolutionary Theory.—As applied to organisms, the term "evolution" may have various shades of meaning. In its simplest and most narrow sense it refers to any descent with modification, the development of variations from an ancestral type. "Organic evolution may be defined as orderly change among organisms, both plants and animals."[5] In its broadest sense evolution conveys the idea that "From some geologically remote, primitive form of life all the diverse kinds of plants and animals have developed . . . by gradual and orderly change. All creatures are genetically related. . ."[6]

Since both of these definitions include a time element, it would seem that the natural starting point of the theory would have been the fossil record showing the stages which transpired from the past to the present. This was not the case. That it was not is probably due to the fact that geologic chronology was insufficiently formulated and the order in which new forms of life had appeared on the earth was imperfectly known. Under these conditions the gradual change exhibited

by fossil forms with the passing of time would have been much less obvious than the intergradation between living types. Nevertheless, we should not think that the records of ancient life did not influence the early evolutionists at all, because as Louis T. More has pointed out, "If we had not found fossils which were different from existing species, our argument for evolution would be academic, to say the least."[7]

The first really significant work on evolution was that of J. B. Lamarck which reached the attention of the world in 1801. The monumental studies he carried out in seeking to apply the Linnaean classification to all the "animals without backbones" included fossils. Gradually there unfolded before him a panorama which led him to abandon his earlier view of fixity of species in favor of variations developing over long periods of time. But, "Though he studied fossils and used them to support his evolutionary views, that development came late in his life and was a consequence rather than a cause of his advocacy of evolution."[8]

Charles Darwin likewise was aware of fossils, but in his "Origin of Species" ". . .his discussion of them is introduced by a chapter entitled, "On the Imperfection of the Geological Record," which seems to indicate that he felt the contradictions offered by fossils to his theory more keenly than he felt their support. Nevertheless he believed wholeheartedly that descent with modification had gone on throughout geologic time, for he wrote, "Hereafter we shall be compelled to acknowledge that the only distinction between species and well-marked varieties is, that the latter are known, or believed, to be connected at the present day by intermediate gradations, whereas species were formerly thus connected."[10]

Intensive study of the fossil record during the past century has brought to light much new and more detailed information. There has been a corresponding increase in emphasis upon it as the most reliable evidence that evolution has actually taken place. Julian Huxley comments, "Primary and direct evidence in favour of evolution can be furnished only by palaeontology."[11] One writer of a geology text book has said, "Although the comparative study of living animals and plants may give very convincing circumstantial evidence, fossils provide the only historical, documentary evidence that life has evolved from simpler to more and more complex forms."[12]

The Fossil Record

It is plain, then, that evolutionists feel that the fossil record validates their position. Only a thorough and impartial study of the facts can reveal the extent to which such a feeling is justified. However, in this chapter we shall only attempt to illustrate the sort of situations which are commonplace.

Life assumes myriad forms upon the earth today. Nevertheless, it is possible, though not always easy, to fit these forms into groups, the members of which resemble one another more than they resemble the members of other groups. Thus we can discriminate between the plant and animal kingdoms, and within these kingdoms we can organize major subdivisions known as phyla. The phyla in turn are composed of smaller groups, on down to the level of species and their variations. Because of this grouping within groups, any individual plant or animal is simultaneously a member of a species, a genus, a family, an order, a class and a phylum.

The fossil record is the story of the rise and fall of species. Oldest known fossils are sketchy indications of sponges, worms, sea weeds and jelly fish, but beginning with the point in geologic time known as the Cambrian period (the opening of the third era) the aspect changes from one of scarcity to one of abundance. Not only have Cambrian rocks yielded a large number of individual specimens, but representatives of a large number of diverse groups. In fact, the majority of phyla of invertebrate animals and many of their classes make their first appearance here.

Sucessively younger rocks contain even more abundant fossils, but they are not identical with those of the Cambrian. Sometimes the differences are so great that the plant or animal is classified in a group not previously encountered in the record: it is a new species introducing a new phylum or a major sub-division of an already existing phylum. Sometimes the differences are small enough that the new type can be regarded as a new species within an already existing genus.

Animals with backbones accord a simple illustration. Such creatures are unknown among the fossils of Cambrian time, but in the rocks of the following period there are fragments of a peculiar type of fish. These fish constitute several new species, but the possession of a backbone is so distinctive a characteristic that these species must be placed in a phylum separate from any previously encountered in the record. Thus the Vertabrata have their origin.

In rocks of later periods of time, species of other types of vertebrates are found and require the erection of new classes within the phylum: amphibians, reptiles, birds, and mammals in that order. Although these classes have persisted from their time of origin to the present, there has been a procession of different species maintaining them. Early forms such as dinosaurs and toothed birds seem bizarre when viewed from the standpoint of the familiar reptiles and birds of today.

The many invertebrate phyla exhibit the same phenomenon of the appearance in post-Cambrian time of new species which require the erection of classes and orders to accommodate them. Conversely, many species have become extinct subsequent to their appearance, and sometimes even higher groups disappear from the

record, though no phylum has been known to lose all of its constituent species.

For example we shall consider a portion of the Class Anthozoa of the Phylum Coelenterata. To this class belong the host of forms popularly called corals. No fossils of this class are known from Cambrian time, but they make their appearance in the layers of the next period. On the basis of their skeletal structure and manner of growth these early corals can be divided rather readily into two sub-classes which persisted through numerous geologic periods until all of the species comprising one of them (the Tabulata, according to the classification by Raymond C. Moore) died out. The other sub-class (Moore's Zoantharia) continued to the present time.

A study was made of certain of the corals (Sub-class Zoantharia) which were distributed through a thickness of 4,000 feet of ancient strata in Scotland. Representative samples were taken from four successive horizons of the strata in order from older to younger. All of the corals studied belonged to one genus, but to four different species within that genus. For the sake of simplicity we shall refer to these species as A, B, C and D.

In the lower or older layers species A, B and C were present. However, 69% of the individuals were of species A and the rest were species B except for one single specimen of species C.

At the next horizon A was virtually absent, B had dropped to 3% of the total individuals, C had risen to 69% and D made its first appearance with a strength of 28% of the total.

At the third horizon A and B were insignificant, C dropped to 20% and D was not the dominant form.

At the fourth horizon the proportion was about 5% C to 95% D.

A living coral impresses its structure, and configuration very distinctly upon its skeleton. As the animal grows, new skeletal deposits faithfully reflect the changes which occur. This means that by careful sectioning of the skeleton, it is possible to reconstruct the stages through which any individual passed en route to maturity. Examination of the corals from the sequence we are citing shows that species B passed through growth stages which correspond to the later and mature stages of species A. Species C passed through stages nearly identical to the mature forms of species A and B, in that order before reaching its own distinctive mature stage. Likewise, species D incorporated the mature forms of species B and C in its growth.

Here, then, is an intergraded series of adult corals which with the exception of species B, succeed one another as dominant forms in a sequence of populations. It is quite possible that all of these should be assigned to one species instead of four. Modern paleontologic practice would emphasize that although "species" D differs appreciably from "species" A, there is no real discontinuity from one to the other; "species" B and C are simply arbitrary units that only exist because samples were taken from four horizons in the strata instead of having one continuous sample.[13] However, this is still a good example of the rise and fall of successive types such as is encountered repeatedly in the fossil record.

Similar, but on a larger scale, is the case of the order to which the corals just discussed belong. No new species of this order are known subsequent to the close of the third era of geologic time, nor was there any carry-over of the previously extantones. The sub-class to which the order belonged continued to be represented but by entirely new species which must be placed in a new order.

Interpretation of the Evidence

It is in the light of such evidence that the question of whether or not evolution has occurred must be faced. There are three alternatives: Either 1) all species and varieties, living and fossil, are totally unrelated to one another; or, 2) all species are related by descent from one ancestral form of life; or 3) there is a limited amout of relationship among species because there has been more than one ancestral type.

Total Lack of Relationship—The idea that no species are or ever have been related to one another has already been mentioned as "the fixity of species" concept. The implication of this position is that each separate species was a direct creation of God and has maintained its identity from the beginning of the existence of life on the earth. A vast amount of understanding has arisen from the proximity of the concepts of "God" and "no variation" in this viewpoint. Many have thus presumed that any belief in a special or supernatural creation of life carries as a necessary corollary the fixity of species. It is the equating of creative activity on God's part with a strict lack of relationship among living things that has often led well-meaning Christians into positions of dogmatism and made them a needless target for ridicule. An example of this confusion is found in a standard textbook of geology, which reads, ". . .(Special) Creation assumes that each kind of animal and plant was 'molded from the dust of the Earth' and 'given the breath of life' in its present form, each being a 'special' and independent creation."[14] What the author has really defined is fixity of species. It is certainly possible to believe in a special creation without believing this.

It is easy to see that fixity of species is an unsatisfactory explanation of the fossil record on many counts. For example, as pointed out above, even those who held rigidly to it encountered difficulty in the

attempt to recognize the supposedly distinct species. Shall corals A to D be considered as four species, or one? The Linnaean practice was to classify plants and animals purely on the basis of similarities to and differences from an ideal (and generally non-existent) type. This would most probably favor the erection of four species at the cost of disregarding both the striking similarities of growth stages which all pass through and the progressive sequence exhibited by the dominant forms of the successive layers. These things must then be attributed to coincidence or to the whim of God, neither of which is particularly credible.

If corals A to D were regarded as one species, then it would be ridiculous to talk about fixity. The group would be exhibiting more internal variation than could be compatible with the idea of undeviating forms set forth from the hand of the Creator.

The origin of such a form as coral D also presents a problem to proponents of fixity. Since D was not found in the lowest layer of the series, it is necessary to say that it immigrated from elsewhere. Again, the fact that it arrived just in time to become the dominant form culminating a progressive sequence must have been merely fortuitous.

Invoking immigration to account for the appearance of new forms was the idea to which the learned Cuvier clung. His pupil, Louis Agassiz, recognized some of the difficulties inherent in it, and he proposed that new forms were direct creations of God which came into being subsequent to the original Creation. Both of these men believed in cataclysmic floods as accounting for the extinction of any group and thus preparing the way for immigration or re-creation.

Accumulation of geologic and paleontologic data made it obvious that a fantastic number of cataclysms and re-creations would be required to account for the facts, and this school of "catastrophism" fell into disrepute by the middle of the nineteenth century. Cuvier, Agassiz and their followers were the last scientists who made any serious attempt to champion the cause of fixity of species.

Ultimate Relationship of all Living Things.—Diametrically opposed to the concept of fixity of species is the belief that all things which have ever lived have been related to one another through a meshwork of common ancestry. This is the most comprehensive form of evolutionary theory and is what is usually meant by that term.

It is easy to understand why so many students of paleontology feel that the ultimate conclusion urged upon them by the facts is the relationship of all things. Considering the case cited of corals, even the most conservative person would have little hesitation about regarding members of species A to D as close relatives. The strong resemblances and the carry-over from one population to the next in this and other examples implies that the successive species had much in common genetically, so much so that "to decide where in a graded series to draw a specific boundary is a vexing if not insoluble problem."[15]

The original Linnaean concept of classification was essentially devoid of any idea of relationship through descent. The modern concept is that members of a group are similar to one another because they are related. If this makes sense for a sequence such as the corals, how far shall the principle be extended? If all the species of a given genus are related, and all the genera of a given family are related, where or why shall a line be drawn to say "This group is totally unrelated to that one."

The evolutionist feels that such line drawing is artificial, even when it is not possible to demonstrate the intermediate forms whereby one group received its inheritance from another. Darwin wrote, ". . .I cannot doubt that the theory of descent with modification embraces all the members of the same great class or kingdom. I believe that animals are descended from at most only four or five progenitors, and plants from an equal or lesser number. Analogy would lead me one step farther, namely, to the belief that all animals and plants are descended from some one prototype."[16] Writing in 1951, G. G. Simpson states. "No one seriously doubts that the whole of life has factually been a continuum of populations when the whole sequence is considered, in spite of the innumerable discontinuities in the record."[17]

Limited Relationship.—In spite of Simpson's sweeping assertion, there are some who seriously doubt that the whole life has been a continuum of populations. Since the fossil record opens with the majority of phyla already in existence, it is at least permissible to question the assumption that in earlier ages these phyla converged backward toward one primeval ancestor. Also, within the phyla there are many discontinuities between various groups of species. This is illustrated by the two orders of corals mentioned above, one becoming extinct at the close of the third era, the other appearing in the fourth era. The question then arises whether these groups had a common ancestor in Cambrian or Pro-Cambrian time and one group simply did not secrete skeletons capable of fossilization until late in its history; or whether species of the second group are descended from those of the first but the intermediate forms have not been found; or whether the two orders represent lineages which have always been genetically distinct but within which there has been ample variation. This latter interpretation. of course, would fall under the heading of "limited relationship," the hypothesis that various groups arose independently of others and have undergone considerable internal modification.

Another example of discontinuity comes from the

angiosperms or plants which bear covered seeds. This great group, which includes grasses, flowers and hardwood trees, appears very suddenly in the fossil record, late in the fourth era. Its ancestry is one of the puzzles of paleontology. A recent student has commented, "Answers might be found more readily if the ancestral group or groups were known within the gymnosperms, or if, within the record of the angiosperms themselves there were fossils which pointed to these groups. But it is now generally conceded that no known type, fossil or living, can fill this key position."[18]

Such discontinuities or gaps are frequent at the level of orders, more frequent at the level of classes and almost invariable between phyla. The thorough-going evolutionist will frankly admit that on the higher levels, "transitional sequences are not merely rare, but are virtually absent" and that this absence "does require some attempt at special explanation."[19] The explanation takes the form that transitional types between major groups could not be expected as fossils, or at most would be very rare finds. This is attributed to the probability that transitional forms must have been few in number and undergoing very rapid change. Since fossilization is at best so fortuitous an event, it would be extremely unlikely that any but a very few of the transitional forms would have been preserved, and still more unlikely that any would be found today.

In speaking of these who emphasize the sudden appearance of new forms, Simpson writes, "We know as a fact that change *often* occurred gradually through successive populations overlapping in variation. We know that this is a *possible* explanation for all changes shown in the fossil record. We also know as a fact that abrupt change often did *not* occur. We do not know positively that it *ever* occurred. Is it logical to conclude that the latter process was usual or important in evolution?"[20] Although he has reference here to those evolutionists who do not agree with his conviction that life evolved always by gradual changes, his remarks also have pertinence for those who favor the concept of limited relationships.

The idea of limited relationship is not new. In the quotation given above Darwin indicated his feeling that this is where the facts led and that further relationship could only be inferred by analogy. He then admitted, "But analogy may be a deceitful guide."[21] Nevertheless, this possible deception apparently did not worry him much!

It is possible, if not very edifying, to quibble extensively over whether the concept of limited relationship is not actually just a conservative form of the theory of organic evolution. The thorough-going evolutionist will declare that in the long run it makes little difference whether there was one original ancestor or several. In either case forces have been in operation which have modified the descendants and given rise to new species, which is the essential point. However, if evolution is so defined as to indicate that all living things have sprung from one type, then the concept of limited relationship cannot be considered an evolutionary theory. However, if evolution is so defined as to indicate that all living things have sprung from one type, then the concept of limited relationship cannot be considered an evolutionary theory.

It should be made clear that those who subscribe to limited relationship do not venture to say how many original types there may have been. This is, after all, rather immaterial to the position.

What Do Fossils Prove?

We have seen that evolutionists regard the fossil record as a final court of appeal in substantiation of theory. Whatever difficulties there may be in determining the how and why of evolution from the study of living things, always the evidence of the fossils stands to confirm the fact that multitudinous changes have occurred through the ages. It is in this light that fossils are often referred to as "the documents of evolution," as, for example, in the following quotation. "In the study of embryology and comparative anatomy we have only circumstantial evidence of evolution, but in the fossil remains of evolving series we have the actual documentary evidence that the changes have occurred."[22] The logical fallacy of this particular statement is apparent, for the thing to be proved is already assumed, *i. e.,* you cannot appeal to "evolving series" of fossils as proof of evolution.

In all honesty it must be conceded that fossil series, too, are circumstantial evidence which permit an evolutionary interpretation—and many feel even demand it—but cannot in and of themselves close the issue. To a large extent the basic philosophy of an individual will enter into his consideration of the fossil record. As one professor of paleontology remarked, "You can 'prove' almost anything you want to from fossils."

The paleontologist cannot experiment with his data as can the biologist He is limited to observing that certain forms occurred at such a time and place, and subsequently they were joined or replaced by other similar or dissimilar forms. He can and does analyze populations of fossils statistically; he can examine fossil progressions in the light of modern genetic knowledge; he can study the relationship of newly appearing forms to the environment in which they flourished; he can decide what interpretations and conclusions seem most compatible with the data and most reasonable to him. But in the last analysis he is still dealing with probabilities, not with empirical evidence.

We turn to Shull, a modern defender of evolution, for an appraisal of the situation. He declares, after reviewing the fossil record for his readers, "Biologists

have *assumed* genetic continuity because the alternative explanations have seemed incredible or impossible."[23] (Italics ours). This is as fair a statement as one will find anywhere on this subject.

Fossils do not prove evolution. Neither do they disprove it. They certainly strongly suggest that a considerable amount of descent with modification has transpired. They also exhibit a lack of transitional forms which may or may not be significant of limits of relationship.

Fossils And Special Revelation

It is commonplace in geologic and paleontologic literature for the authors to mention the supposed futility of seeking correlation between the fossil record and the scriptural record of life's origin. For them modern geologic knowledge has consigned all such investigation to the level of medieval thinking and those who accept the Biblical account are dismissed with sarcastic comment, or at best pity.

It is safe to assert that the majority of those who thus scoff do so because they believe in evolution, and on the other hand, regard Genesis as teaching the fixity of species which were created in six days some 6,000 years ago. Louis T. More in his critique of evolution says Genesis presents "an undoubted denial of the transmutation of species."[24]

A careful and unprejudiced study of Genesis, chapter one is essential to establish what actually is said and, equally important, what is not said, as it has bearing upon the fossil record.

On the positive side, Genesis primarily points out that God is the Initiator of the myriad forms of life on earth in their original condition. The account of this activity of His is general, not specific. A few representative groups of plants and animals are mentioned. They are presented as appearing successively, not contemporaneously. There is progress from plant life through to those forms of animal life which we regard as "higher," culminating in man. They are fashioned so as to reproduce "after their kind."

There are strong hints in the account that God's creative activity was a process involving time and materials. In the case of man this is definitely indicated, but literal translation also points to it in the other phases of creation. In connection with plants the words say literally, "the earth caused to go forth grass of herbage," etc.[25] In connection with land animals we are shown the interaction of God's activity with the process which He ordained: God said, "The earth shall cause to go forth living soul. . .and God made the beast of the earth."[26]

Certainly none of this is at variance with the testimony of fossils.

There is much left unsaid in the Genesis account. In its grand outlines we are not told how long ago God began His creative activity, but merely that it was "in the beginning."

The account does not state that the various groups mentioned appeared with their full complement of constituent types and members, nor is any indication given of the time involved in attaining this complement. For example, although the "beasts of the earth" were caused to appear at some specific point in time, there is nothing which demands the belief that all types of animals which ever fit this general category appeared at that very time. Again, when God finished creating the group "mankind" there were only two individuals in it. The many races of mankind which exist today must have developed subsequently.

The possible degree of variation within the groups mentioned is not discussed, but the injunction to reproduce according to kind could not possibly indicate fixity of species. The word translated "kind" is a very broad one and is not the equivalent of the modern technical term "species."

The record does not even mention sea plants nor invertebrate animals. These striking omissions certainly indicate that Genesis One was not intended to be a comprehensive survey but only a suggestive outline.

On all of these points there is no lack of harmony between fossils and the sacred revelation. What is unequivocal in each can be accepted freely without undermining or detracting from the other. The points of friction between them are thus reduced to two considerations which can be presented in the form of questions: 1) What is the meaning of the six days of Genesis One? 2) How much, if any, descent with modification is implicit in the phrase, "after its kind"?

It is not within the scope of this chapter to discuss the already much-discussed word "day," with all of its possible meanings. Suffice it to point out that the Scripture does not say there were six immediately consecutive days on which instantaneous and complete creation occurred. Therefore there is no real conflict with the appearance of different fossil forms at different times throughout long ages. To the present author a plausible view is that the days in question were literal ones upon which God revealed some phase of His creative activity to a particular individual who presented them arranged according to topic and in poetic form. Others deplore this viewpoint, and it is certainly not the only acceptable one.[27]

In connection with the phrase "after its kind" we have emphasized that this cannot refer to species as we regard them. Therefore it must describe some other sort of genetic boundary or situation. Since the fossil record does contain profound and persistent gaps between otherwise reasonably complete sequences, it is an easy step to equate the genetic boundaries (if such they be) with these gaps. Then Scripture allows and fossils show considerable descent with modification. In

this view, which will be recognized as an adaptation of "limited relationship," each gap indicates a point where God intervened directly to start a new group on its way.

The chief objection to this view is that it is based on negative evidence, that is, absence of fossils. However, not even the most ardent evolutionary paleontologist anticipates that more than a few of the missing forms will ever be filled in by further discoveries. He crosses the gaps by faith in the principle of evolution because that seems a more realistic recourse to him than to invoke direct intervention from God.

We can never be entirely certain just which gaps or discontinuities of record are real and which reflect the insufficiency of fossil collections. Likewise, one can never be dogmatic concerning just where the various groups of Genesis One fit into modern classification.

It is entirely possible that the phrase "after its kind" refers to some laws of reproduction whose functioning is not necessarily discernible from the fossil record. If this is the case, there is no limitation at all upon the amount of evolution which could be compatible with the Genesis account. The phrases "God said .. the earth caused and God made" may well refer to evolutionary processes with the emphasis upon the fact that "without Him was not anything made that was made."[28]

In conclusion we may state that fossils give absolutely no ground for losing faith in the inspired character of the Genesis chronicle. Neither do they provide startling confirmation of it. Perhaps the most that can be said is that these two are complementary aspects of the same truths.

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An Excerpt from A Talk Presented Before the American Scientific Affiliation

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During the past ten years I have been interested in the effects of ionizing irradiation on living cells. The many facets of the problem revealed some interesting facts. It was found that the various biological principles were differentially effected by irradiation. The capacity of the cells to differentiate into tissue formation was the most susceptible principle. At a higher irradiation dose cell division was abolished. At a much higher dose the capacity of the cells to anabolize was injured. Very high doses were required to stop energy metabolism or catabolism. We were able to upset the processes of tissue induction so that many terata were produced with very low doses of x-irradiation. These anomalies were not transmitted to the progeny.

It is known that experimentally or naturally occuring radiations cause some gene mutations which are transmitted to the progeny. Mutations also occur through chemical action of some mutagenic chemicals such as nitrogen mustards. Etymologically the term mutation denotes a change, and it implies that the change can be an addition or a deletion of the gene transmissible from the parent to the progeny subject to genetic laws. To date every viable mutation on record has been a deletion. I have challenged biologists to show me a single case of advance through mutations but after twenty years of challenging no one has produced the evidence. Most of the biologists assume that such mutations are present but they do not know of any specific case. This fallacy is accepted by faith. There is not a single case in which the mutant shows the addition of a character formed *de novo* which was absent in the parental generation. In addition to genetic mutations that are either lethal or else their presence is derived mathematically and not teleologically. In either case propagation of progeny from nonexistent parents is an impossibility. The proponents of the theory of evolution are aware of the above facts, and they themselves state that evolution through mutations by deletions ad infinitum is absurd. Yet they also know that without an additive change evolution is impossible. They discard their experimental facts and assume that improvement through mutations must occur. It is not therefore peculiar that after 100 years of experimentation and fact-finding that the subject remains a theory.

A supposition is a belief and must be accepted by faith. The subject of evolution then is not a science but a religion accepted by faith. This religion denies the existence of God, professes initial spontaneity, hopes for advance through mutations, has its reward in deletions, and is crowned with translocations and lethal genes. Can one reconcile such a religion with Christianity? —Choose you this day whom ye will serve ; — — as for me and my house, we will serve the Lord. (Josh. 24:15).

If you read Julian Huxley, P. A. Moody, G. G. Simpson, T. Dobzhansky, and others and you will find the following statements. The mathematical odds of a man, a mammal, or a fruitfly coming into existence accidentally by the united effects of all the mutations in one group of animals is represented by a number so large that it would fill a large novel with naughts. Or, a number larger then all the electrons and protons in the known universe. They postulate that selection must have taken place. Nothing is said concerning the mode of selection or the probability of mutant alleles in two different animals occuring and finding each other simultaneously. They state that favorable mutations occur at a rate of one per 100,000 and two in $100{,}000^2$, and twenty mutations in one animal that may show a difference has a chance of one in 1×10^{25}. They admit that such odds are ridiculous. These probabilities are discarded and hope is based upon the improbabilities.

If a cell is irradiated for a long period one would expect some mutations to occur. The primordia of the *Sequoia gigantea* have been irradiated by cosmic, nuclide, and ultraviolet rays for two thousand years. Since both the male and female gametes are found on the same plant there is an effective irradiation of four thousand years. Some deletions may have produced nonviable seeds, but the fertile seeds produce trees identical to the parent tree. The fit survive because they have the attributes of their parents. Others have become unfit through deletions.

The theory of evolution postulates that ontogeny recapitulates phylogeny. If the higher phyla evolved they must have evolved through mutations. Mutations are invariably recessive. Further mutations should cause decapitulation. Of the thousands of observations decapitulation has not been observed or produced experimentally.

The latest avenue of escape for the theory of evolution is the proposition that the species were formed through an explosive event. If we must call it an explosion, the Bible notes six explosions during the time of creation whose exploder is the Triune God.

Carbon dating has not found anything older than 20,000 years. Those items found to be older than

10,000 years are invariably of plant origin. (See Libby 1952).

I was disturbed with Dr. Adolph's reconciliation of the theory of evolution with the Bible (See J.A.S.A. vol. 8, no. 3). He implies that Heb. 11:3, shows that men may have evolved. On the contrary man thinks that evolution happened but the Bible states that he was created by God. Jesus said God made them male and female (Matth. 19:4). The presence of fossils in various geological strata is explained by the destruction of pre-Adamic life (Jer. 4:23-26). The Lord also turned the earth upside down (Isa. 24:1). In antithesis to Dr. Adolph's explanation of Psalms 139: 15-16 after praying I prefer to read it thus: My *substance* (mortality to immortality) was not *hid* from thee (it was predestined), when I was made in secret, and curiously *wrought* (immorality wrought through His faithfulness) in the *lowest parts of the earth* (He descended into hell with my sins). Thine eyes did see my *substance* (immortal Bride of Christ), yet being *unperfect* (while the number of the chosen for the formation of the Bride of Christ is not completed); and in *thy book* (book of life)) *all my members* (the chosen) were written, which *in continuance were fashioned* (Christ's Bride is fashioned in continuance by the addition of the saints from every generation), *when as yet there was none of them* (elected even before our existence).

In conclusion my prayer may be as stated in I Cor. 2:5 "That your faith should not stand in the wisdom of men, but in the power of God."

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ANTHROPOLOGY

James O. Buswell III, M.A.

Neanderthal Man Straightens Up!

On December 27, 1956 in New York City, section H (anthropology) of the American Association for the Advancement of Science commemorated "the 100th anniversary of the discovery of the Neanderthal man" by a symposium presented at the 123rd annual meeting of the association.

Papers were presented by well-chosen leaders in the field of human paleontology. Loren C. Eisely, University of Pennsylvania, commenced with an excellent historical orientation "Neanderthal Man and the Dawn of Human Paleontology." The material culture associated with Neanderthal was the subject of Hallam L. Movius, Jr., of Harvard.

With unusual breath and brilliance for his years F. Clark Howell of the University of Chicago discussed the ticklish problem of the Neanderthaloid of Southwestern Asia and their relationship to classic types of Western Europe.

"Some Observations on the Pathology of the Neanderthal Man" were made by William L. Straus, Jr., of John Hopkins University. The session was concluded by a brief discussion of the significance of alledged "American Neanderthaloids" by T. Dale Stewart of U. S. National Museum in Washington.

Of greatest significance was Professor Straus's presentation of the results of recent re-examinations of the famous "old" man of La Chapelle aux Saints. These were the remains upon whose reconstruction Boule, in 1911-13, based his long-famous picture of the Neanderthal posture: stooped, with head thrust forward, knees bent, stupid expression and all. No cervical curvature and very slight, if any, lumbar curvature of the spinal column was long believed to be the chief explanation for this.

Straus reported, however, that there was abundant evidence of advanced osteo-arthritis in La Chapelle mandible and throughout the post-cranial skeleton. The vertebrae not only revealed marked "lipping" and deformation, but indicate as well, significantly faulty repair on the part of the investigators. It was pointed out that recently Aramburg and Schultz have seriously questioned the "naturalness of semi-erect posture in an habitually bipedal stance." Furthermore, Aramburg has shown that modern man has frequently the same form of vertebrae as La Chapelle proving that it was not a Simian feature as Boule had thought.

Professor Straus concluded by stating that "there is nothing about Neanderthal man that would necessarily cause him to walk any differently than ourselves." ..

This new development in human paleontology will no doubt have some serious implications for some evolutionist's theories. An entire "stage" of human evolution for some, will be automatically eliminated.

For the creationist position, however, it merely necessitates reappraisal of the data at hand, and allows for a strengthening of the position that man has always been "man" as far back as the evidence goes.

Of course, there are some who have always included the Neanderthal man with the *Homo sapiens*, but this recent re-examination by Professor Straus would seem to make entirely unnecessary the taxonomic creation of a separate species for Neanderthal man. Of course the distinctive skeletal features of the skull: the extreme supra-orbital ridge, the heavy bones, no chin, etc. still remain as the hallmarks, so to speak, of early man. These are in no way indicative of any qualitative differences.

Wheaton College
Wheaton, Illinois
February 4, 1957

BIOLOGY

I. W. Knobloch, Ph.D.

The Crisis In the Science And Engineering Fields

Millions of words have been ground from the literary mills of the country about the shortage of scientists and engineers. This shortage has been known from the 1940's at least as witnessed by John Steelman's report to the President in 1947. To say that there is alarm about the matter is to put it mildly. The reasons for the concern are mainly two-fold in nature, (1) not enough of these people are being graduated to adequately staff the colleges and lower schools and also supply the needs of industry and government and (2) fear that Russia is either catching up to us, or as some believe, outstripping us in scientific and technical personnel.

Before saying anything about the college teacher shortage, it may be in order to dwell briefly upon the shortages in the elementary and secondary schools. The supply is short there in some areas, particularly in the science fields. This concerns us greatly because it is in the schools that the first real directed interests in science are started. It is my understanding that many high school teachers who were not majors in science have been pressed into service, especially in the smaller schools. This will not work any better than substituting dentists for physicans. They simply do not have the proper training. English majors, for example, who are forced to teach science are, in some cases, apathetic in their work and this attitude is quickly transferred to

the bright perceiving eyes of the young. There is ample evidence that professional scientific and engineering organizations are at long last bestirring themselves to assure an adequate supply of the needed teachers at all levels. The insistence of these groups upon adequately-trained teachers is, in some quarters, meeting opposition from the entrenched professional educators who have long and erroneously regarded teacher training in both methodology and subject matter as their sole responsibility. It is to be fervently hoped that before long the truce flags will be unfurled and that educators of *both* sides will sit down in harmony and without reservation to produce some adequate long-range plans for a balanced teacher-training program.

In regard to the teacher shortage in the colleges, one may say that in certain sciences like physics and chemistry, and in the allied field of mathematics, the shortages are acute. This is true to a certain extent in the biological sciences if one grants that the required degree is the Ph.D. This is a sensitive subject with some who could not or would not work for the terminal degree. It is sufficient to say, therefore; that if college science teaching is to be a recognized profession one must have a certain minimal amount of training.

Teacher training programs are not enrolling as high a percentage of would-be science teachers as they did. This may be due to such factors as the de-emphasis of science teaching in many high schools, poor guidance programs, lack of suitable science courses in the summer schools and general laziness. Enough has been said about the need for teachers to outline the general situation.

The second point is of equal importance. James Barker (1955) said that in the United States, the percentage of total collegiate population represented by the science and engineering students has fallen from 17% to 10% in recent years. In the Soviet Union, the percentages are *increasing* rapidly and the prestige and salaries of both teachers and researchers are rising. According to the National Science Foundation, there are 200,000 scientists in the United States. Fifty-five percent of the total are in the physical sciences, 39 percent in agricultural and biological sciences and 6 percent in the earth sciences. Industry, which employs almost half of the total has been accused of raiding the colleges for talent much as the major league scouts strip the colleges of their best athletic talent. Progressive industrial leaders now realize that they must not kill the goose which lays the golden eggs and they are actively trying to shorten the gap between supply and demand (by assuring their own talent through scholarship programs.)

Right or wrong, this is an age of science and technology. To speak plainly, it is the military implications which we are facing in this battle for adequate supplies of scientists and engineers. One is not an alarmist when one points out that the survival and supremacy of the United States depends upon keeping several steps ahead of our rivals in the fields of science. Science should only be used for the pursuit of truth but, alas, such cannot be the case, much as we might wish it. We also know that unless America is kept strong and healthy, the government will become impotent and one will not be *allowed* to search for truth in fundamental fields.

The above paragraphs, then, tell something of the shortage and the reasons for concern. Of proposed remedies, there are scores. It would be almost impossible to make a complete list of these. A sampling might, however, be in order. John Steelman's report to the President lists some solutions and various chapters of Sigma Xi have recently given others. The seemingly more important solutions are given below but edited and not necessarily in order of their importance. No one is a complete solution. All apply to some facet or facets of the general problem and all need to be considered carefully.

Proposed Remedies For Meeting the Scientist and Engineer Shortage

1. Strengthen career information service by issuing up-to-date brochures; have science faculty men give talks before high school groups; write newspaper and magazine articles on the science crisis; originate interesting TV programs on careers in science and engineering; maintain an information booth at science fairs and everywhere else appropriate.
2. Help in the organization of a science club at each large high school; strengthen the work of the Junior Academies of Science.
3. Discussion of the science crisis in their classes by every science teacher at both the high school and the college level.
4. Restore the laboratory period where it has been abolished; properly equip the laboratories and reserve rooms for science to save time lugging equipment from one room to the next.
5. Relieve teachers from selling child insurance, taking tickets, running the book store and other unprofessional chores.
6. Do not cancel high school science courses because of low enrollment. Build up the enrollment by doing better teaching.
7. Encourage industry, government laboratories, college departments etc. to hire science teachers in the summer months and discourage them from unduly raiding the campuses.
8. Separate science from social studies where they are given together in order to give emphasis to each.
9. Have general science in the elementary grades and require more specialized subjects in the high

schools for graduation. It would seem that every high school graduate should have, at least, one course in chemistry, physics and biology.

10. Give more guidance to sub-standard science teachers; offer refresher courses to regular science teachers to help them keep abreast of new developments;promote science courses from in-service teachers to make them eligible for graduate work (this means increasing the subject matter offerings in summer schools) ; brief guidance people on the crisis in science.

11. Continued cooperation among the American Association for the Advancement of Science, the Engineering Manpower Commission, the Scientific Manpower commission, the American Chemical Society, the American Mathematical Society, and others.

12. Raise college admission standards to the extent that entering students must have had some science in high school.

13. College teachers should work with high school science teachers to encourage every student who shows promise in science and who has the desire, to go on in the field. Every such student should be salvaged.

14. Make certain that every promising and desirous science student will be offered some financial assistance to go on in science should his parents be unable to pay all of his way.

15. Spend more time and money on recruiting new science teachers and less, if necessary, on improving those already in service. This is not based upon importance but on doing first things first.

16. Encourage scientists to run for State Board of Education and for school boards so that science may be fairly represented.

17. Stop drafting college students majoring in science or engineering. Such people can best serve their country in these fields at a time like this. Wars are won in the laboratory and not necessarily on the battlefield. There is nothing undemocratic about fitting people in the niche where they can best serve.

18. Raise teacher's salaries stepwise and according to training so that teachers will recover their buying power, at least, of the 1939 era.

Some of the above are short term projects and others look toward the future. I would like to say just a few words about some of the things that should be done *at once.*

A science club is a necessity if one is to capture the interests of the would-be scientist. The modern world is so full of diversions and teachers are so rushed that it takes a real effort to form and hold together a group of youngsters. The quality of a club can be high or low depending upon the quality of the leader. With good guidance, I feel that many, many students could be encouraged to go further into science or engineering. If a high school teacher is not available, the local college talent should be scrutinized or some local amateur scientist can be recruited.

Everyone should know something of this scientific age in which we live. Call it cosmic consciousness if you will. For this reason science should be compulsory in the upper grades of the elementary school and also, of course, in the high schools. Science can be learned by observation but one's observations must be tested. This means that, in the high school at least, there must be laboratories where experiments can be made. This is learning by doing. Some studies have shown that it costs little if any more to teach science classes than any other type of class. I would urge therefore that science be restored to those curricula where it has been abandoned and that science be no divorced from the laboratory.

I believe that another very good, immediate step would be for the local college science teacher or teachers to obtain a list of promising science students from the high school teachers. These students should then be contacted and talked with in a friendly fashion. This might be called salesmanship but since many other interests are contacting students, it seems imperative that scientists make an active effort to get their fair share of the high school graduates. The financial condition of the students can be learned during the course of the talk and possibilities can be explored of obtaining some financial assistance for those who could not otherwise go to college.

Teachers and religious people are doing the most important long term work now being done in the world. These people should be receiving the highest wages rather than those who simply make us cry or laugh. The American people must take another long look at this problem and, even if they must cut some of the "necessities" of life, they must raise teachers salaries much, much higher than they are, probably twenty percent. Teachers of course, must be well prepared and competent in both subject matter and methodology. Teaching is a profession and demands the highest type of knowledge and skill. At the college and university level, the teacher must gain the professional degree that goes with his field. In most cases this means the Doctor of Philosophy degree. Physicians are not allowed to practice without their M. D. degree. It is a most hopeful sign that requirements are going up in the colleges in regard to the higher degrees, or, at least they were until the tidal wave hit the colleges. Professional status of the profession and the respect that goes with it, have taken a set-back in recent years. The plain fact is that in many fields there are just not enough Ph.D's to go around. The reason that we dwell upon this matter is that the point emphasizes the shortage of trained personnel.

I would urge therefore that the four steps (science

clubs, compulsory science in the high schools, personal contact and higher salaries) outlined above be put into action as soon as possible by high schools and college people and by the public. I believe that they show the most promise for the present. Soon, it can be hoped, some or all of the other steps can be implemented.

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East Lansing, Michigan
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PHILOSOPHY

Robert D. Knudsen, S.T.M.

Beyond Existentialism?

In an early column I ventured to express the opinion that the existentialist philosophy might already have reached its high point and that movements were under way that would overcome it. Even a cursory look at the list of recent publications in philosophy would seem to deny this statement altogether. One is struck by the widespread interest in the existentialist problematic. Existentialism is in the mode. There is a flow of literature not only in German and French but also in the Scandinavian languages, Dutch, Italian, Spanish and Portuguese. Some of the works in Spanish and Portuguese, interestingly enough, come from South America. There has been increased activity in Scandinavia since the second war in the study of Kierkegaard. Writing in the *Tijdschrift voor Philosophie* (Mar., 1956), Bernard Delfgaauw expresses the opinion that the center of Kierkegaard study has shifted from Germany to the Scandinavian countries, and especially to Denmark. In our country the existentialist movement is making itself felt in a more extensive way. As would be expected the spearhead of the invasion has come through theology. Some theological students are inclined, I fear, to place Kierkegaard's works on a par with the Bible for devotional reading. More to the point philosophically speaking is the fact that various prominent philosophy of religion departments (e.g., Columbia and Princeton) have men who are strongly influenced by existentialistic theology. We can also note that the latest volume of the Library of Living Philosophy (ed., Schlipp) is devoted to the philosophy of Karl Jaspers, who is one of the original founders of contemporary existential thinking.

A crescendo of interest in something, however, does not mean that there are not forces at work to undermine it. When the public at large becomes quite interested in a bullish market, the bears began sharpening their claws. Though there is rather a crescendo than an abatement of interest in Existentialism, there are clear signs of a reaction. I am not referring primarily to those who like the official Catholic theology and the majority of orthodox Protestants have found the existentialistic position inimical to their convictions and who have rejected it out of dogmatic considerations if nothing else, but I refer to a number of philosophers who have worked through existentialist thought and who are trying to overcome it while preserving what they consider to be real insights which it has attained.

An instance of the foregoing is the work of Otto Friedrich Bollnow. His small book, *Existenzphilosophie* (Stuttgart: Kohlhammer, 4th ed., 1955), not only characterizes existentialistic thought in a concise and striking way but also presents his strictures against it, which he has developed in more detail in his recent book, *Neue Geborgenheit.*

Bellnow approaches Existentialism in a pregnant way as a radicalization of Lebensphilosophie and as an attempt to overcome the nihilistic effect of historicism. He says that the contemporary existentialistic philosophy arose on the background of the historicism and relativism in Germany after the first world war, when all established values and institutions were threatened to be engulfed. This relativism and nihilism was not restricted to a few isolated scholars but reached down and gravely unsettled daily life. A quotation from his *Existenzphilosophie* at once indicates his approach and is a clear pointer to the significance of the idea, "Existenz." Because of the crisis "...there inevitably had to arise the desire for an ultimate, unconditioned handhold (Halt), which could not be affected by the general disintegration. And since man had become disillusioned with every objective faith and everything had become doubtful for him, since all contentful sources of meaning (Sinngebungen) in life had been thrown into question by relativism, there remained only the retreat into one's own inner life (eigne Innere), in order to discover there in an ultimate depth which preceded all established contents (Festlegungen) the position that was no longer to be found in an objective world order (Weltordnung). This ultimate, most intimate core of man was designated by the concept taken over from Soren Kierkegaard, "Existenz." (Bollnow, *Existenzphilosoprie,* p. 13).

Bollnow is of the opinion that a thorough critical discussion of contemporary Existentialism is now even

more necessary than when it first arose between the two world wars. Its very nature is such that it demands to be overcome. He says, "The Existenzphilosophie has in its consequences led into such an impasse that the problem of surmounting it has forced its way into the focus of the contemporary philosophical problematic" (*Ibid.*, p. 9). Bollnow himself tries to overcome Existentialism, while preserving what he thinks are real gains that it has made.

Bollnow spots this impasse in the formal and contentless character of the Existenz-idea, and in the fact that the existential experience cannot have any duration. He sees rightly that the Existenz-idea must be contrasted to all content. By this he means that Existenz stands over against any world view, any system of values, any program, etc. It is to provide the handhold beyond the relativizing of all contentful standpoints.

In this connection we can observe that Jaspers says that it is in Existenz that the highest content is found. But Bollnow means, I believe, that Existenz gives us no criterion for our action, and in this sense the Existenze-idea is certainly empty. Even the highest goal of the Existentialist, the riskful engagement of the entire person in decisive action (Entschlossenheit), is found by Bollnow to be threatened by degeneracy into an empty adventurousness. What is to determine the content, the direction, of this heroic effort? It has already degenerated in Camus' image of the "absurd hero" (*Ibid.*, p. 131). He says, "...committing oneself in this way can be genuine and responsible only when it is undergirded by a definite, contentful faith" (*Ibid.*, p. 130).

Bollnow concludes that the Existenz idea taken in its purity must of necessity be transcended. One must gain a new, contentful faith. "Ohne sie wurde die existentielle Entschlossenheit selber zum leeren Abenteurertum zerfallen und der unbedingte Einsatz in jedem Augenblick ohne zeitlich Bestandigkeit und ohne Treue bleiben" (*Ibid.*, p. 131).

Bollow is not satisfied with a view point that would merely retain a polar tension between Existenz and content (*Ibid.*, p. 134). Quite out of keeping with an existentialist position, he says that there must be the development of a new world and life view, which can answer the question of content and thus of meaning. He discovers, however, in the major existentialists themselves the attempt to overcome the problems inherent in Existentialism. There have been important modifications of their positions.

I sincerely believe that there are insights in existentialistic thought which Christians can appreciate and which indeed are very close to Biblical thought. We need only remember that Kierkegaard's thought was supposed to be in the service of Christianity. But I just as sincerely believe that the Christian must detach these truths from the existentialistic mould in which they come. It is difficult to sympathize with those Christians who speak glibly about existential earnestness, when they mean something like the following: that one has been struck *personally by the meaning* of some objective truth, e.g., the resurrection. That is not using the word "existential" in an existentialistic way. "Existential" cannot refer to the application of an objective, general truth, which is valid prior to its appropriation. It does not even refer to the fact that one must have "faith" to see the truth of something like the resurrection, which happened and has a meaning whether you or I know any thing about it or believe in it. A careful reading of Bollnow's book should convince one of these facts, and should contribute to a more careful use of the idea of Existenz among Christians. It should also give the Christian student of philosophy an insight into another area where he can bring to bear the truths which are graciously given him by divine revelation.

Schiedam, Holland
February 2, 1957

PSYCHOLOGY

P. D. Marquart, M.D.

Can Jesus Solve Maladjustments?

Among Christian believer, I frequently hear some form of this rather unthinking question:

Is not all psychoneurosis due to sin in the life?

Is not neurosis always a reaction or response to guilt?

Doesn't it prove that a man lacks spirituality if he is neurotic?

The answer to all these questions is "No," though guilt is, however, a frequent response accompanying neurotic behavior. Some mental trouble is due to organic factors, in fact such organic and physical causes can in their turn increase a person's stress and tension. Not all functional (i.e. psychological) maladjustments are due to sin either.

I am reminded of the remark of a church member when asked whether he might be interested in a Gospel witness group who were actually working with patients inside a mental hospital. He said, "I'm not at all interested in such a group. All that mental disease is due to sin, you know." His remark was not necessarily true, but, if it were, that fact should tend to accelerate the efforts of true Christians to witness—and some of these mental cases were actually improving under this testimony.

What are the facts about this difficult question? Just

what relationship is there between maladjustment and sin? Even though it is true that much of maladjustment is sin-involved, if not sin-caused, we must refrain from making any generalizations which include all cases. Dare we point the finger of scorn, and would this not be an accusation? If so then who is the "accuser of the brethren?"

Maladjustment is an illness. We cannot say "You naughty person, you must be sinning or you wouldn't have appendicitis." Neither dare we say: "If you are neurotic, it must be because you are not walking close to the Lord."

Not every evil is evidence of sin and guilt. Consider Job. He was not a sinlessly perfect man, but he was spiritually mature. Nevertheless, he showed some signs of psychoneurosis while under stress, such symptoms as—despondency, reactive depression, complaints, emotional outburst, and anxiety tension. Facing the Lord in Job 42, brought about the cure.

Anxiety is now known to be the starting point of all maladjustments from hangnails to suicide. Every neurosis is fear-derived. However, the Lord's most frequently repeated commandment in the Bible is: "Fear not." Yet we can have anxiety without being gross sinners. The Lord is able to *chasten,* if there is sin, but he *scourges* every son, regardless of guilt. God allows evil circumstances in the lives of His own, but these same evil circumstances may be used by Him for the prevention of sin, or to draw His child close to Himself, as well as in a correctional manner. Nevertheless, many maladjustments are sin-involved, if not sin-caused.

One of the best ways to know that your patient is guilty, is by his very denial of the matter, used as a defense reaction. How often I hear these neurotics say; "Now my trouble is purely psychological and not spiritual at all, so you don't need to bring any of your Bible stuff into this discussion." Such contentions reveal a conflict over guilt itself. Usually they are aware of this guilt in their lives, but they refuse to admit its dire effect upon them. Incidentally, one seldom sees problems like this in a child of God, which are purely psychological or purely spiritual. Most of these problems are mixtures of both together. With that attitude, there is no use to proceed further, nor to cram Christian doctrine down his throat. He must suffer, and then he will learn better.

What then do we do for the Christian neurotic? Secular methods often help them, but they are not quite as effective as in the world. Dare we say that "Christ is the answer." If we do, some Christian will call us fanatic. They surely will. Mind you, we are not saying that the patient has guilt in his life, nor that he is a spiritual failure. Yes, he probably has such guilt—but so have you.

Again, we rehearse, in psychoneurosis, "Christ is the answer," and for every maladjustment. Is it impossible to say the same for every organic trouble? It seems too simple to say that "Christ is the answer," and we need to do so with care, lest the patient feel that we are too trite and that he is being given the "brush-off." No. We mean more than that. Christ is the over-all answer to our maladjustments. He shows us in His Word how to overcome those very things which lead to neurotic fear, at the same time that he is getting purely secular help. The well-known hymn says, "Jesus can solve every problem." Can He? Do you really believe that line? I do.

Wheaton, Illinois
February 5, 1957

SOCIOLOGY

Frank E. Houser, M.A.

In the past this columnist has been content to report the theoretical formulations and research results in sociology which would be of interest to Christian men of science. In so doing we emphasized the cutting edge of contemporary research. Perhaps it is now time to place before us—for one issue—some of the funded knowledge in sociology which has marked importance for Christians.

One of the most significant set of propositions about our contempory society is that delineating power. If what the sociologists are saying is true regarding the directive elements in our society, then evangelical Christendom faces an abrupt change in its ideas of ethics.

As a background to understanding the concentrations of power now residing in the giants of industry, labor, and government it is necessary to recall the rapid change from a chiefly rural to a chiefly urban way of living wherein the cohesive bonds of family life gradually eroded. New primary associations grew up, such as the gang, the drug store crowd, the lodge, and the union. After all, with the family losing its functions of economic production, recreation, education, protection and even religion there were other groups formed to take the interest of the family members. We now find ourselves in a "sea of influence" where powerful cross currents are commonly encountered.

The new groupings in our industrial society have become gigantic in size. Production, recreation, education, protection—to mention some of the functions largely lost by the family—are now vast bureaucratic structures. We now speak of the entertainment *industry,* the educational *system.* Our basic needs are now met by institutional complexes too large and complex for any man to understand. And our attitudes to life

itself have been heavily affected by the media of mass persuasion—themselves intricate commericial organizations. All this is what Frederick Allen, the late editor of *Harpers Magazine,* called the "big change." The outstanding economist, Kenneth Boulding, has coined the term, "the organizational revolution." Industry is organized in the form of gigantic corporations, labor in nationwide unions, farmers in powerful pressure groups, even doctors in a monolithic voice, the American Medical Association.

The struggle for power as these pressure groups serve their own interests is focussed most often in the political arenas of state and national government. But power struggles are often as vivid inside these bureaucratic groups as men climb or miss the notches to seniority.

These extensive organizational structures with their inherent power make decisions that determine a great deal of our acting and thinking.

These observations on our society I believe to be accurate. I pass over the question of whether or not it is a desirable state. Suffice it to say it is probably here to stay a while. What is of more concern to me at this point is the revolution in ethics this view requires. Assuming religion makes a difference in a man's morals, this contemporary social situation knocks into the proverbial cocked hat the idea that Christian influence is adequately expressed through personal relations. As Rasmussen put it in *Christian Social Ethics,* "... being kind and faithful in the family, or pleasant and generous among one's vocational associates, or a friendly next-door-neighbor does not add up to effective influence in organizational and political structures that make the policies that determine the patterns of our society." He maintains that personal good will will not produce the good social organization.

Not long ago Kermit Eby, writing an article entitled "The Glass Top Desk" in *Christianity Today,* raised the kind of question we all now ask: "How can we give meaning to our Judeo-Christian ethic in a society that is increasingly complex, with decisions ever further removed from the persons affected by them?"

One answer left for us is a Christian social action that deals with power and influence at the level where it works—the organizational level. This means cooperative influence through such church, religious, or even secular organizations as are ready and able to do the job. This action is going to require an explanation to the folks back in the pew as well as the pastor who are not yet cognizant where the sources of power lie or how to deal with them.

This view of ethics will also affect one's idea of religion—the base of ethics. As a matter of fact it becomes apparent that when Christianity is summed up as one's devotional life with Christ it becomes a part truth. No matter how much we would like to escape into the bliss of communion with Christ, the gospel demands active outreach to our people and their patterns of living. This does not always present the most pleasant prospect. It demands decisions which are sometimes agonizing. It is far from bliss. Unless contemplation and action are mutually instructive we stand in danger of either religion without ethics or ethics without religion.

Wheaton College
Wheaton, Illinois
February 12, 1957

A CHEMIST'S PRAYER

H. Orville Heisey

O God, come into the laboratory
Of my soul and take the catalysts of perspective
And maturity of mind that control
And activate me and my reactions—
I say take them and modify my total life
And its effect on others.

Please neutralize
The irritating acids of my selfishness
With the basic elements of your love
To yield kindness and thoughtfulness.

Let the vapors of your fragrance
Diffuse through the crystal lattice of my personality
And the chill of indifference will distill them;
Then this condensed beauty can dissolve
The corroded bonds between my faith and works—
Bonds corroded with the inflexible and abrasive
Oxides of negligence.

The molecular vibrations
Of my inner life are energized and stabilized
By the peace that's past understanding;
The bonds uniting the atoms of my body, soul, and spirit
Are strengthened by the joy of the Lord.
Now by stirring into
The solution of my complete life,
Contained in this vessel—fragile,
But created in your perfect image,
I say, by stirring in a double portion of your love, Lord,
Crystallize in me some of the beauty of Jesus.
Weigh in enough of the salt
Of your preservation and put on enough
Divinely touched pressure to raise
My boiling point beyond that which can be
Reached by the heat of the day
And by the heat of the refining fires
Fed by your desire to purify me.

And further, in the mortar of the daily round,
Crush the coarser grains of my imperfect understanding
Under the pestle of your chastening love.

I thank you Lord
That you sanctify all phases of my life—
The gaseous phase of emotional ecstasies,
The liquid phase of change that helps me adapt to new conditions,
The solid phase of the foundations that stabilize me.

At times, Lord,
The frustration in the laboratory of life
Tends to agitate my surface waters;
Will you then pour in more of the oil of your Spirit
For that calm of surface equilibrium
That bespeaks depth and composure of soul.

I need more faith, Lord;
I need enough to dissolve the precipitate
Of the difficult and impossible;
For you have shown me that their solubility
Is at least proportional to my faith,
And not to the quality of the liquid of my environment.
With the power of your infinite greatness

And the precision of your infinitesimal detail
You are arranging the molecular structure
Of my existence into a pattern I may or may not perceive,
And infusing it with the resonance that
Transforms it from an inorganic molecule
In the ores of unregenerate life
To an organic molecule than can be part
Of the structure of your divine plan for man's life;
And from mere human existence to that life more abundant...
I thank you for all this.

Now, Lord, I cannot always
Understand your operations with me:
One day in the test tube of trial,
Another in the retort for decomposition of incorrect ideas and conceptions,
Then in the crucible for ignition of persistent impurities,
Once and again to your balance,
Where even the nations are but dust,
And I am found *wanting*:
These operations have left me lacking—
Fill in these spaces, O God;
And have left me desiring more of yourself—
Illuminate me and reveal yourself to my heart.

But I don't mind all this, Lord,
For your analysis discovers to me
What should be removed and where I may be unbalanced;
Your synthesis combines the correct proportions
Of life stuff at the proper reaction rate
To yield a more nearly perfect life crystal,
capable of reflecting the wave lengths
That give the right color to those around me.

Now before you leave, Lord,
Remember the corrosive fumes
Diffusing through the laboratory air
And the constant change wrought by
The worldly variables, and that without you
I am amenable to their effects.
So please it you, O God,
To give me enough of yourself and your essence
To effectively buffer me against these subtle forces.
I thank you for yourself and for hearing me, heavenly Father,
Omniscient and understanding Chemist
Of the laboratory of my soul. Amen.

NEW MEMBERS

Authelet, Emil J., 118 Lexington Ave., Providence 7, R. I., is employed as Project Director with the American Mathematical Society. He received his A.B. degree and B.Th. from Providence-Barrington Bible College.

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