INTER-OFFICE

To: Mr Richard Barky

Date: Feb. 22, 1973

Department:

Subject: Geology

From: Robert Macdonald

Research is a continuing effort, and it is necessary to stop from time to time and communicate one's thoughts to others. It seems as though the subject of the relationship of the Bible and geology has barely been scratched, so this paper is really just a progress report.

I certainly agree that the Word of God is the foundation of knowledge, and that a proper understanding of geology comes from a proper understanding of the Bible. However I'm not sure that one could gain a complete understanding of just what the Bible does say if one were altogether divorced from the real world. I am thinking in particular of what the Bible has to say about a pre-Adamic world. Perhaps by careful study of the Bible one could have deduced that there was one, but I doubt that this was done. I expect that those who first formulated the gap theory did not do so by a study of the scriptures alone. Isn't it more likely that they were prompted to look for Biblical sanction of a world before Adam by the evidence of the physical world around them? Was this just trying to fit the Biblical account to the evidence of the real world?*

I have never found any contradiction between the two. I am confident that if we properly understand both we will find no contradiction between them, and moreover, they will be mutually supportive. There should be no contradiction between what God has created and what He says. Therefore there should be no contradiction in fitting together two narratives of the history of the earth by the same Author.

Can we come to a complete understanding of what the Bible says about geology without reference to the physical world? The Bible gives us very little information on what happened before Adam. I feel that the Bible tells us what we would be unable to learn for ourselves, and that God expects us to fill in the gaps in the story by what we observe and place them into the proper framework of revealed knowledge.

I think we all agree that we need to speak with one voice on matters essential to the carrying out of this work. Part of the problem in the past has been a failure to understand what both the Bible and God's creation have to say. It is hoped that this report will help in both areas.

* See Appendix 1 for a further discussion of this point.

The papers written last May by Mr. Gentet and Mr. Lain have been useful contributions in several ways. They have unearthed a number of facts of which I was unaware. They have brought up problems and pointed out areas that needed clarification and further research in the general problem of relating geology and the Bible. In addition they have clarified their own views on the subject.

First I would like to discuss a few points brought up in their papers.

PALEOZOIC AND MESOZOIC LIFE NOT CONTEMPORANEOUS

Apparently we have not laid to rest our old theory that all the Mesozoic and Paleozoic organisms were contemporaneous and that the order in the faunal succession is merely a burial order. I had stated that if they were contemporaneous, there should be some mixing together of the Paleozoic and Mesozoic forms of life in at least a few deposits. I pointed out that trilobites and dinosaurs are never found together. The point has been made that the different habitats of dinosaurs and trilobites would prevent their occurrence together as fossils. However there is a possible situation in which marine and terrestrial fossils are intermixed. Littoral deposits, those forming along a shoreline can and often do contain both types of fossils. This is common in deltaic deposits. Our geology field trips have for years taken students to a fossil locality in Sunland where angiosperm leaves and fish are found together in the Miocene Modelo Formation. This is known to be a delta deposit; the ancient river channel and distributaries have been located. Ancient river channels, by the way, are an indication of a period of time, here in the tertiary. It would seem very unlikely that an association between dinosaurs and trilobites would not have occurred somewhere in the world, if these animals had been contemporaneous. It would seem even more unlikely that Paleozoic and Mesozoic organisms that live in the same environment would not be found together as fossils. For instance, if they were contemporaneous, Paleozoic trilobites and the large marine reptiles of the Mesozoic should be found in the same deposits. The cystoids disappear in the Devonian, while the Dibranchiata, a group which includes the octopus, squid and extinct forms with an internal skeleton do not appear until later, in the Missippian. Both forms are marine and live in similar environments. Their fossils are widespread and should be found together in the same deposits if they were contemporary. Countless other examples of non-associations of Paleozoic and Mesozoic organisms that lived in the same environment could be pointed out.

Furthermore we know that the sequence of fossils in faunal succession is even more complex than just Paleozoic - Mesozoic. Each geologic period and its subunits has its own characteristic faunal assemblage. According to the principle of faunal succession the fossils always occur in a certain definite order, and no other. From all we have been able to learn, the principle of faunal succession would seem to be a valid principle.

I'm not saying that the entire sequence of fossils is found everywhere any more than is the entire geologic column. In any local sequence of fossils only a small portion of the total will be found, but those which are found are always in the proper order.

It is important to remember that although faunal succession is used to try to prove evolution, this was not the original intent behind the drawing up of the sequence. The sequence was not assumed in order to fit in with evolutionary theory. William Smith, who did the original work on faunal succession, predated Darwin by a number of years. The sequence Smith drew up was what he observed.

In his textbook Historical Geology, p. 48, Carl O. Dunbar makes this clear:

> "It is important to realize that the sequence of fossils was not assumed and does not rest on any theory; as explained on p. 9 it was revealed by patient exploration and discovery in many regions where there are thick sections of fossiliferous rocks having simple structure, so that the beds are known to be in the normal order of superposition, the oldest at the bottom."

The sequence is real; it is an observed sequence, not humanly devised, and not based on the theory of evolution.

As I have said before, we do not need to try to disprove faunal succession to disprove evolution. Faunal succession is not an evolutionary sequence. The fossil record shows the sudden beginning of abundant animal life in the Cambrian with new forms making sudden appearances at various levels in the sequence. Transitional forms between major groups are lacking. The "family tree" of living things is not a tree but a series of disconnected branches. The fossil record itself is one of the best proofs that evolution has not occurred!

Circular reasoning is not used in dating rocks from the fossils, and fossils from the rocks. Basically the rocks are placed in the correct time order using the principle of superposition. The following quotation explains the role of fossils in dating rocks.

> "It is possible to a very large extent to determine the order of superposition and succession of the strata without any reference at all to their fossils. When the fossils in their turn are correlated with this succession they are found to occur in a certain definite order, and no other. Consequently, when the purely physical evidence of superposition cannot be applied, as for example to the strata of two widely separated regions, it is safe to take the fossils as a guide; this follows from the fact that when both kinds of evidence are available there is never any contradiction between them; consequently, in the limited number of cases where only one line of evidence is available, it alone may be taken as proof."[1]

At this point a brief explanation of the so-called "out of order", or "upside down" strata should be made for those not acquainted with our past findings. Fundamentalist writers have tried to show that the geologic column is meaningless by claiming that mechanisms such as thrust faults used by geologists to explain "out of order" strata actually do not exist. Mr. Gene Hughes[2] has thoroughly analyzed the attempt by Whitcomb and Morris in "The Genesis Flood" to prove the non-existence of thrust faults, and has found instead, that there is ample evidence for their existence. My own investigations of the Lewis Overthrust, a favorite target of such writers, have shown it to be a real thrust fault.

These writers also point to the Alps as an area where the strata are in the "wrong order". They claim that nappes (large scale thrust faults), which are used by Alpine geologists to explain this "wrong order of strata" do not exist. I have researched this subject and written a paper on it (available upon request), and have found that though the strata are in the "wrong order", there is ample evidence that these large scale deformations

[1]"Geology, Encyclopedia Britannica,Vol. 10, p.168, 1946.

[2]Hughes, Gene R., 1967, Overthrusts - Real or Imaginary?

called nappes actually do exist. These resulted from horrizontal forces produced by Africa being thrust into southern Europe before the Mediteranean Sea opened up. Hence the concept of portions of the Alps originating in North Africa.

Similar situations of "wrong order" of strata exist in the Himalayas. While I have not investigated this area, I do know that Himalayan orogeny is very similar to Alpine orogeny. There is evidence that India was originally attached to Africa, from which it broke away and rammed southern Asia, pushing up the Himalyas in the process, much the same as the Alps.

Geologists do not merely assume a thrust fault without physical evidence of it. While they may suspect the existence of one because of a wrong order of fossils, they will not state that one exists until they find physical evidence of it.

I asked Dr. Meade, my paleontology professor at Cal. State, Los Angeles, what happens when a fossil is found to be "out of place". He listed a series of proceedures:

1. Re-examine the fossil to see if it is correctly identified.

2. Examine the strata containing the fossil to see if there has been any deformation. (This might include folding, faulting, or land slides)

3. See if (a) the fossil is part of reworked material from a lower formation or (b) if the fossil may have come down in a crack from an upper formation.

4. If none of these things have occurred, then the vertical range of the fossil would have to be extended.

The ranges of fossils are extended from time to time, and adjustments are made in the placement in the geologic column of formations. These adjustments, however are usually minor, I am convinced from my own studies and observations that the geologic column and the established sequence of fossils in faunal succession are essentially correct.

Mr. Gentet pointed out a paper[3] (p. 112) that gives an actual example of what happened when some fossils were found to be out of place.

> Once a zonal succession is established in one geolgic region, it is not easily upset by stratigraphic observations elsewhere. Zones may be found missing, but

[3]Teichert, Curt: 1958, Some Biostratigraphical Concepts, Bull. Geol. Soc. America V. 69, p. 99-120.

> the succession will not be found to be reversed or arranged in disorderly fashion. Spath (1931) called attention to certain seeming discrepancies in the vertical succession of ammonite species in the Lower Jurassic sequence of Champfromier, near Bellegard in the Jura Mountains of France, as compared to the classical English zonal sequence... It has taken 25 years to solve this biochronological enigma, but after reviewing the evidence Arkell (1956, p. 104) concludes that the seeming discrepancies of the Champfromier section arose from a combination of misidentification of species and disturbances of the section by landslides.

Geological observations are not made in a haphazzard manner; great care is used. If the evidence does not fit the theory, the evidence is not thrown out as is sometimes charged.

First an attempt is made to see why the evidence does not fit the theory. Then if it is plain that the evidence does not fit the theory, the theory is changed. This point was also made by Teichert in the above quoted paper (p. 111).

In the quotation above, Teichert speaks of "zones" and "zonal succession". Zones are the smallest recognized units within each system, each with a particular faunal assemblage. A system is the time - stratagraphic unit equivalent of the geologic time period (Cambrian, Ordovician, etc.). The sequence of zones within each system is like the sequence of systems within the geologic column. Systems may be missing, but those present are always in the same order. Likewise, as Teichert says above, zones may be missing, "but the succession will not be found to be reversed, or arranged in disorderly fashion."

The fossil record contains hundreds of zones, each with its own particular faunal assemblage. What is the chance that such an invarient worldwide sequence of life forms could be built up if they all lived contemporaneously, and the sequence in which they are found were only a burial order? How could a burial order based not on water sorting, but on environments do the job? As I pointed out earlier, there are many Paleozoic - Mesozoic forms that lived in the same environment that are not found together as fossils.

Suppose that in a worldwide catastrophe, one group of organisms were brought in from one area and deposited, then another assemblage from another area were deposited on top of that, and so on. A local sequence of life forms would be built up. But the chances would be against the deposition of

fossils in the same order in a local sequence in another area. Consider the chance that the same order would occur in all sequences worldwide. It would be nil!

There is no way to account for the sequence in faunal succession by one catastrophe. Nor is there any way to account for this sequence by a series of catastrophes, or by a long drawn-out catastrophe. If all these Paleozoic and Mesozoic organisms were contemporaneous, there would inevitably have been some mixing of early and late forms.

The only explanation is that each geologic horizon does indeed represent a different time in the past during which a unique assemblage of life forms was living and being deposited in many parts of the world. Slow or incremental deposition is therefore essential to give time for worldwide changes in populations of fauna whose remains preserved as fossils vary from one stratum to another.

In the paper quoted above, Teichert (p. 110 - 111) says the same thing in a more limited sense. He shows that two successive zones could not possibly be contemporaneous. He describes two zones in the Upper Devonian, each of which contains a different genus of ammonite:

> "Where sedimentation is continuous into the higher Upper Devonian, Manticoceras disappears at a certain level, and if ecologic conditions continue to remain favorable to the existence of goniatites, species of an altogether different genus, Cheiloceras, appear...
>
> "A centruy and a half of research in Europe has shown them to occur in separate layers, Cheiloceras above Manticoceras, never in reversed succession, and later investigations in other continents have led to the same results. (See Miller, 1938; Teichert, 1943) The succession of these genera can, therefore, be used to determine sequence in layered rocks. They are two small but solid bricks in the structure of orthochronology.
>
> "As to the time relationships, it would be nonsensical to assert that the zonal boundary between rocks containing Manticoceras and rocks containing Cheiloceras "transgresses time". Such a hypothesis would require assumption of a highly unlikely pattern of faunal migrations, where swarms of species of Manticoceras are followed, everywhere at the same distance and the same time interval, by swarms of species of Cheiloceras, the two waves preserving their separate identities on a staggered mass migration around the world possibly throughout millions of years, without evolutionary changes and without ever becoming mixed. This picture is unreal. The only realistic conclusion is to assume that the boundary between the Manticoceras and the Cheiloceras zones is a true time plane."

The same thing could be said about the deposition of these two genera by two "waves" in a worldwide catastrophe. Also a way would have to be found of preventing the overlap of the Manticoceras deposits on the Cheiloceras deposits on the second circumvention of first wave around the earth!

Teichert goes on to say:

> "It would be easy to repeat this investigation for almost every critical zone fossil or fauna throughout the geologic column for hundreds, perhaps thousands of test cases. The conclusions would be the same. In the words of Jeletzky (1956) we would have to "invoke a miracle", if for example, we were to assume anything but worldwide contemporaneous deposition for each of the 55 ammonite zones of the Jurassic. Not all of them occur everywhere, but wherever two or more are found in superposition they occur in the same order."

That should be sufficient to prove that each successive zone represents a definite time period and its fossils are indicative of the actual fauna on earth at that time.

We used to say that the fossil record was not a record of life, but of death. In a sense, of course, it is, but we said this having in mind the catastrophic burial of living animals. We believed that paleontologists mistakenly interpreted the fossil record as a record of life instead of a record of death. Actually paleontologists recognize both life and death assemblages in the marine environment and have set up criteria for distinguishing them when the distinction is not obvious. A life assemblage is one that is produced during the normal process of life in a community. It would consist of skeletal remains and other debris left deposited in the place in which they grew. There would not be evidence of the premature death of individuals. A death assemblage would consist of broken and transported skeletal parts from one or more communities and may reflect their catastrophic destructions.

I hate to cut Teichert off in the above quote, because he next quotes W.J. Arkell[3] (P. L 112) in a classic statement that demonstrates creation, not evolution:

> "Evolution is above all very uneven. Certain periods were outstandingly productive of new and virile forms which often seem to have sprung into existence from nowhere . . . and to have become dominant almost simultaneously over a large part

[4] Arkell,W.J., 1957, Introduction to Mesozoic Ammonoidea p. 81-129 in Moore, R.C. Editor, Treatise on Invertebrate Paleontology, Part L. Geol. Soc. America & Univ. of Kansas Press

> of the world. These are the periods of paedomorphosis, macroevolution, saltative evolution, explosive radiation or evolutionary deployment, according to the terminology of various biologists and geneticists. How such sudden multiple creations were brought about is a task for the future to determine."

We should have some insight into the mystery mentioned in the last statement. All the evolutionist can offer is big words to try to explain the "gaps"in the record.

INDICATIONS OF LONG TIME PERIODS IN THE PALEOZOIC AND MESOZOIC

I have shown that the fossils in each level in the geologic record reflect the actual life extant on the earth at the time of deposition. We have found proof at many levels in each local column we have studied that life was going on in a normal fashion at the time of deposition, not having been buried in a catastrophe.* Examples of such are fossil reefs which obviously grew in the place in which they are found, standing trees with their roots in place, tracks and trails both on land and on the sea bottoms, layer upon layer containing burrows and borings made by animals just as they do in the sea-bottoms today, and by fossil soils preserved at various levels, sometimes containing the roots of plants growing down into them.

In addition to this there "inorganic" or physical evidences of long periods of time in the vast majority of the local columns we have studied. This evience includes indications of long periods of time during deposition such as the very nature of the rock itself, and indications of lengthy intervals between periods of deposition. Some of these were listed in the transcript of the Science Department meeting, Jan. 22, 1971. (I can supply the portion of this on Geology.)

One of these points was that fragments of a lower formation are often found in an upper formation. To accomplish this, the lower formation must be first lithified, then uplifted and eroded, with fragments being carried

*That is not to say there are not instances of rapid burial of life forms. There are many, but these are separated by strata which were deposited slowly. Obviously they cannot all be evidence of one of the two Biblical floods.

to an area of sedimentation which is stratigraphically above the first formation. All of these processes involve periods of time. Often these fragments contain fossils facilitating the identification of the original formation, and showing that the entire process occurred during the time life was on earth.

Here is one of the many possible examples of this[4]:

> "As elsewhere in southwestern Utah, the Kaibab limestone in Iron County lies unconformably below rocks that contain Triassic fossils. The contact is generally marked by an erosion surface upon which in places has been laid down a coarse conglomerate of exotic pebbles, among which are worn fragments of paleozoic fossils."

In my course in stratigraphy last spring, we spent considerable time in Santa Anna Mountains in Orange County making a stratigraphic section of upper Cretaceous formations. In that section a very distincitve red conglomerate, the Trabuco formation is largely made up of rounded cobbles. We collected about a hundred of these to try to determine their source. Most were sandstones and volcanics. Two of these sandstone cobbles were very interesting in that they contained fragments of a black siltstone we recognized as the Triassic Bedford Canyon formation, which was about 400 feet below in the stratagraphic section. I have a portion of one of these cobbles should anyone wish to examine it.

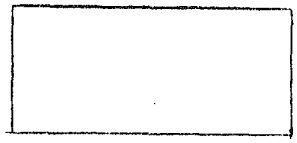
This specimen shows three cycles of sedimentation, lithification, uplift, and erosion. These three cycles are illustrated schematically in Figure 1.

This diagram merely illustrates how this cobble could have been formed, not the actual mode of formation. However it gives one some indication of the time involved. Remember, each process in each of the three cycles is itself an indication of a period of time. There is even more involved here than the diagram shows. The Bedford Canyon Formation is metamorphosed, while the overlying formations are not. This shows the formation was at one time buried deeply enough for regional metamorphism, and uplifted and exposed by erosion. This all took place between 2 and 3 in Figure 1.

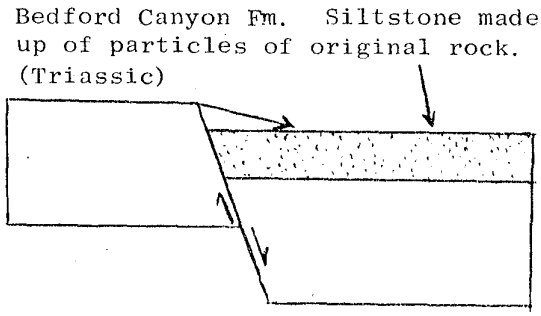
[4]Gregory, Herbert E., 1950, Geology of Eastern Iron County, Utah; U.S.G.S. Bull. No. 37, p. 28.

If we consider the events previous to the deposition of the Bedford Canyon Formation and subsequent to the deposition of the Trabuco Formation, we find yet more time involved. In this study we examined several thousand feet of Upper Cretaceous sedimentary rocks above the Trabuco Conglomerate. A conglomerate can be deposited rapidly, but most of the rest were fine grained sediments which show many indications of time: ripple marks, burrows and mullusks preserved in the place in which they lived.

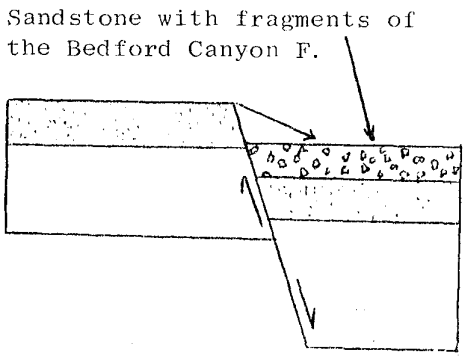
We have other examples of fragments of lower formations in higher formations in the geology lab which are available for examination, as well as examples of burrows, tracks and other time indicators.



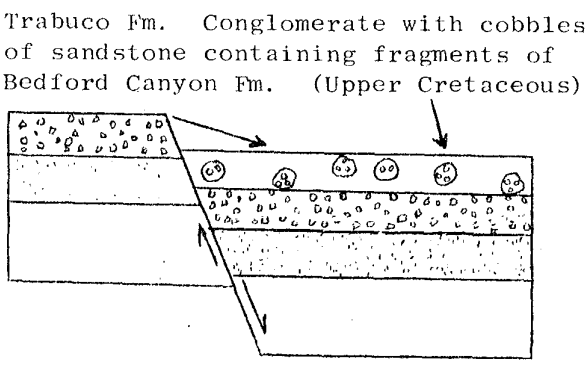
1. Original rock.



2. Uplift, erosion and deposition.



3. Further uplift, erosion and deposition.



4. Further uplift, erosion and deposition.

Figure 1: Schematic diagram illustrating the process of formation of the cobble in the Trabuco formation.

PALEOECOLOGY AND ECOLOGICAL SUCCESSION

During the last year I have become aware of other ways that the fossil record is a record of a long period of time. I have just completed a course in Paleoecology. This is a study of ancient environments as indicated by fossil assemblages, how the fossils are situated in the sediments, the sediments in which they are found, and by other associated organic and inorganic phenomena. An amazing amount of information about past environments can be gleaned from these observations. Not only can the environment at anyone level be discerned, but continuous changes in environment with respect to time can be determined by detailed studies at various levels in a section. Often the samples are taken only a fraction of an inch apart. A study[6] by Ferguson of a section in Scotland may be of interest as a typical paleoecological project In this thorough study an entire vertical section was examined. I have a copy of this paper should anyone wish to examine it. In addition a textbook on paleoecology is available in the college library.

If Paleozoic and Mesozoic life were all contemporaneous, the succession of strata resulting only from a catastrophe, the results of this type of study would make no sense. Environments would likely be mixed at any one level, and the succession of environments, if any, would not change gradually in a logical way. Even if each stratum did represent a single environment, it would be contemporaneous with all of the other environments in the column, the only differences reflecting the different source areas. The result would be a haphazard succession, not a meaningful one.

This type of study has been made for numerous local sections all over the world. In my stratigraphy class last spring, we studied two different sections in the Upper Cretaceous. In both we found continuous and logical changes in environment.

The biomass responds to changing environments by shifting the population of its organisms from one type to another. This process, known as ecological succession, is gradual taking perhaps a century or more.

When an area becomes denuded of all life and soil, the first plants to appear are small in size and of only a few varieties. Then as the soil is prepared, the early population is gradually replaced by population of larger and

[6]Ferguson, Liang, 1962, The Paleoecology of a Lower Carboniferous Marine Transgression, J. Paleontol. V. 36, p. 1090

more numerous varieties. This process is repeated until a "climax" population is reached. This process, of ecological succession is illustrated in the development of a grassy meadow which eventually gives place to the forest.

These changing populations of organisms with respect to time can be observed in the geologic record as well. Our studies in the Upper Cretaceous sections and the studies reported by Ferguson are examples. The most detailed studies of this type make use of microfossils, especially forams, spores, or pollen.

I recently attended a lecture by Dr. Judy Linton, in which she described some paleontolological research she did while in graduate school at Sheffield University, England. She described micro and macrofossils in a section of coal bearing strata of Carboniferous Age near the University. The microfossils studied were fern spores of various kinds. Fern spores are extremely resistant to decay, and are preserved in great numbers. Although the ferns themselves are not preserved here, the parent plants can be determined by other fossils in which the spores are found attached to the ferns.

Figure 2 illustrates the results of these studies which show ecological succession in response to changing environments which were brought about by changes in elevation. Life in the area was killed off by burial under sand. The bottom of the clay deposit shows the sequence starting with a few species of small scruffy ferns. Apparently the area was being elevated, becoming progressively dryer. As one moves to the top of the clay, the spores show that this population is gradually replaced by larger ferns. The population of ferns in the bottom of the thin coal bed are about the same as in the top of the clay bed. Moving to the top of the coal bed, the population again changes gradually to a large number of species of huge ferns, 150 feet high. An extremely rapid growth rate of these ferns causes organic material to accumulate faster than it can be broken down. This climax population persists until the environment changes again. It appears that the area sinks, water kills off the ferns, and mud is deposited over the mass of accumulated vegetation At first fresh water mullusks are deposited, then shallow water marine mullusks as salt water comes in. As subsidence continues, deep water marine mullusks are deposited. Then the cycle apparently starts over with the appearance of shallow water marine mullusks again indicating elevation.

How could such an arrangement of fossils indicating an orderly ecological succession result from a catastrophe? It couldn't. The only way to explain it is that each stratum represents the life extant in the area at the time of

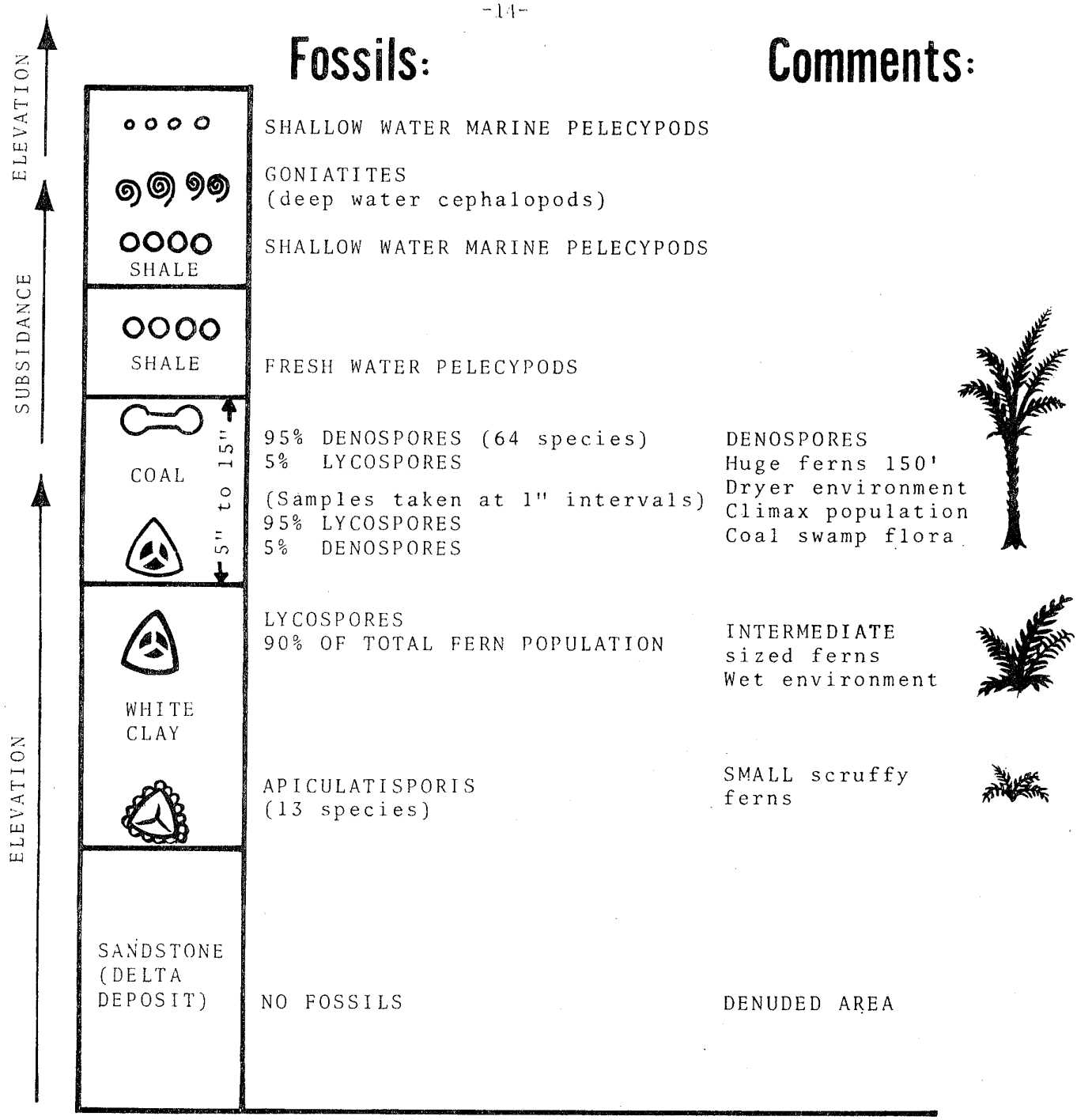
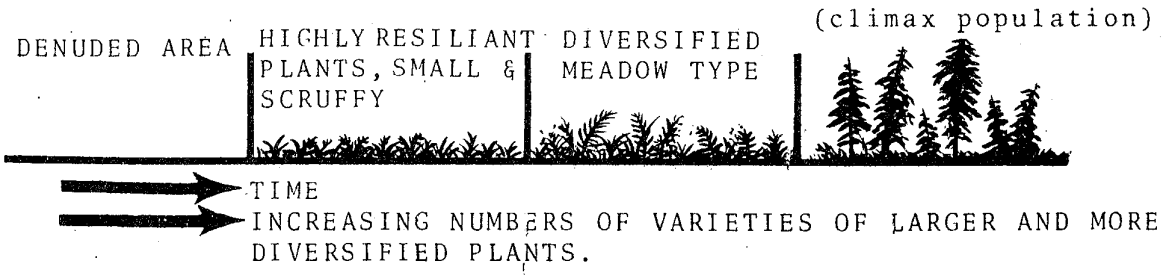


FIGURE 2. ECOLOGICAL SUCCESSION IN A CARBONIFEROUS COAL-BEARING SEQUENCE, ENGLAND.



EXAMPLE OF CONTEMPORARY ECOLOGICAL SUCCESSION:
THE DEVELOPMENT OF A MEADOW

deposition. Periods of time between strata are required for the populations of organisms to respond to changes in the environment.

Coal is commonly found in such a sequence of beds. This sequence is an example of a cyclothem, a cycle of beds that is repeated over and over perhaps dozens of times. Apart from the fossils, a cyclothem indicates a cycle of sedimentation, difficult to explain by a catastrophe, especially when their repeated nature is considered. In addition a cyclothem commonly has an even longer sequence of up to ten beds, often including limestone, a chemical deposit which forms slowly by precipitation from water. Dr. Linton's study is not an isolated example. This type of investigation has been repeated for coal deposits all over the world. Murchison and Westoll give a detailed description of the succession of spores in the coal deposits of England. They point out[7]:

> "The spores in coals occur in characteristic associations, implying the occurrence of different plant communitites associated with the deposition of peat. Preliminary investigations indicate the existence of four such associations in the Coal Measures of Britain. It is probable that certain of these could be further subdivided. Each association is generally dominated by one or more characteristic species which are also found in the other associations in smaller numbers.

They illustrate this succession and its relationship to the microstructure of coal in Figure 3 (p. 36). Note that these all occur within a single coal seam.

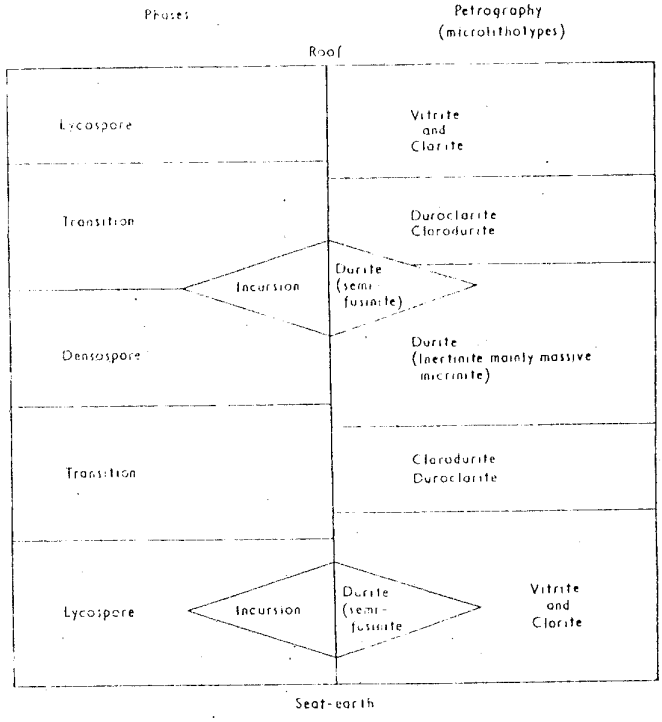


FIG. 3 Diagrammatic profile of a coal seam showing the sequence of miospore phases and petrographic types.

[7]Murchison and Westoll, 1968, Coal and Coal Bearing Strata, American Elsevier Publishing Co., Inc., p. 33.

Marchison and Westoll (p. 31, 39) go on to explain the significance of spore succession, usually called a spore profile.

> "The facts reported above strongly suggest that in a relatively stable environment deposition of peat was accompanied by a succession of plant communities. The sequence of phases is interpreted as a response by the vegetation to changing ground-water conditions (associated with the availability of plant food), proceding in the direction of removal of free-surface water as the peat increased in thickness, thereby raising the surface of the bog. The Densospore phase occupies the culminating position before subsidence reasserted its influence, resulting in a reversal of the plant succession . . .
>
> "In support of this theory the evidence of contemporary tropical peat deposits in Borneo may be cited. These show a close parallel with many aspects of Carboniferous coal seams. According to Muller (1964) they are tree-covered raised bogs equivalent in size to the blanket bogs of more temperate latitudes. Profiles through these peats show a succession of vegetation types proceeding in response to edaphic and not climatic factors."

A typical spore profile illustrated in a book in the college library is reproduced here as Figure 4[8].

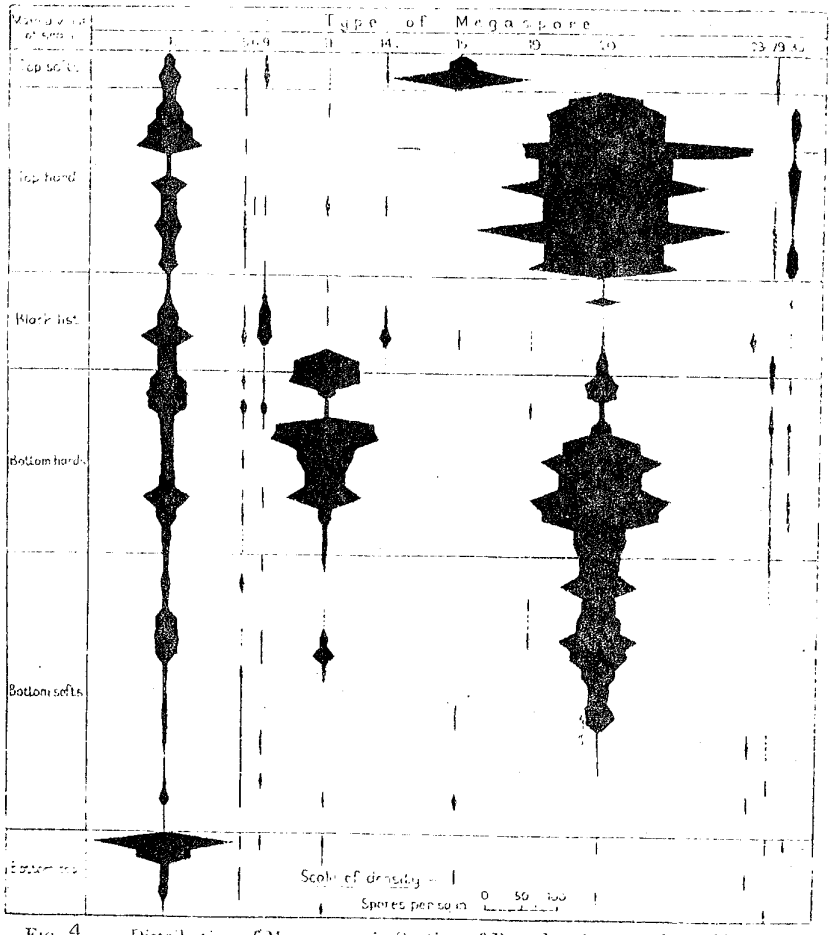


FIG. 4 —Distribution of Megaspores in Section of Barnsley Seam.—Slater, Eddy and Evans.

[8]Francis, Wilford, 1954, Coal, Its Formation and Composition, Edward Arnold Publishers, London, p. 84.

This spore profile is for a coal seam in England. On the same page Francis, the author comments:

> "The similarity of the cross-sections of spores from America coals, with those of South Yorkshire coals, is significant of the similarity of plant life and climatic conditions in N.W. Europe and the Eastern Regions of U.S.A. during the late Carboniferous."

Data of this nature are one of the indications that North America and Europe were joined in one land mass during the Paleozoic.

The same type of study has been done with the Tertiary lignites. Since the Tertiary is dominated by seed bearing plants, pollen grains are used instead of spores. Like spores, pollen grains are very resistant. The German lignites have been the most extensively studied in respect to pollen grains and the lignites of Australia, Nigeria and North America have been studied somewhat less. Figure 5 shows a typical pollen histogram (the term "histogram" is used in place of profile in pollen studies), reproduced here from Francis' book, page 211. The common names of some of the plants have been added.

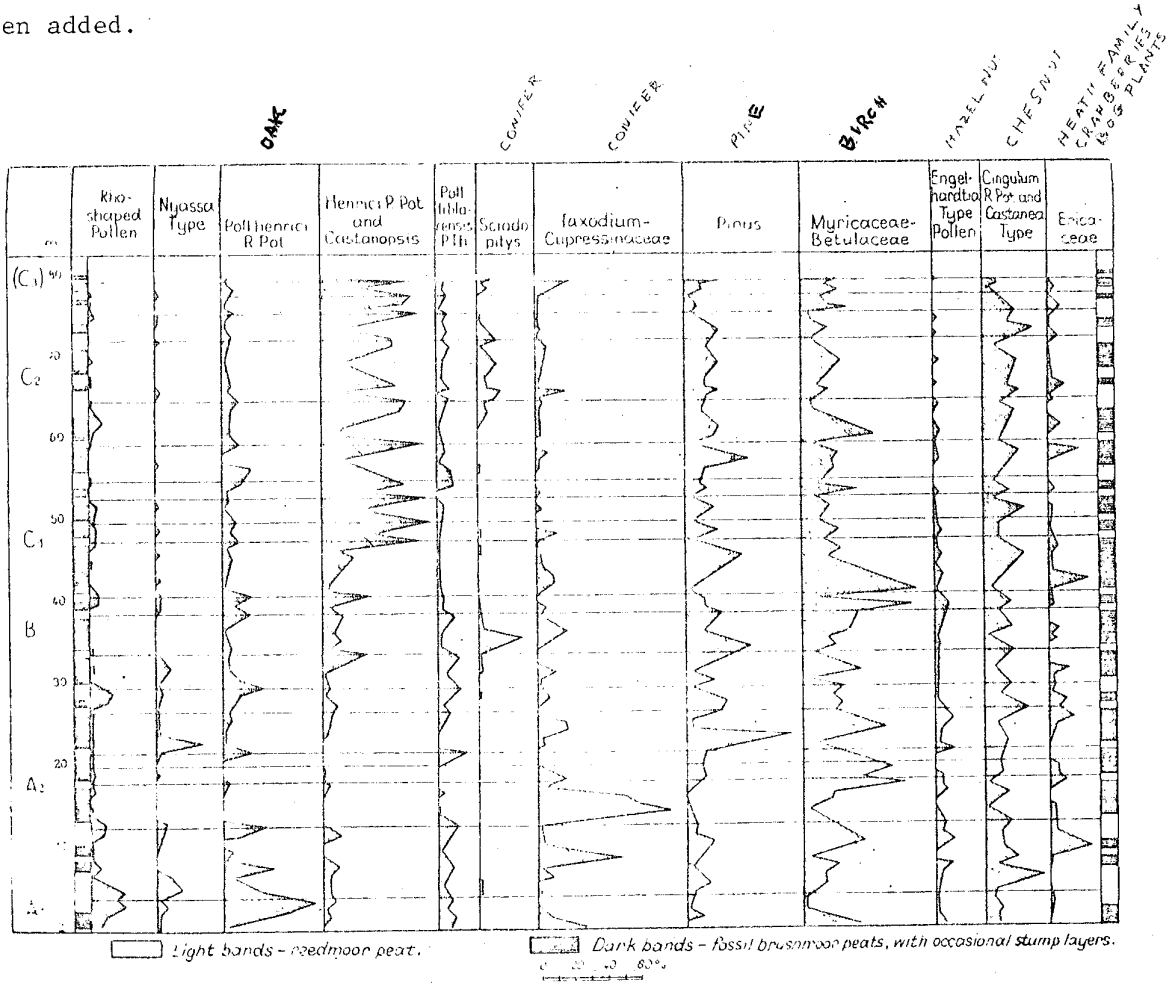


FIG. 5 —Histogram of Pollen in Fortuna Mine (Rhine).—Thomson

There is some correlation between the amounts of certain pollen grains and the light and dark bands of the lignite as shown at the side. However, the important thing here is how the relative quantities of the various types of pollen change with respect to each other. Notice that in the last column which shows the amount of pollen from bog plants, both the high peaks and low points match those of the birch. On the other hand, note the negative correlation with the oak. Other relationships can likewise be noted from the diagram. The amount of moisture is the most likely environmental factor determing the relative abundances of these plants. Temperature is undoubtedly a factor in others. Francis (p. 205) mentions that the Sciadipitys (a conifer) marks the transition from a warm to a cold climate. He also says that pollen in coals from species living today can be used to determine the actual environmental conditions at the time of deposition.

Thus we again see populations of plants changing in response to environmental changes. A period of time is required for these changes to take place.

Spore and pollen studies have been made not only on coal deposits, but on other sedimentary strata throughout the fossiliferous portion of the geologic record. Detailed studies of this type have been made on formations all over the world, and they all show changing populations of plants in response to changes in environment. I have copies of articles on several of these studies should anyone wish to see them.

This is one of many indications of long periods of time in the Tertiary as well as the Paleozoic and Mesozoic. The question of time in the Tertiary will be further explored in a subsequent memo.

RAPID DEPOSITION

I don't want to imply that all deposits are made slowly. There are many examples of rapid sedimentation. In general these would be the coarse grained deposits, sandstones, and conglomerates. Not all of these, however, are water deposited. Exceptions would be eolian sandstones and glacial deposits. Although there are many examples of rapidly deposited formations, these are all interspersed with deposits made slowly. Obviously they can't all be the result of the two Biblical catastrophes. Most of them must have resulted from local events.

I have even seen rapidly deposited coal in the Upper Cretaceous in Utah. Large chunks of coal were eroded from another formation and redeposited. Although this formation was deposited rapidly, a considerable time interval is indicated since the original coal was deposited. The vegetation had to be buried deeply enough to become metamorphosed to coal and uplifted and eroded to become the source for the reworked coal.

NEO-CUVIERISM?

In the January, 1971 Science Meeting I apparently gave the impression that I believe in the Cuvierian concept of multiple creations in the pre-Adamic world, each terminated by destructions. Mr. Lain is correct in saying that there is no evidence for this. Actually I have never believed in this concept. The fossil record shows that new organisms appeared in the record from time to time, and at other times groups of organisms have become extinct. This shows that at times God created new organisms, and at other times, species were destroyed or allowed to die out. There is a continuity to this pre-Adamic world. It would appear that there is no record of the complete destruction of all life during that period before Adam. I therefore do not consider the pre-Adamic world as a series of creations, but <u>one</u> creation, even though the acts of new life forms were not all simultaneous.

Why the sequence of life we find in faunal succession? What possible reason could there be for God creating the organisms of the pre-Adamic world "by stages" instead of all at one time? Perhaps a better question would be "Why a pre-Adamic world at all?" Human answers to these questions are bound to be somewhat speculative since God has not revealed this knowledge, but a few ideas have been proposed.

It has been suggested that there was pre-Adamic life so that the angels could have something to rule over and work with. This seems a likely possibliity, but there must be more to it. It seems to me that we have a pattern analogous to that which we find today in the process of ecological succession. As I have said before, faunal succession is not an evolutionary sequence. It is marked by the sudden appearance of life at the beginning and by the sudden introduction of various new life forms periodically in the sequence. The first life forms created apparently were bacteria, algae and possibly worms, "simple" organisms that could survive in a barren and sterile environment. The points in the sequence which mark the first appearance of new life forms indicate where God created new species, and added them to an already viable ecological system. These new organisms were added from time to time as the environment became prepared for them by the former ecological system.

The succession of life forms added by creation was one of generally increasing complexity and size. Thus the sequence observed in faunal succession was not a result of evolution, but one necessitated by practicality.

It took a few "simple" small varieties of organisms in the beginning to prepare the way for more numerous varieties of larger and more complex organisms, and so on.

After formulating this concept, I was surprised to find nearly the same thing in our historical geology textbook by William Lee Stokes[9].

> "At the present time, plant and animal succession occurs whenever newly vacated territory becomes available. Such opportunities arise after forest fires and the draining of swamps, and following the retreat of glaciers, and other similar natural events. In the dim geologic past, however, no outside reservoir of life existed, and not all the space and energy resources could be utilized immediately because nothing had yet evolved to utilize them. At one time, for example, the lands were barren of vegetation; many geologic ages ran their course before plants evolved that could live on dry land. The gradual and lengthy process whereby the energy sources of our planet were utilized successively by plants and animals is called geological succession. It differs in no fundamental way from the ecological succession that occurs today when a new environment appears, except that it requires much more time."

The only difference between our concepts is that his involves evolution, and mine, creation.

Understanding the reasons for this sequence imparts an understanding of at least one possible purpose of the pre-Adamic creation - - to prepare the earth for man. This preparation was not only of the environment, but also of the fossil fuels and our mineral resources which made possible the industrial revolution. The industrial revolution has brought us many evils, but it has also given us the means by which the gospel can be preached to the world in these last days.

Mr. Gentet questioned the concept that the pre-Adamic creation prepared the earth for man. He pointed out that the environment had become entirely unsuitable for man during Lucifer's rebellion, necessitating Gods' remaking it during the six days. The earth was flooded, and darkened. If the darkness were caused by dust and other gases in the atmosphere, the atmosphere had to be cleaned up, and the waters separated from the land. The land had to be dried out and the salt removed. But other than this the environment for man

[9]Stokes, William L., 1966, Essentials of Geology, Prentice Hall, Inc., p. 370.

basically came through the catastrophe, the soil, the sea, and the atmosphere were already prepared, not to mention the fossil fuels and mineral resources.

But why couldn't God have created the proper environment for man instantly? The question could also be asked, "Why couldn't God have created the entire universe instantaneously 6000 years ago as the fundamentalists claim? The answer to both questions is that He could, but He didn't do it that way. Apparently this is not the way God works. This subject is dealt with in an article written by Mr. Ginskey and myself: "Did God create the universe with the appearance of age?" Available upon request.

There is a second factor involved in the sequence in faunal succession that we have long recognized, but seldom consider. This factor was brought to mind by a recently published dialogue[10] between a creationist and an evolutionist. Roger Cuffey the evolutionist defended evolution by citing many examples of transition fossils that bridge the gap between forms. He pointed out that "some groups have been so thoroughly studied that we know sequences of transitional fossils without break" (p. 161). John Moore, the creationist, countered that all these involved changes from one species to another within the same genus. He went on to show that there are no such series between kinds.

The fossil record does show sequences of change from one species to another through time, but always within the created kinds. Dr. Deakins has suggested that this change might in some cases be greater than we had thought, possibly going back to the level of the order. That is in some orders, all of the species in it may have come from one created group.

This change which we have called "variation within kinds" is often called "microevolution" by biologists. This kind of change, which is observed in living species is due to the mechanism that God built into each created organism so that it might adapt to a changing environment. This ability was built into the genes of each organism at its creation, and allows change only up to a point. One genesis kind can never change to another.

The fossil record, then seems to be a result of two factors, the order in which organisms were created, and changes within the created kinds in response to changing environments.

[10]Moore, John N., and Cuffey, Roger J., 1972, Dialogue: Paleontologic Evidence and Organic Evolution, J. American Scientific Affiliation, V. 24, No. 4, p. 160 - 176.

INDEX FOSSILS IN GENESIS 1

We have lived with the concept of two creations of physical life so long that it almost seems that it is revealed in the Bible. Certainly the Bible alludes to the existence of the Universe before Adam, but there is not a word in it that would lead one to even remotely guess that there had been physical life before Adam. The only way we can discern that there was a creation of physical life before Adam is by studying geology and paleontology. Likewise these studies are the only guide we have as to the nature of this creation.

It has been suggested that mammals, angiosperms and birds are "index fossils for the age of man", since these organisms are mentioned as being created at the time of man. According to this idea all deposits containing fossils of these organisms were laid down since the Adamic creation. However, if we were to say that the organisms created at the time of Adam as recorded in Genesis 1 are the "index fossils for the age of man", we would then have to include all of the sea sea creatures, the "creeping things" and all the plants. This would include all of the marine inverterbrates, sharks, fish, insects, reptiles, anphibians, gymnosperms and probably ferns and other spore bearing plants, as well as mammals, birds, and angiosperms. This list pretty well includes all types of organisms that have ever lived on earth. Thus we would be forced to conclude that on that basis, that all organisms preserved in the fossil record were contemporaries of man and were created 6000 years ago. We would have to say that all fossils were "index fossils for the age of man." We have never believed this to be true. Therefore the mention of a certain type of organism as being created with man does not prove that it did not exist in the prior creation.

Since Paul says Adam was the first man, we are left with the remains of man as the only "index fossil" that can positively be used to distinguish the Adamic creation.

THE BOUNDARY BETWEEN THE TWO CREATIONS

According to our old theory, the first creation had no mammals or angiosperms and their first appearance marked the beginning of the Adamic creation. This theory presents some difficulties in the placement of the boundary between the two creations. It has necessitated a considerable amount of gerrymandering of the boundary to make our theory fit the real world. One could say that it was the stratigraphers that did the gerrymandering, but I do not think so. They make careful observations, and stratigraphy is not in that bad a state. There are minor adjustments and changes made from time to time, but nothing as major as would be required to make our old theory fit. Paleontologists do not distort the record to fit the theory of evolution. They are quite objective in reporting what is observed. Our old criteria for distinguishing the two creations does not work because separation between what we thought were "two worlds" is not as distinct as we had thought.

The angiosperms were already abundant by the Upper Cretaceous, and the dinosaurs do not disappear until the end of the Cretaceous. On page 23 and 24 of his paper, Mr. Lain cited some of the evidence indicating the transitional nature of the boundary between the "two worlds".

Figure 6[11] shows the demise of the dinosaurs at the end of the Cretaceous (Colbert, p. 214). However, frogs, turtles, lizzards, snakes and crocodiles are shown as continuing thru the boundary. There is no evidence of a universal destruction of all life here.

Figure 7 (Colbert, p. 156) shows the termination of several groups of the Triassic- Jurassic boundary. Likewise there are other extinctions at other levels in the record. These extinctions occurred at various times and can not all be the result of the same event.

[11] Colbert, Edwind H., 1955 Evolution of the Vertebrates John Wiley & Sons, Inc.

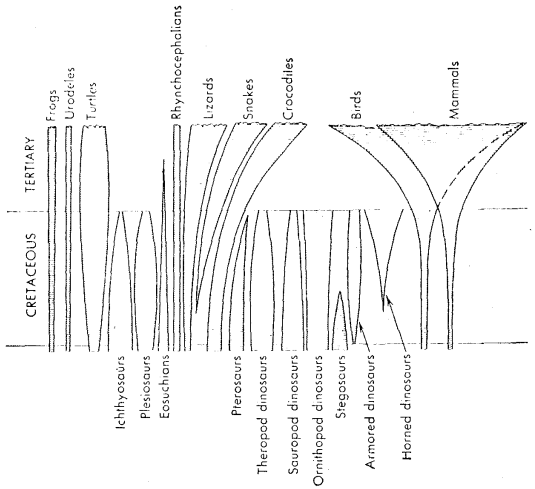


FIGURE 6. Range and relative abundance of tetrapods within and beyond the Cretaceous period.

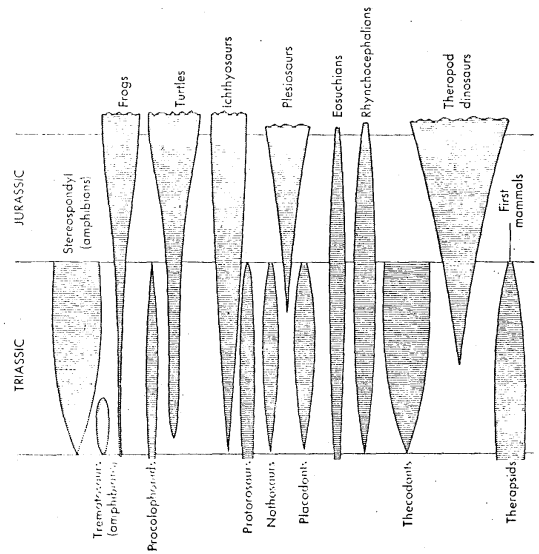


FIGURE 7 Range and relative abundance of tetrapods within and beyond the Triassic period.

It is well known that there were abundant angiosperms in the Cretaceous. However, until recently there were no well documented pre-Cretaceous angiosperms. A recent find in Utah has now documented the existence of angiosperms of the Jurassic. [See March 12, 1973 Memo]

> "Petrified palm logs comprising two species of Palmoxylon, as reported (1) from the Middle Jurassic Arapien Shale Formation near Redmond, Utah were excavated from undisturbed beds within this formation. These represent the first definite flowering plants known from strata of pre-Cretaceous age. Three criteria are necessary in order to substantiate the validity of a proposed pre-Cretaceous Anthophyta.
>
> First the collection site must be Jurissic or earlier in age. Second, it must be demonstrated that the fossil was collected in place. Third, the fossil must be unquestionably related to the Anthophyta (Magnoliophyta)." [12]

> "our discovery of petrified axes in Utah that can be referred to the family Palmae on the basis of their well-preserved cellular structure is indeed an important find, especially when it comes from Jurassic strata." [13]

Fossil invertebrate fauna from the Arapien shale surrounding the trees has been identified as either Middle or Upper Jurassic.

> " The Arapien Shale was defined (12,13) as a Jurassic formation which appears stratigraphically conformable below the Twist Gulch Formation which, in turn, is overlain in the Salina Canyon region south of Redmond by sediments (12) belonging to the Upper Jurassic Morrison Formation."[13]

The Morrison Formation, which stratagraphically overlies the Arapien Shale contains dinosaur remains in many areas including Dinosaur National Monument. Therefore we have angiosperms well below strata containing dinosaurs.

[12] Tidwell, William D., et. al., 1970, Pre-Cretaceous Flowering plants: Further investigation from Utah, Science, v. 170, No. 3957, p. 547.

[13] Tidwell, William D., et. al., 1971, Palmoxylon simperi and Palmoylon pristina: Two Pre-Cretaceous Angiosperms from Utah. Science, V. 170, No. 3933, p. 836.

Another significant find was also reported in the same area [12] (Tidwell, p. 548).

> "Well-preserved palm roots imbedded in growth position within sandstone beds of the Arapien Shale (Fig. 1) have recently been collected. These roots vary in size from the diameter of a pin to several centimenters and may be traced laterally within the sandstone beds, where they form a network of small and large roots typical of a living arborescent monocot. At least three species of palm roots (Rhizo-palmoxylon) are present in this formation. Axelrod(7) reviewed the collecting sites of both the palm stems and roots with us. He suggested that rather then roots being found in only one sandstone bed, the palm roots were present in several sandstone horizons, each of which indicates a distinct period of flooding and deposition. These roots demonstrate that palm trees, and thus flowering plants,were growing over an extended period of time in central Utah during the deposition of the Arapien Shale Formation.[11]

Illustrated in this article is a photomicrograph of a section of one of the fossil roots showing the typical palm root structure.

Trees in growth position are one of the indications that a significant amount of time has passed between periods of deposition. Here we have at least one horrizon with trees in growth position, and possibility of several. These palms were actually growing during the Jurassic. They were not contemporaneous with life preserved at other levels in the section.

In his paper, Mr. Gentet commented that no angiosperms are found in the Upper Jurassic Morrison formation with its abundant dinosaur remains. However, angiosperms and dinosaur tracks do occur together in the same formation. William Lee Stokes[13] reports such an occurrence in the Upper Cretaceous Blackhawk formation in Utah.

> "A large number of fossil leaves occur in the formation including sequoia, fig, willow, and other still-living forms. Dinosaur tracks are also found in abundance in some coal mines in the formation.[14]

Here is undeniable proof that the dinosaurs and angiosperms were contemporaneous!

[14] Stokes, William L., and Cohonour, Robert E., 1956, Geologic Atlas of Utah, Emery County, Bulletin 52, Utah Geological and Mineralogical Survey, Univ. of Utah

I include here two diagrams[15] which show the increase in the Angiosperms during the Cretaceous as well as the continuation of other groups of plants.

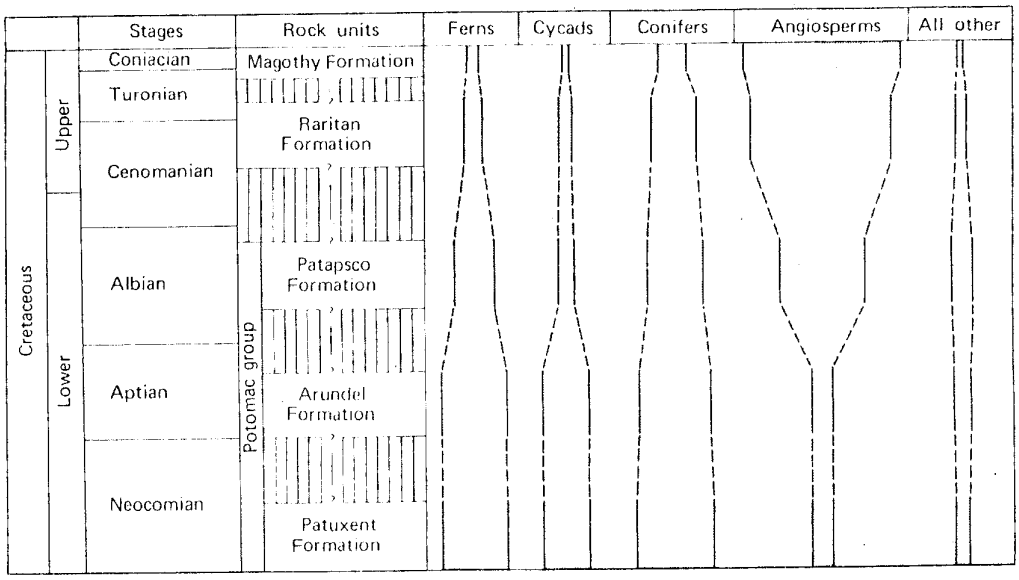


Figure 8 Relative proportions of genera in plant groups of the successive Cretaceous floras of Eastern United States (from Dorf, 1955).

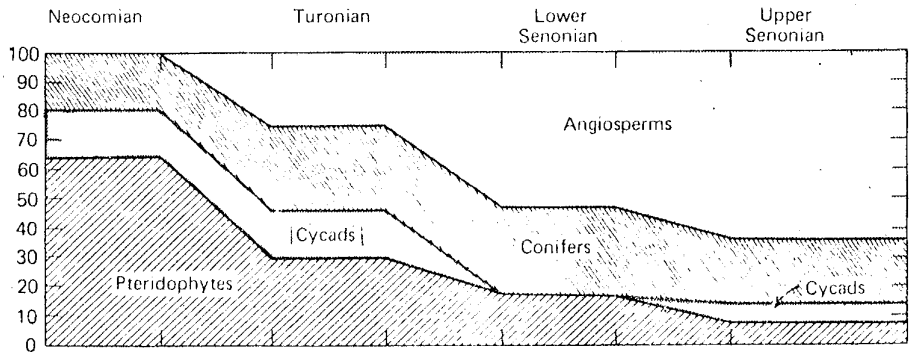


Figure 9 Changes in dominance of plant groups in New Zealand during the Cretaceous, based on percentages of species in collections from Waikato Heads (Neocomian), Seymour River coal measures (? Turonian), Paparoa coal measures (Lower Senonian), and from Shag Point and Pakawau (Upper Senonian). From McQueen (1956).

[15]Tshudy, Robert H., and Scott, Richard A., 1969, Aspects of Palynology Wiley-Interscience, New York, p. 333.

I quote one passage from the same textbook[15] (p. 344) which states that no great changes in vegetation occurred at the extinction of the dinosaurs.

> "significant faunal changes-- including the great extinciton of dionsaurs, ammonites, and rudistid pelecypods -- did occur at the [Cretaceous-Paleocene] boundary and contributed to one of the noteworthy faunal gaps in the paleontological record (Newell, 1962). The paleobotanical record, on the other hand, seems to have no gap of comparable magnitude, so that the Cretaceous - Tertiary passage appears to have occurred without drastic vegetational change. "

No, it is not easy to draw a definite dividing line between the world of mammals and angiosperms, and the world of dinosaurs. In his paper, Mr. Gentet quoted an interesting statement made by Romer.[16]

"It has long been clear in the minds of those working with mammal--like reptiles and primitive mammals that with increasing knowledge it would be impossible to draw a sharp line between Mammalia and Reptilia." Romer goes on to say that the former distinctions of jaw type does not work out.

The whole problem of whether a given animal is or is not a mammal, and where to draw the line between the worlds of mammals and reptiles is really of no consequence as I will prove in a later momo. I will show that the Tertiary has to be pre-Adamic, meaning that there were mammals and angiosperms before Adam. The boundary between the two creations, then is above the Tertiary, and below the level at which the remains of human beings or human civilization are found.

[16]Romer, Alfred Sherwood, 1968, Notes and Comments on Vertebrate Paleontology.

THE COLORADO PLATEAU

In the summer of 1971 Mr. Burky, Mr. Hopkinson and I visited a number of areas in the Colorado-Utah district. That autumn we presented our findings in a meeting which a number of you attended. I would like to quickly review what was presented at that meeting.

First it was shown that there is an undeniable sequence of strata in the Colorado Plateau, over two miles of total thickness. They are all relatively horrizontal with one formation resting upon another. The order of deposition is easily discernable by superposition. This column represents the entire period life has existed on earth and includes all but two of the geologic periods. The diagrams in Figures 10, 11 and 12 were shown to illustrate this sequence of strata. Figure 13 shows the correlation of formation names from one area to another. Though these names may change from one area to another, the formations grade laterally into each other.

We checked out the fossils in these strata and found that the fossils do follow the sequence they are supposed to according to the principle of faunal succession. Figure 14 summarizes the fossils found in the sequence.

We showed that there are many indications of time involved during the deposition of the strata in this section, and significant intervals between periods of deposition. We zeroed in on the Redwall Limestone in the Grand Canyon and showed numerous time indicators in that one formation. Figure 15 illustrates some of the time indicators in the Redwall formation. Unconformities and other phenomena at both its upper and lower contacts and within the formation show considerable periods of time between periods of deposition as well as during deposition. The Redwall formation is a very clean limestone containing little or no mud. This indicates deposition under very quiet water, not catastrophic conditions. Limestone is a chemical sediment whose deposition depends upon precipitation of lime from water. This is necessarily a slow process, being dependent upon the rate at which lime is brought into water by streams carrying this product of the chemical breakdown of rocks on land. The 550 foot thickness of this limestone alone is indicative of a long period of time during deposition.

That summer we visited Dinosaur National Monument in north-eastern Utah, where an extraordinary assemblage of fossil dinosaur bones are preserved in the Upper Jurassic Morrison formation. Here abundant partially disarticulated dinosaur bones are contained in a relatively small sandstone lens. We examined the possibilities: Was this a result of a worldwide catastrophe, or did it occur as geologists say? They propose that dinosaurs were trapped by a flooding

river, their carcasses being carried downsteam and eventually deposited in a sand bar. These dinosaurs were partially dismembered indicating they were dead for awhile before burial. The deposit covered only a very limited area. One would expect a catastrophic event to spread the bones out over many miles. The upper portions of some of the longer bones were partially decomposed as if the protruding ends had been exposed to the weather for a period of time -- perhaps a year or so. Some of these protruding parts had small teeth marks in them as if the exposed portions had been chewed on by small animals. At the time the dinosaurs died other animals were apparently not only still living, but carrying on their usual activities. We therefore concluded that the geologists explanation was much closer to the truth.

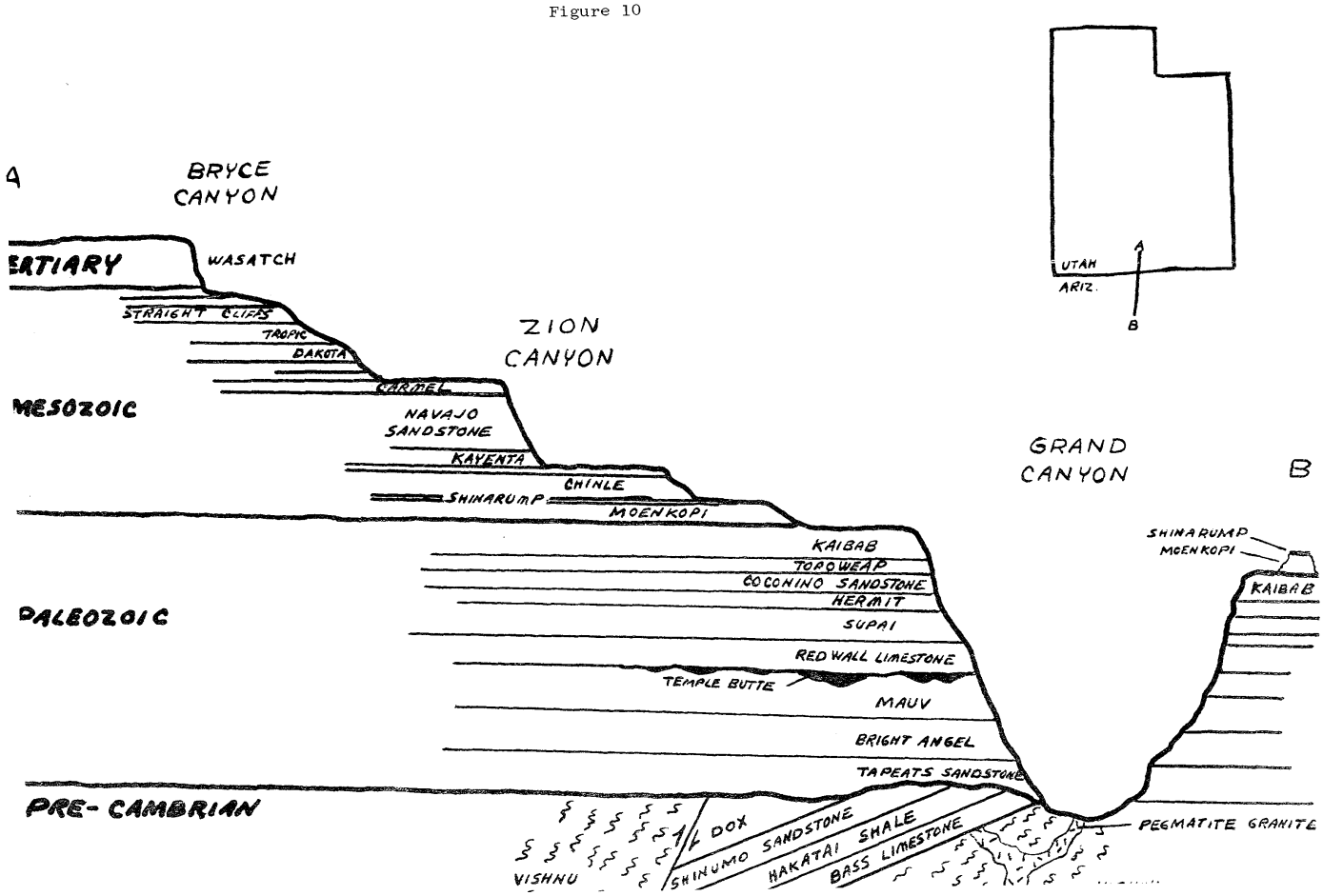
We found many time indicators in the Tertiary, as well as in the Paleozoic and Mesozoic. One of the most significant was a vertical series of algal reefs in the Eocene Green River formation in north-western Colorado. There we illustrated by color slides showing that there is no way for them to have been transported in from another location. They obviously grew in the place they are found. The total thickness of the reefs was about 110 feet. Algal reefs have been studied in present day lakes, and based on present growth rates, these reefs would have taken 6,000 years to grow. Even if we double or tripple the present growth rate, we are still in trouble if we try to account for them this side of Adam, especially when we consider the other occurrences during the Tertiary. Hundreds more feet of shales between the algal reefs require more time for deposition. Several other Eocene formations (see Figures 12 and 13) lie both above and below the Green River formation. The total thickness of these Eocene formations is more than a mile. The Green River formation itself, 2,600' thick in this area is mostly fine grained carbonaceous shales. The algal reefs as well as other environmental indicators show deposition in a fresh water lake. For instance associated with the algal reefs are abundant oölites indicating gentle wave action over a period of time.

Not only a long period of time required to account for the Tertiary deposits, but more time is needed to uplift and erode these formations to their present configuration. There is no way to account for the Tertiary here unless we assign it to the pre-Adamic period.

Whether or not there are true mammals in the Paleocene, there are fossil mammals in the Green River and the Eocene formations both above and below. (see figure 14). We therefore concluded that there were mammals and angiosperms in the pre-Adamic creation.

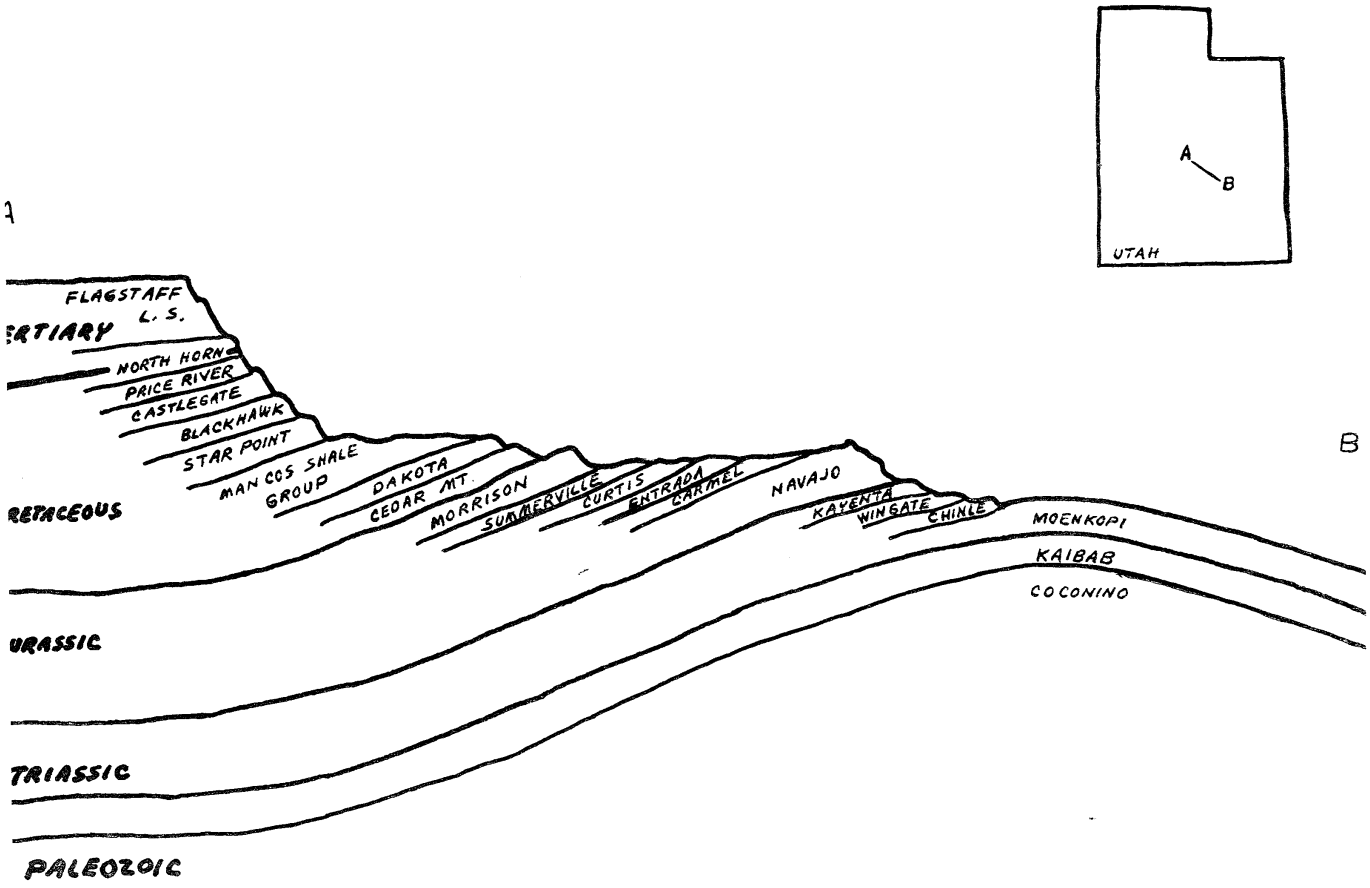
SOUTHERN UTAH & NORTHERN ARIZONA CROSS SECTION

Figure 10



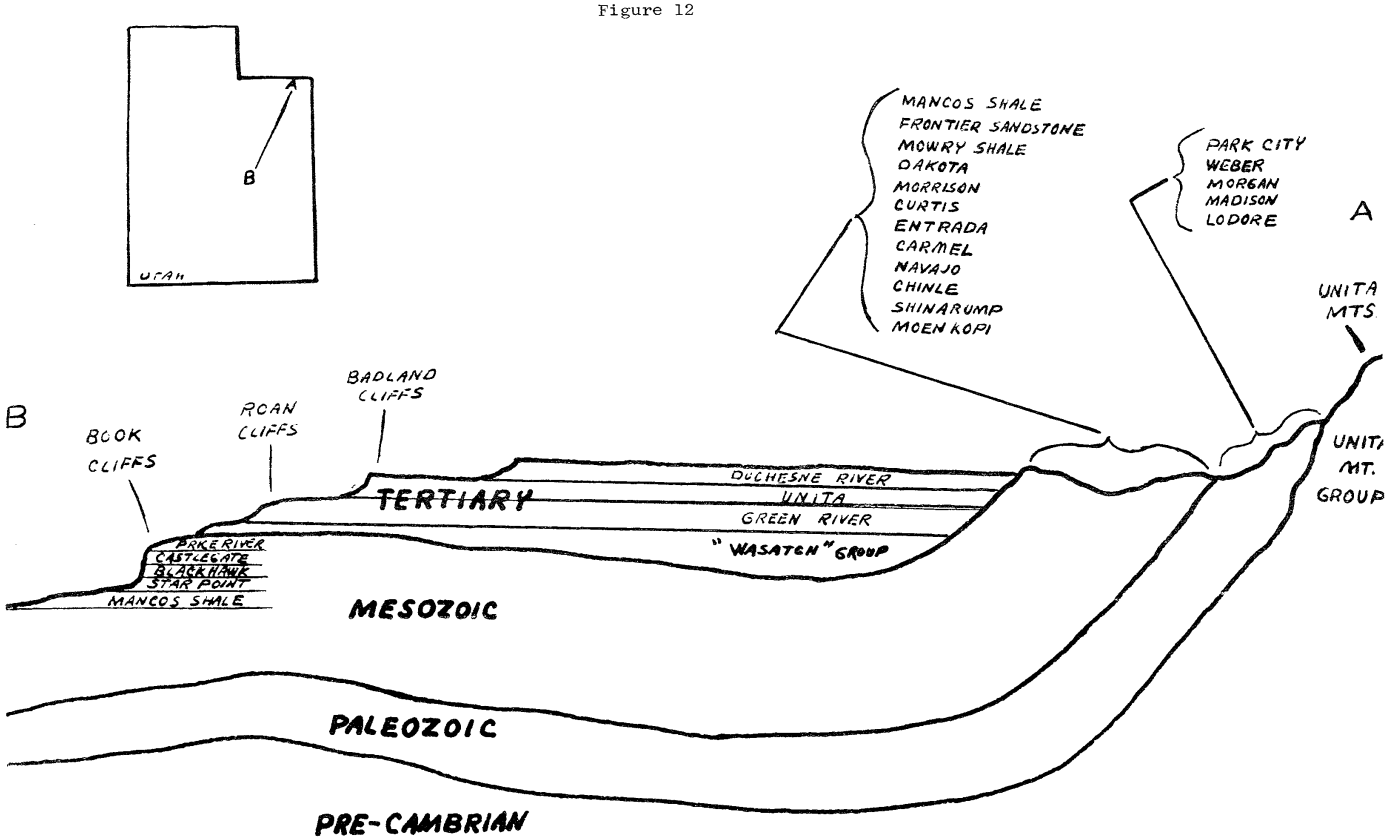
CENTRAL UTAH CROSS SECTION
(WESTERN EDGE OF THE SAN RAFAEL SWELL)

Figure 11



UNITA BASIN CROSS SECTION

Figure 12



CENTRAL UTAH GEOLOGIC COLUMN
(SAN RAPHAEL REEF)

	Formation	Approx. Thickness
Tertiary	Green River	
	Colton	300-1500 '
	Flagstaff Limestone	200-1500 '
	North Horn	500-2500 '
Cretaceous	Price River	700-1200 '
	Blackhawk (includes Castlegate)	700-1000 '
	Star Point Sandstone	200-450 '
	Mancos Shale Group	3000-4500 '
	Dakota Sandstone	
	Cedar Mountain	
Jurassic	Morrison	350-500 '
	Summerville	125-450 '
	Curtis	75-280 '
	Entrada	250-840 '
	Carmel	800 '
	Navajo Sandstone	500 '
	Kayenta	
Triassic	Wingate Sandstone	400 '
	Chinle	400-500 '
	Moenkopi	700-900 '
Permian	Kaibab Limestone	100 '
	Coconino Sandstone	700 '

SOUTHERN UTAH & NORTHERN ARIZONA GEOLOGIC COLUMN

	Formation	Approx. Thickness
Tertiary	Wasatch, Claron, Intrusive & Extrusive Igneous Rocks	7-800 '
Cretaceous	Kaiparowits	0-1200 '
	Wahweap	
	Straight Cliffs	1800 '
	Tropic	0-1000 '
	Dakota	0-100 '
Jurassic	Morrison	350-500 '
	Winsor	0-190 '
	Jurassic Undivided	0-200 '
	Carmel	0-675 '
	Navajo	1800-2200 '
Triassic	Kayenta	700 '
	Moenave	455 '
	Chinle	385 '
	Shinarump	75-185 '
	Moenkopi	980 '
Permian	Kaibab Limestone	320 '
	Toroweap	290 '
	Coconino Sandstone	400 '
	Hermit	300 '
Pennsylvanian	Supai	1000 '
Mississippian	Redwall Limestone	500 '
Devonian	Temple Butte	0-100 '
Cambrian	Muav	400 '
	Bright Angel	25-400 '
	Tapeats Sandstone	0-200 '
Late Pre-Cambrian	Unkar Group (Bass Limestone, Hakatai Shale, Shinumo Sandstone, Dox, Rama)	4640 '
Pre-Cambrian	Zoroaster Granite	Dikes

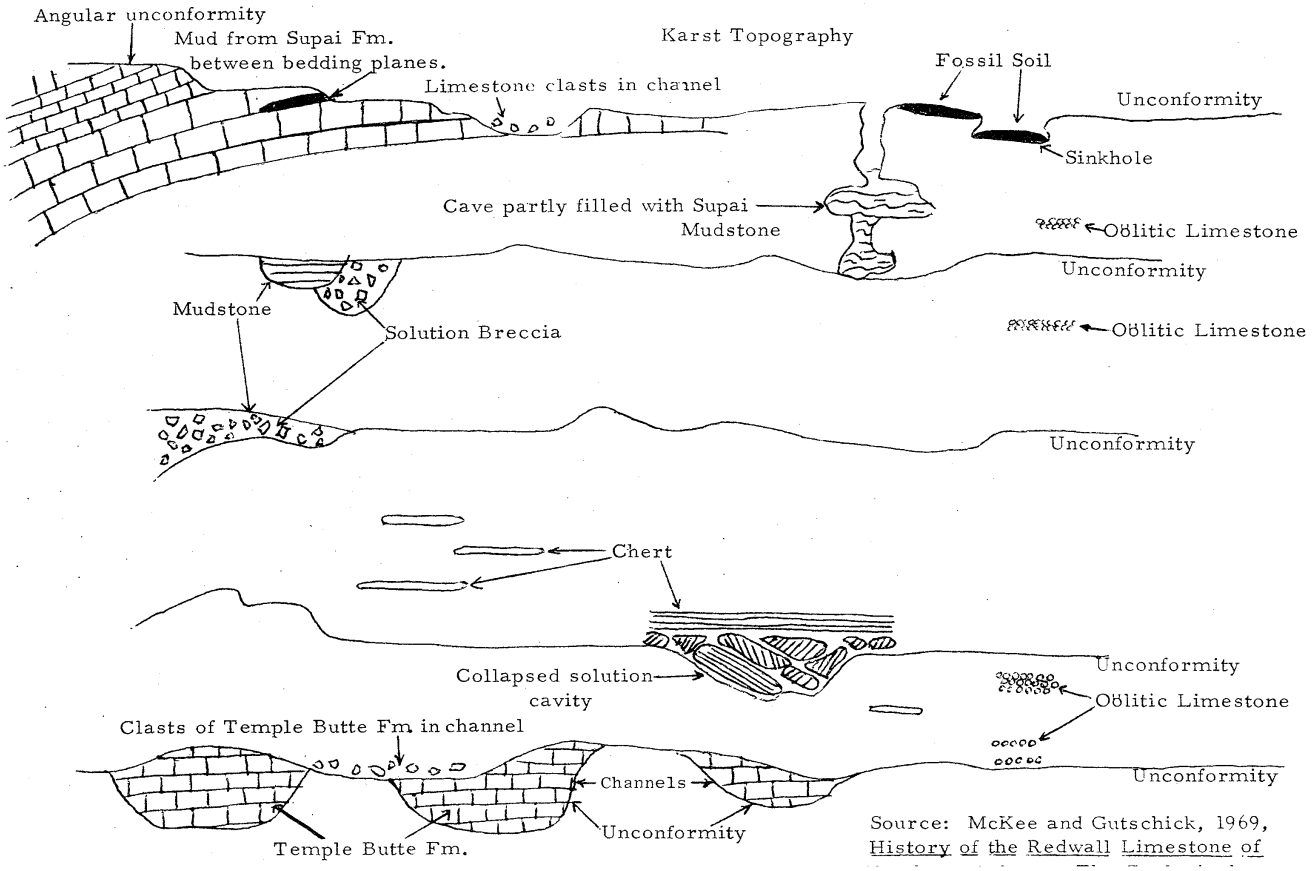
NORTHEASTERN UTAH GEOLOGIC COLUMN

	Formation	Approx. Thickness
Tertiary	Duchesne River	1500 '
	Uinta	2000 '
	Green River	2800 '
	Colton	
	Flagstaff	
Cretaceous	North Horn	
	Price River	
	Castlegate	
	Blackhawk	
	Star Point	
	Mancos Group	3080 '
	Frontier	80 '
	Mowry	90 '
	Dakota	50 '
Jurassic	Morrison	800 '
	Curtis	200 '
	Entrada	200 '
	Carmel	200 '
	Navajo	900 '
Triassic	Chinle	250 '
	Shinarump	75 '
	Moenkopi	800 '
Permian	Park City	200 '
Pennsylvanian	Weber	1000 '
Mississippian	Morgan	1200 '
	Madison	175 '
Cambrian	Lodore	450 '
Pre-Cambrian	Uinta Mt. Group	20,000

FOSSILS OF THE ARIZONA-UTAH AREA BY FORMATION

PLEISTOCENE		Bison (extinct species)
EOCENE	Duchesne River Fm.	turtles, crocodiles, mammals
	Uinta Fm.	mammals
	Green River Fm.	mammals, algae reefs, crocodiles, turtles, fish, fresh water Mollusks, insects, angiosperms, lizzards, birds, marsupials insectivores carnivores, primates,
	Wasatch Group	Mammals, Eohippus, elephant-like animal, rhodents
	Wasatch Fm.	Fresh water mollusks
CRETACEOUS		Coal, mollusks, angiosperms
JUR-ASSIC	Wingate Fm. Kayenta Fm.	Dinosaur tracks
TRIASSIC	Shinarump Fm. Chinle Fm.	connifers (Petrified Forrest)
	Moenkopi Fm.	Land Animal trails, sea shells
RIM OF GRAND CANYON		
PERMIAN	Kaibab Fm.	Marine animals, brachiopods, coral, sea lillies, sponges shark teeth
	Coconino Fm.	Trails of Reptiles, Anphibians
	Hermit Shale Fm.	Land plants, animals, ferns, cone bearing plants, insect \ salamander tracks
	Supai Fm.	First land plants and animals
MISSISSIPPIAN Redwall Limestone		Brachiopods, mollusks, crinoids, coral
DEVONIAN Temple Butte Fm.		First Verterbrates: Fish
CAMBRIAN		Trilobites, Brachiopods
PRECAMBRIAN		Algae

Figure 15. The Redwall Limestone, Mississippian



Source: McKee and Gutschick, 1969, History of the Redwall Limestone of

APPENDIX 1

I have given more thought to the concept mentioned on the first page that it may not be possible to completely understand the Bible apart from the real world. Was the "gap theory" originally formulated by Bible study alone, or was the concept prompted by observations of the apparent antiquity of the earth or the universe? I was unable to trace the "gap theory" earlier than Thomas Chalmers, a Scottish theologian who popularized it in 1814. He was impressed with the new information on geology publicized during that time. William Hanna, his biographer, said of him:

> "The merit, I believe belongs to Mr. Chalmers of having been the first clergyman in this country who, yielding to the evidence in favour of a much higher antiquity being assigned to the earth than had previously been conceived, suggested the manner in which such a scientific faith could be harmonized with the mosaic narrative." *

Apparently Chalmers first accepted the geological evidence of the antiquity of the earth, and then sought to harmonize the view with the Bible. Unfortunately, the original question is still unanswered, although I suspect that the "gap theory" was conceived as a result of physical observation.

However, other examples show that a correct understanding of certain physical concepts mentioned in the Bible depend on a proper understanding of the physical creation. One of the most obvious, is the nature of the solar system. In the Bible the sun is always spoken of as moving in relation to the earth, as in Joshua 10:13, 27; Ecc. 1:5 and Isa. 38:8. This would lead one to conceive of a geocentric system, although it would not rule out a heliocentric solar system. It is natural to speak of the sun as moving from the reference point of the earth as we do today even though we know better. Job 38:12-14 can be interpreted in terms of a heliocentric solar system, but I doubt that this would be obvious without prior knowledge of the concept. Apparently the ancients understood the true nature of the solar system, and thereby had a proper understanding of what the Scriptures had to say on the subject. They properly understood the Scriptures on the basis of what they had observed. Perhaps even the antiquity of the earth

was known anciently, and the scriptures thereby properly understood. After the knowledge of these things was lost, it became difficult, if not impossible to understand what the Bible had to say on these subjects.

Another example would be understanding what happened when Jacob set peeled branches before the livestock causing them to have offsprings with markings. From the account alone, one would think that what the cattle saw caused it, but from the knowledge of breeding and genetics we know that something else was involved.

*Hanna, William, 1854, Memoirs of Thomas Chalmers, Thomas Constable and Co. Edinburgh, v. 1, p. 291.

APPENDIX 2

A few words might be in order here about an item on page 291 of Mr. Armstrong's Autobiography. It concerns the disproof of evolution by paleontology. He had found a statement in a geology text by Thomas C. Chamberlin that said something to the effect that strata could be found in any order, the younger not necessarily above the older, the ages of the strata being determined by the fossils found in them.

Thomas C. Chamberlin co-authored a series of geology textbooks used widely during the early part of the century. I was unable to find such a statement in any of his books, but if Mr. Armstrong had reference to the following paragraph, one can easily see how it could have been misunderstood.

> "Fossils as means of correlation. - While stratigraphy was thus, in the earliest stages, the main reliance in determining the order of events, and biology was the chief gainer, in the end stratigraphy received ample compensation, if indeed it did not become the greater beneficiary; for at no known and accessible place is there a complete succession of sedimentary beds. There are great series here and there but their connections with one another are more or less concealed by surface formations or water-bodies. So also at many places the stratified series has been broken up by deformation, or cut away by erosion. Hence there was need for some reliable means of matching the beds of separated series, and of making up a complete ideal series. This means is found in the fossils they contain."

This paragraph is somewhat unclear. However note that the author states that stratigraphy (superposition, from the context) was the primary guide to determining the order of events. He had made this clear in the previous paragraph:

> "The general order of life succession determined by stratigraphy, - Thus it appeared from the evidence of the strata that there was a general order of life succession. It was also found that this was, in its main features, the same for all the continents. By continued and close studies, the particulars of the succession were worked out more and more fully, and the work is still being pushed forward to greater and greater degrees of refinement. At the same time, it was found that there were different faunas and floras

> in different parts of the world in past times, much as there are now; that there were shiftings and migrations as now; that given species were increasing in some regions and dying out in others, and that innumerable variations and complications entered into the evolution and distribution of the life forms. But under ard through all these there run a sufficient number of common features to show beyond reasonable question the order of succession of life.
>
> Throughout all this study, the chief guide was the actual order in which the fossils were found in the succession of strata, because there is no evidence so conclusive of the order of events as the superposition of the sedimentary beds when they are normal and undisturbed.

This is essentially the same information that was stated much more clearly in the quote on page 4 from the Encyclopedia Britannica.

Again, the fossil record itself disproves evolution. We do not need to try to disprove faunal succession to disprove evolution.

*Chamberlin, Thomas C, and Salisbury, Rollin D., 1906, Geology, Vol. 1, Henry Holt and Co., New York, p. 647.