mediately lethal, would be removed. So again the boundaries of the kinds would not be crossed.

Neither do these considerations lead to any hope for the automatic, mechanistic, origin of life, which some have alleged to have happened. For the processes of life are more than just chemical reactions. There is this ordering and keeping in order. Such an activity would never be brought about by a broth of chemicals, brought together at random.

It might be argued, incidentally, that the last two points are maybe not all that much different. For to say that one kind of life originated, i.e. created, another, e.g. the reptiles the birds, is, in effect, to say that life created itself. And is that so much different from saying that it arose spontaneously? In each case the problem is the same. There are hundreds of adaptations and correlations needed for the simplest living thing of which we know; and other hundreds of new adaptations and correlations would be needed to go e.g., from reptile to bird. But we simply do not see such a correlation of changes coming about by chance.

Nor would the enzymes help here. For their new forms, in order to carry out the new duties which would fall upon them, would be precisely one of the things needing explanation.

Summary and Conclusion

It has been shown that, while the enzymes, amino acids, etc., in the genetic material have an important function, they are not by themselves enough to explain heredity, and the stability of the kinds. For mere chemical activity is not enough; back of it there must be an ordering and guiding. And this fact, that thus organisms are kept within their kinds, but allowed room for limited variation which may be required by the environment, I have called the fourth law.

Natural selection has been put forward as accomplishing the same purpose by some. But I urge that there is a great difference. The fourth law has a much more personal and specific role to play, so to speak. It has to steer a middle course between excessive rigidity and excessive variability; to keep creatures within their kind while allowing them some room for variation. Natural selection, on the other hand, which is really differential elimination, merely acts to eliminate those which are grossly unfit. (Blyth noted natural selection as a conservative and stabilizing force, before Darwin persuaded people that it worked the other way.)[6]

To use a pedagogical analogy, natural selection is an examiner who expels undesirable pupils; the fourth law is a teacher who instructs.

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[3]Paley, William, about 1800. Natural theology: or, Evidences of the existence and attributes of the Deity collected from the appearances of nature . . . Chapter XXIII. (In the reprinting by St. Thomas; Press, Houston, the part cited is on page 323.)

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[5]Tinkle, William J., 1967. Heredity: a study in science and the Bible. St. Thomas' Press, Houston. See especially p. 49.

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FOSSIL SUCCESSION

GLENN R. MORTON*

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The problem with the order in which different fossil groups appear in the geologic record has always been a difficult one for Creationists. Many facts are left untouched by the usual paleoecological explanation of the fossil record; and these are noted. An explanation of the fossil succession as a partial capturing of the repopulation of the world following the flood is presented.

Creationists have always had a difficult time explaining why there is a succession of different species vertically in the fossil record. Why are the mammals only found in the uppermost or later part of the stratigraphic column? Why are the protozoans the first to appear in the Precambrian followed by soft-bodied, multicellular invertebrates in the late Precambrian and hard shelled invertebrates in the Early Cambrian? Why is man the last to appear? The evolutionary explanation of this order, it must be admitted, is perfectly logical given their assumptions.

This paper will present a view that the fossil succession represents neither evolution nor the order that the habitats were inundated by the flood, as has previously been proposed by creationists, but instead represents "snapshots" of the repopulation of the earth following the flood. This view would require that the majority of the post-Precambrian strata were deposited after Noah, his family, and the animals left the ark. It is envisioned that Noah was safely aboard the ark during the most turbulent period of the flood and emerged from it when the worst was over. The earth's surface would have remained in turmoil for several centuries more.

The impetus for this view arises from this author's attempt to explain the non-existence of certain short-lived

*Mr. Glenn R. Morton's address is 3313 Claymore, Plano, Texas 75075.

Table 1: Suggested Chronology of the Early Chapters of Genesis

Time Since Creation	Birth of	True Age* Before Present	Radio-active Age
0	Adam†	5986	5.07B‡
130	Seth	5856	4.71 B
235	Enosh	5751	4.43 B
325	Kenan	5661	4.18 B
395	Mahalalel	5591	3.99 B
460	Jared	5526	3.81 B
622	Enoch	5364	3.38 B
687	Methuselah	5299	3.20 B
874	Lamech	5112	2.69 B
1056	Noah	4930	2.20 B
1556	Shem, Ham, Japheth	4430	841 M
1656	The Flood	4330	570 M
1659	Arpachshad	4327	561 M
1694	Shelah	4292	471 M
1724	Eber	4262	400 M
1758	Peleg	4228	326 M
2788	Reu	4198	268 M
1820	Serug	4166	211 M
1850	Nahor	4136	164 M
1879	Terah	4107	158 M
1949	Abram	4037	52 M
2049	Isaac	3937	2 M

*On the assumption that the flood occurred in 2349 BC, and that Arphachshad was born two years after the end of the flood.
†To be sure, Adam was created, not born.
‡B indicates billion, M, million.

radioactive isotopes by the suggestion that there was a (possibly miraculous) change in the constant of electrical permittivity.[1] Table 1 shows the result of that previous investigation. Noah would have left the ark early during the time that the Cambrian deposits were being laid down. Nahor and Terah would have lived while the Cretaceous rocks were deposited. Abraham would have lived during Tertiary times.

In order to illustrate the problems that the fossil record presents to current creationist explanations of that succession we must first look at the fossil record to see what facts need explaining.

The Fossil Record

In the lowermost rocks, the Precambrian, and in the oldest of them, appear what certainly looks like single-cell organisms. Although generally poorly preserved, as far as details are concerned, these are the first fossils which appear. For a creationist, the appearance of single-celled organisms in the earliest portion of the fossil record presents a problem, but it fits nicely with the evolutionary explanation. These beings are found in rocks believed to be 3.5 billion years old.

Algae, in the forms of algal stromatolites, are found in the Precambrian strata also. Stromatolites are formed when silt particles cover a mat of algae. As the mat is covered filaments of algae push up through the silt and form another mat which, in turn, is also covered by silt. In this fashion a finely laminated sedimentary structure is formed—the stromatolite.[2] Stromatolites are found in strata dated from two billion to the present.

Just before the Cambrian in South Australia, Precambrian multicellular, soft-bodied forms are found.[3] Since these creatures lacked hard parts, their fossils are merely molds of their bodies. The significance of these creatures is that they are multicellular and are supposed to have come next within the evolutionary framework. How is a creationist to explain this apparent evolutionary order from single cell to multicellular organisms within the Precambrian?

As we come to the base of the Cambrian we find an interesting geological feature, the Cambrian-Precambrian unconformity. This unconformity represents a nearly world-wide break in the deposition of strata due to a universal period of erosion. Walter S. Olson describes it thusly:

> "This is the most striking and universal break in the succession of rocks covering the earth. The event which they represent has been used to divide the history of our planet into two unequal and contrasting parts. The continental nuclei at that time were largely stripped down to the crystalline basement. Ancient mountain systems were worn down to their roots reducing the continents more nearly to a plain than they have ever been before or since, leaving a clean slate on which the record came to be written which is usually called historical geology."[4]

It is after this erosional interval that the first fossils appear in large numbers. The creatures which appear at this time includes arthropods, in the form of trilobites, molluscs, echinoderms, and fish.[5] The invertebrates are the most numerous, trilobites constituting 60% of all Cambrian fossils. Only traces of fish have been found; they become important later. The important point about the Cambrian is that every kind of invertebrate is represented and yet in these rocks not one shred of evidence of any vertebrates other than fish appear.

Higher, in the Silurian, the first land plants and animals are found. Surprisingly, the first fossil land animal is a scorpion.

In the Devonian, called the Age of Fishes, fish reigned supreme. Modern teleost, or bony fish, and sharks are found in profusion. One large Devonian fish, the dinichthys, attained a length of thirty feet or more. Today it is extinct.

In both the Silurian and the Devonian the species that do not appear are just as important as those that do. There is as yet no evidence of reptiles, birds or mammals. The first amphibian is fossilized in the Devonian but they do not become important until later.

By the Pennsylvanian, the liverwort, insects and the first reptiles appear. The mammals don't appear until the next geologic period, the Permian. This is after the appearance of the reptiles.

The Triassic rocks yield the first example of frogs, ichthyosaurs (dolphin-like marine reptiles), pterosaurs and modern corals.

Salamanders and birds first appear in the Jurassic while snakes, fleas, and deciduous trees and other flowering plants are first found in the Cretaceous.

The Cenozoic is divided into two periods: the Tertiary and Quarternary. The Tertiary is subdivided into five epochs: the Palaeocene, Eocene, Oligocene, Miocene, and Pliocene. The Quarternary is split into two epochs: the Pleistocene and the Recent. Rocks of these ages are always stratigraphically higher than those of the previous eras and thus they must have been deposited last. It is in these rocks that the modern mammals first are found. Rabbits and rodents appear in the Palaeocene; bats, whales and elephants in the Eocene; Cows, seals and New World monkeys in the Miocene; cat-like types in the Pliocene; and monotremes, those egg-laying mammals, are not seen until the Pleistocene.

Man as a fossil does not occur to any extent until the Pleistocene, although occasional evidence of him does appear earlier.[6] Evidence of human habitations does not occur until the Recent epoch.

One other fact needs to be mentioned concerning the Tertiary record. There is an increase in percentage of occurrence of fossilized specimens of living species with each succeeding epoch. In the Eocene, only 3 per cent of the fossil specimens are of currently living species. In the Miocene, this percentage increases to 17 percent, while 50 to 67 percent of Pliocene fossils are of creatures currently living.[7] How can stratigraphic position have a relationship with the survival of a percentage of creatures if these creatures were on the ark while the strata containing them were deposited? Obviously an increasing percentage of fossilized examples of living creatures as one goes from older to younger beds is hard to explain if those fossils represent the burial of animals excluded from the ark. Noah could not have chosen to take on the ark only those animals which would survive until the latter stages of the flood. Neither does it seem reasonable to believe that God chose to send to Noah animals thusly selected since this would appear deceptive on God's part. The only reasonable explanation for this Tertiary puzzle is that at least the Tertiary strata are later than the departure from the ark, and the animals in repopulating the world were taking their chances on survival.

These are the facts which creationists must deal with when explaining the fossil succession. The basic facts outlined above are shown in Table 2.

Table 2. Pertinent facts concerning the fossil record which need a creationist explanation.

Epoch or period	First Appearance of:
Recent	Human habitations in abundance
Pleistocene	Monotremes, humans, first human habitations
Pliocene	Cat-like types
Miocene	Cows, Seals, New World Monkeys
Oligocene	
Eocene	Whales, Elephants
Paleocene	Rabbits and Rodents
Cretaceous	Two human skeletons, Snakes, Fleas, Flowering Plants
Jurassic	Salamanders
Triassic	Frogs, Ichthyosaurs, Pterosaurs, Modern coral
Permian	First Mammals
Pennsylvanian	Liverworts, insects, first reptiles
Mississippian	
Devonian	Sharks, Teleosts, Dinichtys, Age of Fish, first Amphibian
Silurian	Scorpion, first land plants
Ordovician	
Cambrian	Trilobite, Brachiopods, Fish
Precambrian	Single cell organisms, few soft bodied forms later.

The Ecological View

The primary creationist explanation of the fossil record can be called an ecological theory. It has been used by many, and its is uncertain who first proposed it. This theory proposes that the succession of fossils primarily reflects the order in which the habitats were overcome and buried during the deluge.[8,9] It assumes that all of the sedimentation of the geologic record occurred within the year that Noah was on the ark. Ocean-bottom (benthonic) animals should appear first in the record since they live at the lowest elevation and are unable to move rapidly in order to escape the rain of sediments pouring down on them. Primarily these animals would be marine invertebrates such as the trilobite, molluscs etc. The next creatures to be buried would be the fish since they are the next lowest in elevation. They would be able, we are told, to escape the initial onslaught of sediments because of their mobility. Shore-dwelling creatures, such as amphibians would be next. They would be swept into the ocean and covered with sediments after the fish. Inland animals would follow the shore-dwellers. Reptiles would come next since their intelligence is not as great as that of the mammals. Mammals, being smarter, would be more able to intelligently plan their escape from the waters and thus be able to postpone their entombment. Man, being the smartest of all, would be able to escape to the mountains and be buried last.

The order presented here does superficially represent the order of first appearance of each group. Ocean bottom invertebrates do occur first, followed, by fish, amphibians, reptiles, birds, and finally mammals. As we shall see, this view does not explain the details at all.

Whitcomb and Morris add a further constraint on the fossil succession—hydrodynamic sorting of the fossils.[10] They correctly point out that the settling velocity of a large particle (and for depositional purposes a dinosaur is a large particle) is proportional to the square root of the size, the sphericity and the specific gravity or density of the creature. They then explain why the Cambrian invertebrates are on the bottom of the fossil record. Being denser than most animals their settling velocity would be faster. This is not entirely true, as will be shown later.

The ecological view explains only part of the nature of the fossil record. It only explains the first occurrence of the different groups; it does not account for the continued occurrence of each group from their first appearance onward to the present. Invertebrates don't just appear in the Cambrian and then in no later strata. They appear in the Cambrian first but they appear in each succeeding era. Fish first appear in abundance in the Devonian but they also appear in abundance in each following epoch. The same goes for reptiles, birds and

mammals. The ecological theory strongly implies that once a particular habitat is buried it is unlikely that a similar environment would be deposited again at a later time. For example one would have difficulty in explaining an invertebrate bed covering a fossil forest. Clark typifies the current thinking in explaining the fossils. He states,

> "It is easy to understand why mammals are not found in Pennsylvanian rocks, for these rocks show a type of environment that would not be suitable for them. In fact about the only vertebrates found in these rocks are fishes and amphibians, and a few small reptiles. The presence of amphibia correlated with the general belief that the Pennsylvanian "coal forests" were dense, damp regions quite unlikely to shelter mammals."[11]

In order for Clark's view to be correct the situation must be as that shown in Figure 1. Only where the habitats are localized vertically can it be stated that flood covered habitat after habitat producing a picture of the pre-diluvial ecological zones. And only then can it be said that the Pennsylvanian rocks display an environment unsuitable for mammals.

The correct view of the fossil record is illustrated in Figure 2. If one attempts to determine the habitat which a layer portrays, it is discovered that the habitats are all out of order. Marine layers are on top of terrestrial

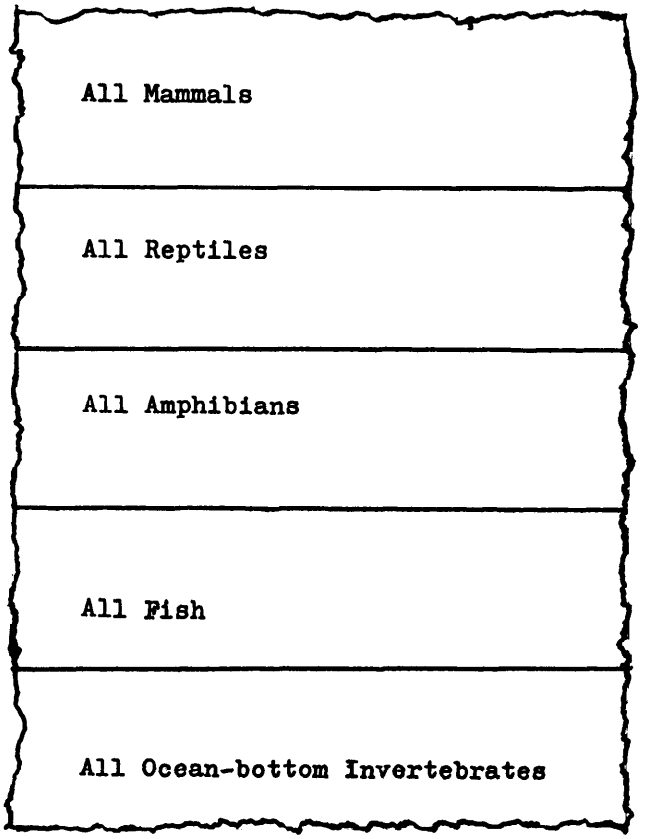

Figure 1. Implications of the paleoecological theory of fossil succession. One would expect fossils to be grouped according to habitat, all benthonic forms on the bottom and mammals on the top. But that is not what is found.

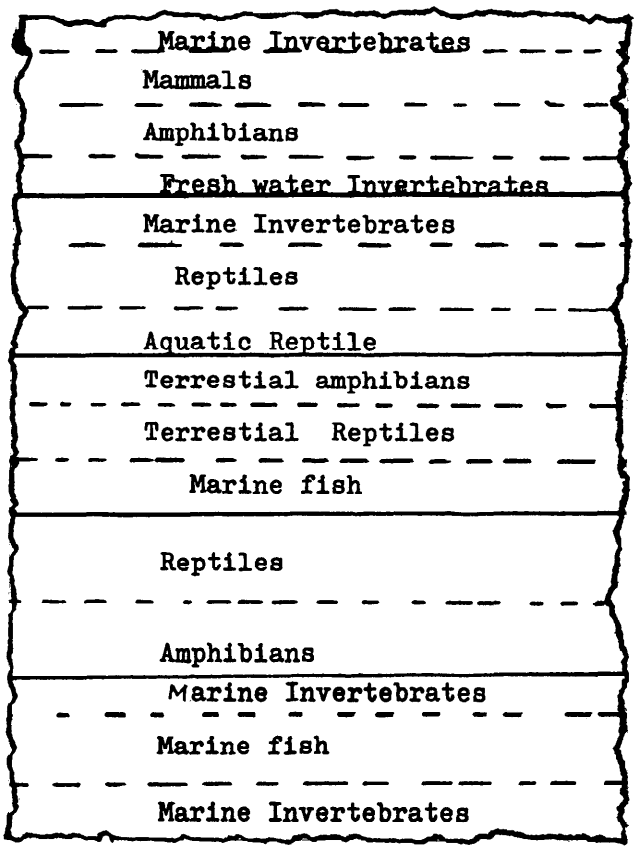

Figure 2. The order found in the fossil record is more nearly as shown here. The order does not agree with that according to habitats, which would be expected according to the paleoecological interpretation.

rocks. Oysters, a marine benthonic creature, are found in rocks higher than reptiles and mammals. This should not be if the geologic record is a record of the habitats being covered by the flood. Velikovsky gives an interesting example,

> "In Cromer, Norfolk, close to the North Sea coast and in other places on the British Isles, 'forest-beds' have been found. The name derives from the presence of a great number of stumps of trees once supposed to have rooted and grown where they are now found . . ."
>
> "Bones of sixty species of mammals, besides, birds, frogs, and snakes, were found in the forest bed of Norfolk."[12]

This forest bed would definitely give the impression that it was a forest habitat. The beds above it, however, are difficult to reconcile with the habitat theory because they represent vastly different environments. On top of the forest bed is what appears to be a freshwater deposit with arctic willow, dwarf birch and land snails fossilized in it.[13] Above this layer is a marine layer with mollusk shells in the life position, meaning they died suddenly. Thus the same locality illustrates three different environments in three successive layers. The order of these habitats is backwards to what would be expected in the ecological theory. Examples like this are not difficult to find. Thus the ecological theory doesn't account for the observed order.

Clark, as well as others, believe that the mammals were able to migrate to avoid burial. Clark states,

> "Thus it is possible that the mammals migrated upward until eventually they were overwhelmed by the waters. Their presence in the Tertiary rocks, therefore, is best viewed as resulting from their migration and final destruction rather than burial in their natural habitats."[14]

Whitcomb and Morris present a similar view,[15] but this migration hypothesis does not explain why whales and dolphins appear late in the fossil record. Surely the whales didn't crawl up the mountains to escape the inundation! If habitat alone were the consideration, whales, seals, walruses, dolphins and ichthyosaurs should all appear in the Devonian with the rest of the marine vertebrates. Not one solitary specimen of mammal or ichthyosaur has been collected from that period.

The whole mammal migration idea is based upon the assumption that the mammals, en masse, would have known where to flee to. Frankly, if this author had never had geography, he would not have the slightest inkling of which direction to go to escape the rising waters. It is doubtful that rodents, who don't appear until the Palaeocene, would know their geography well enough to escape.

Even if the proper direction were known three factors would most likely prevent one from migrating to the mountains. Suppose one were to try to flee rising waters by traveling from Dallas, Texas, to the Rockies. The first obstacle is the number of small hills along the path and it would be likely that one could be trapped on a hill top and cut off by the water. This would be especially likely after a night's rest. Secondly, the waters rushing down from the highlands, would make it increasingly difficult to make it to the Rockies the closer one got. One would have to swim upsteam in order to get to the mountains. And finally, the distance from Dallas to the Rockies, along with the very wet and muddy ground, would make it difficult to march that far within the allotted forty days.

Another problem for the ecological theory is the extinction of the placoderms and ostracoderms, the Devonian fish with thick exterior armor. Clark hypothesizes,

> "It is quite easy to imagine that the heavily armored, sluggish bottom-feeders or mudgrubbers would be overwhelmed and buried in muddy sediments, while active fishes like the sharks and teleosts could escape, for the most part, and survive to a certain degree throughout the whole surge of flood water."[16]

If lack of mobility killed the Devonian fish, then how in the world did the oysters and clams survive? They are even less mobile. We find oyster-like creatures from the Cambrian up to the present. The ecological view is illogical at this point or at the very least *ad hoc*.

If, as the ecological view advocates, the Devonian represents the period during which the marine habitat was being buried, why do we find huge fish graveyards in strata of all ages? The Devonian Old Red Sandstone,[17] the Eocene Green River formation,[18] and the Miocene Monterrey shale[19] all contain vast quantifies of fossilized fish. Why did the Eocene and Miocene fish not die during the Devonian? How did they survive until late in the flood?

Whitcomb and Morris' hydrodynamic sorting during deposition is not borne out in the fossil record. As we saw, they propose that the Cambrian invertebrates are on the bottom of the fossil record because of their high density, and their habitat. The settling velocity of a particle is proportional to the square root of the diameter, proportional to the sphericity, and proportional to the density difference between the animal and the water. Animals which have the fastest settling velocity within each habitat should be expected to be on the bottom of that habitat. According to the equation, if everything else is approximately equal then the larger animal should be expected to be on the bottom. The larger the particle; the larger the settling velocity.

Even if the densities are not equal, size should play the major factor in determining which animal should be deposited first. The density of a living creature is very unlikely to exceed a value of 3 grams per cubic centimeter nor dip much below 1.2 grams per cubic centimeter. This means that the density difference term in the settling velocity formula can only vary over one order of magnitude (e.g. the density of water is 1 so the density factor can vary from .2 to 2). Size however can vary over 3 or 4 orders of magnitude meaning that size will play a larger role in hydrodynamic sorting than density. In spite of this, Whitcomb and Morris mention nothing concerning size as it relates to which animals would be deposited first.[20]

Figure 3 illustrates the size and habitat distribution which would be expected if Whitcomb and Morris' hydrodynamic sorting were true. The largest specimens of each species in each habitat should be on the bottom of the rocks deposited. As one climbs higher in the column, successively, smaller specimens should be found until the next habitat is inundated. At that time the largest specimens of the newly inundated habitat should appear on top of the smallest specimens of the last habitat. This, however, is not seen in the fossil record. Very nearly the opposite case is observed. E.C. Olson notes,

> "Increase in size is the usual course followed in the evolution of phyletic lines and adaptive radiations. It is, of course, by no means universal . . ."[21]

George Gaylord Simpson states of the laws of evolution,

> "Among these, one of the best substantiated is a tendency for increase in size."[22]

Small trilobites occur earlier in the fossil record than do large ones. The largest Cambrian trilobite is 18 inches long while the largest trilobite, thirty inches long, occurs later in the Ordovician. This is backwards to what would be predicted on the basis of hydrodynamic sorting. Since the sphericity and densities of the trilobites were approximately the same, the only major difference in their settling velocity would have to be due to the size. The larger specimen should have been deposited first; that is not what is found.

The same situation applies to dinosaurs. Small Triassic dinosaurs appear before the gigantic Cretaceous ones. Small mammals precede large ones. Small fish precede large ones. Why wasn't the thirty

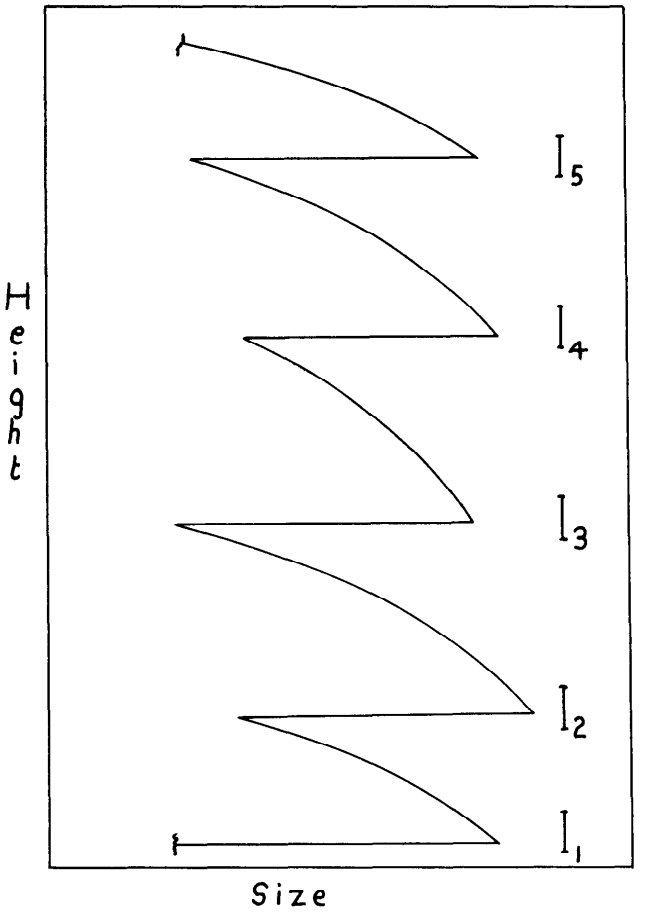

Figure 3. If hydrodynamic sorting played a dominant role in determining the locations of fossils, one would expect the variation of size of fossil with height in the geological column to be somewhat as shown here. Greater height, of course, goes along with more recent time of fossilization. $I_1, \ldots I_5$, represent the successive inundations of habitats 1, . . . 5.

foot long dinichthys of the Devonian period deposited before the smaller Silurian examples? The hydrodynamic model would predict such a situation, but it is contrary to fact.

Because of these and many other examples of contradictions to the ecological-hydrodynamic model of fossil succession, this theory should be rejected. It is dangerously *ad hoc* and is only capable of predicting the *first* appearance of a group but is not able to explain why these groups persist through the record.

The Basic Problem

What is the basic problem with the ecological view of fossil succession? Why won't it predict the details of the record? The problem seems to lie in the implicit assumption that all of the geological phenomena were finished and in place the day that Noah left the ark. This view of the speed with which the geologic work was completed seems to be a natural outgrowth of the creationists' need for speedy deposition due to the very stringent time constraints. Creationists only have a few thousand years with which to explain the geology. This has forced them to emphasize the items in the geologic record which demanded rapid action while ignoring those items which need time.

Many items in the geologic strata are indicative of a passage of some time between the deposition of two successive strata. Mud-cracks are found lithified and buried on the boundary between two layers. Mudcracks can only form when the surface of the mud dries out causing volumetric shrinkage. This shrinkage causes cracks to develop on the surface. If the dried cracked mud layer is quickly inundated and covered by sediments before the clay has had time to absorb water from the next influx, the cracks will be preserved in the fossil record. Laporte[23] shows a picture of Silurian mudcracks in limestone. Features like this strongly imply that the layer was exposed to air long enough for it to dry out before subsequent sedimentation.

Some, and I emphasize some, fossil plant beds in which the plants are preserved in an upright position just may represent in situ burial. If any of these deposits are truly *in situ* then the surface upon which the plants grew had to be free of sedimentation at least long enough for the plants to grow. Chester Arnold cites the Rhynie chert,

> "An outstanding example of *in situ* preservation is furnished by the plants in the Rhynie chert bed, of Middle Devonian age in Scotland, where numerous small rushlike plants are preserved upright where they grew."[24]

Hatched dinosaur eggs also indicate time separated two different periods of deposition. Twenty-five eight-inch dinosaur eggs were found near Choteau, Montana in Cretaceous strata.[25] All of the tops of the eggs were broken in a manner indicating that the dinosaurs had hatched. This find certainly implies that the surface upon which the eggs were laid was free of deposition long enough for the eggs to be laid and hatched. It is unlikely that the eggs were washed into place since they were found together (an unlikely happening if they were transported by water); and the eggs were not smashed as would be likely to occur under transport.

Another indicator of a time separation between bedding layers is the fact that worm burrows are often

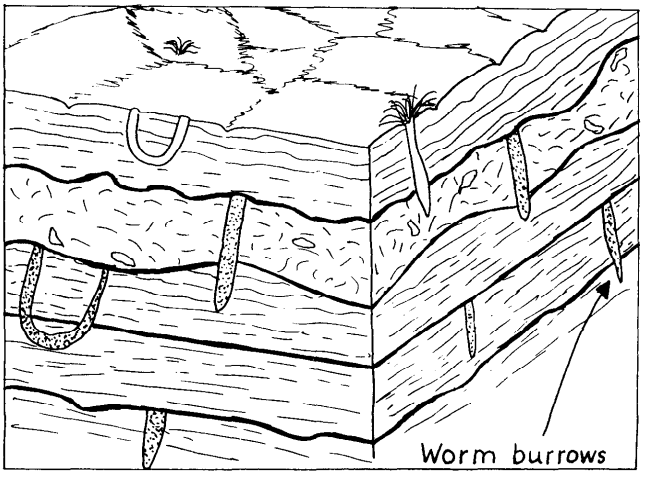

Figure 4. Worm burrows truncating into bedding planes indicate a certain amount of time separating the deposition of successive beds.

found truncated into the upper bedding plane as shown in Figure 4. The Black River and Manlius limestones of New York exhibit this phenomenon.[26] Obviously each bedding plane was an ocean bottom long enough for the worms to set up housekeeping.

Although equivocal evidence, fungal attack on plant material included in coal seams could be interpreted easily within the framework presented here. The particular fungus which is seen in coal beds can only attack the plant above water. Wilfred Francis reports, "The theory that *in situ* brown coal plants grew and decayed above the water level is supported by the frequent occurrence in the deposits of the remains of fungal hyphae and sclerotia."[27]

Partial erosion of pre-existing beds and the redeposition of the eroded material in younger beds has also been observed. Pennsylvanian fossils have been reported in Tertiary strata due to the erosion, partial weathering and redeposition of the Pennsylvanian source rocks.[28] Obviously, this would require a significant amount of time between the deposition of the Pennsylvanian rocks and the deposition of the Tertiary stratum. The Pennsylvanian rocks would need to be lithified then eroded before this situation could occur.

If the flood accomplished all of its work within a one-year period, why are sandstones nearly always void of fossils? Uniformitarianists explain this in a perfectly reasonable manner. They claim that the shells are oxidized and abraded by the action of the sand until they are no longer there. If the flood dumped everything into place over a year, then the deposition of even a modest sediment thickness on top of the crystalline basement of 3,650 ft., represents an average deposition of 10 ft. per day. At this rapid a rate any shell trapped in the sand should remain to be fossilized. If the deposition took longer, say several centuries, then shells and other organic remains would be destroyed in the manner suggested thus explaining the paucity of fossils in sandstone.

Angular unconformities present problems for the creationist view that everything occurred in a one year period. The author has seen seismic data from the eastern United States which reveals the structure shown in Figure 5. Initially the lower beds were deposited horizontally. After they lithified, they were thrust along the fault. The top of the anticline was then eroded. After all of this had occurred, the upper layers were deposited also horizontally. The thrust fault had ceased its movement since it does not cause a break in the upper layer. The whole area was then tilted. This sequence of events requires a certain amount of time.

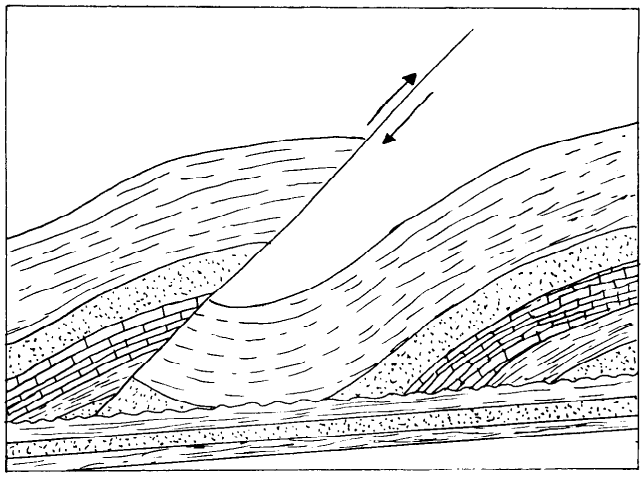

Figure 5. Angular unconformities also indicate a separation in time of the deposition of the lower layers and the upper tilted layers.

Many other geological indicators of time could be presented such as footprints in the record. The surface upon which the being walked was free of deposition at least long enough for the stroll to be completed. Space does not permit others to be cited but it is clear from these already cited that it is difficult to fit them all into a strict one-year period.

Before attempting to explain the fossil record one other question has to be raised. Whitcomb and Morris estimate that the preflood population was over 1 billion.[29] Rehwinkle estimates from 1 billon to 11 billion antediluvian souls.[30] Both say they are making conservative estimates. If these estimates are true, where are their fossilized remains? Where are the bells, plows, trumpets, eating utensils, houses and other cultural artifacts? We find trilobites, oysters and other animals by the billions but we have only a few human fossils and these are from the highest levels of the fossil record. Why? The answer to that question is, I believe, the key to understanding the fossil record.

Fossil Succession and Reproductive Rates

If the missing humans are the key to the fossil record then that is the place to start. There appears to be only two ways to explain the lack of humans in the fossil record. The first is to assume that they all were able to climb to the highest peaks and thus avoid the burial and fossilization. We have, however already seen the problems associated with that view. Houses and other cultural artifacts could not have participated in that migration.

The second explanation could lie in the Cambrian-Precambrian unconformity. As will be recalled, this unconformity represents a tremendous world-wide erosional interval during which ancient mountain systems were worn down. If this event is the evidence of the onset of the flood then the lack of humans can be explained easily. Due to the fact that all of the sediments are resting on top of crystalline basement and therefore the basement had to be eroded to its permanent basement depth before permanent sedimentation could occur, nearly all of the sedimentary and metamorphic material had to be eroded before sedimentation first occurred. If the onset of the flood were catastrophic enough to erode solid rock and many millions of cubic miles of it, think what that would do to flesh! Thus it is suggested that the most reasonable explanation of this puzzle is that the humans, the houses and other cultural artifacts were totally obliterated by the tremendous erosive forces at the onset of the flood.

The general lack of Precambrian fossils and the early appearance of protozoans can be best explained as the result of slow prediluvial sedimentation rates. The

Precambrian strata, as was pointed out earlier, are believed to be prediluvial sediments. If the sedimentation rates before the flood were similar to the rates measured today, then fossils would not be expected. Modern sediments average around 1 percent organic material[31] and most of that is merely chemical compounds, not recognizable proto-fossils. There are practically no fossils in modern sediments. The reason for this is that in order for a plant or animals to be fossilized it must be buried under sediments deeply and rapidly or it will rot or be eaten by scavengers. Under today's rates of sedimentation not many fossils are formed. If the rates of sedimentation before the flood were similar to the present's then fossils would be unlikely then also.

Under a regime described above, the only likely candidates for fossilization would be the bacteria. Being small they would be likely to escape being eaten. Decay of larger animals is caused by bacteria; so unless a living bacterium were able to eat the dead one it wouldn't rot either. Also, they were present in huge numbers. The multicellular Precambrian fossils which appear just before the Cambrian might be due to rapid burial caused by a precursor local catastrophe to the flood. This could explain the order of fossils found in the Precambrian.

Getting back to the obliteration of the humans at the onset of the flood, it must be admitted that the same obliteration would face the other organisms especially marine ones, not carried on the ark. If this were true, then a few lucky survivors would be necessary to repopulate the earth. It would seem certain that Noah did not carry marine creatures on the ark. He would not have had that much water on board, nor are marine creatures mentioned in the Biblical account.

Thus the fossils would be post-flood, as would the rocks containing them. The fossil record is therefore a series of "snapshots" of the repopulation of the earth. Local catastrophes after the flood were the cause of the fossils being trapped in sedimentary layers and buried deep enough to preserve the bodies.

Within this model the order of the appearance of fossils will primarily reflect a species' ability to spread around the earth. Two things would be necessary for a species to be preserved. First, the species must be widely dispersed in order to maximize its exposure to local catastrophes. Secondly, a local catastrophe must occur in the region inhabited by the species. Thus the more rapidly a species becomes widely dispersed the earlier it will appear in the record. The more offspring that a creature can produce the sooner the species will become widespread.

The invertebrates, the first group to appear in the record, are also the most prolific reproducers. Birdsell states, "The potential rate of increase among some marine invertebrates which produce free-swimming larval forms is so great as to involve very large numbers,"[32] Oysters produce 114,000,000 eggs per spawning.[33] A hog parasite, *ascaris limbricoides* var. *suum*, has been observed to produce 700,000 eggs in a 24 hour period.[34] Because of the invertebrates reproductive capacities they would be the first to repopulate the earth.

Fish generally produce fewer offspring than the invertebrates, but still enormous numbers by human standards. An oceanic codfish produces over 6 millon eggs per season. Turbot produce 9 million per year; ling 28 million; herring 20 to 47 thousand; freshwater trout 25 thousand; and freshwater sunfish only 1000 per season.[35]

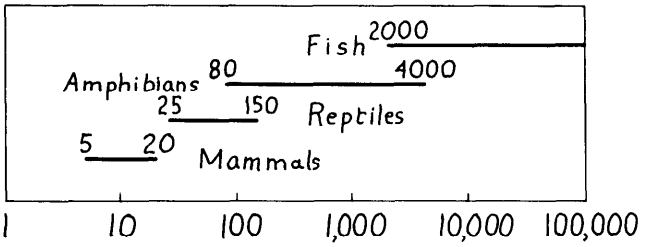

Figure 6. The number of offspring produced during the lifetime of a breeding pair of different groups. Note that the horizontal scale is logarithmic.

Amphibians are the next prolific reproducers. The bullfrog *Rana catesbeiana* is a very prolific amphibian producing 20,000 eggs per year.[36] Most generally the rate in frogs is around 2000 per year. Salamanders on the other hand produce only 40 eggs per year.[37] It is interesting to note that the frogs appear in the Triassic while the salamanders appear later in the Jurassic: a perfect correlation with their reproduction rates.

Reptiles produce fewer offspring than the amphibians. They generally produce between 25 and 175 offspring per year. Small lizards produce an average of 8 eggs per year while monitor lizards produce 25 per year.[37]

Mammals are the slowest reproducers of all. They average between 5 and 20 offspring per year. Thus they should be the last creatures, on the average, to become widely dispersed and subject to fossilization in a post flood catastrophe. Figure 6 shows the reproductive rate for some fish, amphibians, reptiles and mammals.

As one can see there is a remarkable correlation of reproduction rates with the order of appearance of the various groups in the record. In a world where the population has been decimated the repopulation would be fairly rapid at first since predators would also be few in number. A larger percentage of offspring would be expected to survive in a nearly predatorless world. As time went on and the predator's numbers increased, the rate of repopulation would slow until the present population stability was reached.

This post-flood view of the sediments and fossils allows an easy explanation for why or how humans could have left evidence of themselves in Glen Rose and elsewhere. Underneath the rocks on the bed of the Paluxy River there is around fifteen thousand feet of other sedimentary rocks. If all of those deposits were laid down in one year, how did the people who walked on the mud at Glen Rose survive the deposition of nearly three miles of material? Where were they hiding? The same problem applies to the human skeletons found in Cretaceous strata.[39] Lammerts notes of these two skeletons,

> "Admittedly this discovery offers as much of a problem for Flood geologists as for those of the orthodox point of view. For it is difficult to explain

Table 3. Longevity and the number of offspring in Deer mice. (After Birdsell)[32]

Species	Lifespan (days)	Number of Offspring per year
Peromyscus Maniculatus	152	20
Peromyscus Truei	190	12
Peromyscus Californicus	285	6

how two men could still be alive after such a depth of strata had been deposited. And if already drowned, why were they not buried later in the Mesa Verde formation? A more detailed and clear cut concept of just how the Flood accomplished its work is badly needed in order to be able to see how such finds as these fit into theoretical expectations, or creationists will be guilty of the same *ad hoc* explanations as evolutionary-minded colleagues."[40]

If these two men do not represent prediluvial people but instead are among the first pioneers to enter the new world, and some area-wide catastrophe killed and buried them, then the answers to Lammerts' questions are obvious. These men didn't live through the flood; they were Noah's descendants.

It was earlier noted that there is a general tendency in the fossil record for the individuals of a particular group to increase in size with the passage of time (e.g. in higher strata). This tendency, unexplainable by the ecological model, is perfectly logical on the repopulation assumption. The longer an animal lives, the fewer offspring per year are produced. An example is shown in Table 3 for three species of deer mice.[41] *P. maniculatus* lives the shortest time, 152 days, but produces the most offspring: 20 per year. *P. californicus* lives the longest, 275 days, but produces the fewest offspring; 6 per year. This inverse correlation of life span with reproductive rate is general, as is shown in Table 4. It can be converted to a size-reproductive-rate inverse correlation by noting that generally larger animals have longer life-spans. It takes longer for their bodies to grow to a larger size. This would imply that the larger animals would take a little longer in repopulating the world and appear later in the record than the smaller members of the group. See Table 5 for some comparison of reproductive potential vs. size.

Table 4. Reproductive Potential versus Lifespan in Mammals.

Animal	Lifespan (years)	Offspring per year
Elephant	70	1/6-1/10
Wild Ass	50	1
Baboon	45	1/2-1
Whale	35	1/2
Bison	30	1
Lion	18	3/2
House Cat	15	10-16
Dog	12	8
Hamster	1	54
White-footed Mouse	< 1	130

Table 5. Reproductive Potential versus Size in Mammals

Animal	Weight KG	Offspring per year
Whale	31,751	1/2
Elephant	5,443	1/6-1/10
Hippopotamus	3,600	1
Bison	900	1
Bear	360	2
American Elk	340	1
Gorilla	170	1
Lion	150	3/2
Aardvark	82	1
Pronghorn	45	2
Sea Otter	35	1
Baboon	24	1
Beaver	16	4
Dog	13	8
Agouti	10	8
Bobcat	9	4
House cat	3	10-16
White-footed Mouse	< 1	130

The greater explanatory powers of the reproductive-repopulation model of fossil succession presented here should, it is hoped, aid the flood geologist in explaining how the flood accomplished its work. This new view does explain more of the details of the geologic record than the previous creationist explanation and therefore should be given serious consideration.

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