Foundation, Fall and Flood

A Harmonization of Genesis and Science

Third Edition

By

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Note on the use of the word "chance"

In this book, "chance" is defined as nothing more than a random choice. To read into this word the metaphysical view that chance is the opposite of design or that chance is the alternative to God is an erroneous reading. The view advocated herein is that the outcome of chance choices is controlled by the way God constructed the universe.

Part 1: The Traditional View

THERE'S A HOLE IN THE BUCKET!

On Wednesday, July 9, 1522, a lone ship dropped anchor at Sao Tiago, Cape Verde Islands. The ship, Victoria, was the sole, bedraggled survivor of the first voyage around the world. Three years earlier the expedition had started with 5 ships and 270 men. All that remained were 17 of the original crew, along with 4 East Indians picked up along the way. The rest had deserted, been captured, or perished. Cano, the commander who had taken charge after Magellan's death, sent Martin Mendez ashore to make arrangements for ship repairs and re-provision. When Mendez returned to the ship, he amazed everyone by telling them that the islanders adamantly insisted that it was Thursday, July 10. The crew was positive that it was July 9 since every day they had made entries into the ship's log. Additionally one of the crew had kept an independent, personal diary that agreed with the ship's log. After much discussion, and detailed examination of the solar and planetary positions, it was decided that the only way to reconcile the two conflicting pieces of data was to assume the length of the day for a moving boat was not the same as for a stationary island. This was mankind's first experience with relativity.

The data impugned many theological ideas such as, the constancy of the length of a day. Psalms 39:4 stated: "Show me, O LORD, my life's end and the number of my days; let me know how fleeting is my life." How could God number the days, if the days were variable?

The data also brought into question several concepts of a sixth century monk named Cosmas. Cosmas' views were widely held in the church at the time. First, the voyage disproved Cosmas' idea of the earth. Cosmas believed that the earth was flat, yet Magellan's crew had sailed around the earth. Secondly, the voyage disproved Cosmas' idea of the sun. Cosmas believed that the sun revolved around a mountain in the north but that it didn't circle the globe, as that was impossible. Cosmas' view would require that Magellan's crew experience the same number of days as the islanders, yet they didn't. The sailors obviously followed the sun west but by doing so had disproved Cosmas' theories. Thirdly, Cosmas believed that no one lived on the opposite side of the earth, yet Magellan's crew brought back people from the opposite side of the earth.

The Church viewed this data as a threat to harmony and peace within the church. The data was sent to the Pontiff at Rome, who after a suitable period of study pronounced that the Victoria's crew had obviously made an error. This event, twenty-one years before the publication by Copernicus of his heliocentric views, was a harbinger of the battles to come between Science and Religion. The religious authorities had declared that an observational fact was not really true. Twenty-eight consecutive popes over a three hundred-year period concurred with that decision. Over that period, every Catholic sea captain was forced to choose between believing his religion or his eyes.[1]

Today's battle does not concern the earth' revolution but concerns whether the Earth is old or young, whether man evolved or didn't, and more importantly, whether the Bible is true or false. If the Bible represents revelation by the Supreme Deity who created the world and knows the facts of science, why do we have such a difficult time reconciling the two? Surely there must be some way that both can be true.

My interest in this area arose in college where my science, physics, and my faith required different beliefs. When I became a Christian I was taught that the earth must be young. The biblical interpretation I was given seemed reasonable and I had faith that God would provide answers for the problems. Never having taken a geology course, I was unprepared for the problems I would soon see.

After college, I began to work as a geophysicist in the oil industry and found that my problems only increased. I struggled greatly with the data I was seeing. I saw that the sedimentary rocks, the rocks I believed were deposited by the flood were 30-60,000 feet thick. This required depositional rates of 100-200 feet per day during the flood. How could animals flee to the hills with that much rock falling on them?

A few years later, I calculated the earth's surface temperature under the vapor canopy, the water vapor canopy that was believed to have been the source of the floodwaters.[2] Any significant amount of water vapor in the earth's atmosphere would cause temperatures in excess of 200 degrees Fahrenheit. Any water vapor canopy under which the earth was habitable, had too little water to cause the flood.

The problems multiplied. I learned about coal. There was 45 times more coal than could have grown on the preflood world.[3] Young-earth creationists claimed that the entire geologic column didn't exist anywhere on earth, yet oil companies had drilled through rocks of every geological age.[4] What was I to do?

I tried desperately to deal with the data that I was seeing. I wrote 15 articles and 7 letters for the Creation Research Society Quarterly trying to deal with these issues. I ghost wrote the evolution section for Josh McDowell's

Reasons Skeptics Should Consider Christianity. But I knew in my heart that my views had serious problems.

The problems stem from the extreme tension the conservative interpretation of Genesis creates between science and the Bible. Like many scientists I was faced with a choice. Unfortunately, most students of science choose science against the Bible and leave Christianity. Most of my geological colleagues are atheists. They were not brainwashed. They chose what they did because of the data they see. Christians blame the professors but don't consider our role in not providing a satisfactory explanation for the data. We create a hole in our bucket which produces an apologetical maelstrom drawing many into the dark hole of atheism. I almost went down that maelstrom.

Eventually, I had a crisis of faith. The data that was so contradictory to the young-earth interpretation wore on me. I faced an ethical dilemma. Do I write about it without an explanation? Do I hide the data from my readers? Do I point out the problems to my fellow young-earth creationists. God requires honesty, faith in the face of problems, and correction of our brothers in the faith. What is one to do?

When I was a young-earth creationist, I believed God would provide an explanation for the problems. But in 200 years since Lyell published his geological book, He hadn't provided any Christian with a workable solution. I knew that my articles in the Creation Research Society Quarterly would not work. This created more ethical tension. Do I tell those who liked my views that they were wrong or do I hide this from them?

In the late 1980s hope began to fade. I decided not to publish any more. And with one or two exceptions I followed that path. I quit thinking about the area for several years. I remained a young-earth creationist, but an unthinking one.

By the fall of 1993 I could no longer hold the intellectual storm at bay. I had just gotten hooked up to Internet and was drawn to the issue again on Talk.Origins, the Usenet list dedicated to the creation/evolution area. I saw all the problems of the young-earth position again for the first time in several years. I was struck by the lack of change in the young-earth arguments even after eight years of data acquisition. I was devastated to realize that everything I had written was wrong, and that there really appeared to be no explanation for how to fit geology into a Scriptural framework. I had to find an alternative interpretation or give up on Christianity. Being on the edge of loosing my faith, I spent several weeks trying to figure out how to tell my wife and children that I was not going to go to church anymore. I had come to the conclusion that Genesis was a fairy tale. The common liberal approach, that Genesis is an allegory, simply does not appeal to me. So it came down to finding an explanation or rejecting Christianity.

During the turmoil, while going to sleep one night, a new view formed in my mind. This view incorporated all the scientific data and yet was consistent with what the Bible says (but not consistent with what the young-earth interpretation). With this new view, I could believe that God created man and life specifically. I could remain committed to the Scripture as God's inerrant Word. I could remain committed to honoring the data of science. And I could be committed to the union of both of them.

This book is a topical history of my discovery of problems and my search for solutions. The book is divided into 2 parts. The first part discusses data that made me, like many Christians uncomfortable. It is not a rejection of the Bible. It is not a rejection of God as Creator. It is a rejection of all the current, widespread interpretations of the Bible. The second part presents a novel solution to the problems raised by the first section.

As noted above, the tension between the current interpretation of Scripture and the data of science creates a tension. We need to close the hole in the bucket--stop the maelstrom. We need to provide a scientifically accurate scenario that apologetically supports the Bible. This is the hope of this book.

Reference

1. William Manchester, A World Lit Only by Fire: The Medieval Mind and the Renaissance: Portrait of an Age, (Boston: Little, Brown and Company, 1992), p. 290-291.

2. G. R. Morton, "Can the Canopy Hold Water?" Creation Research Society Quarterly. 16(1979):164-169.

3. G. R. Morton,. The Carbon Problem. Creation Research Society Quarterly. 20 (1984):212-219

4. http://www.isource.net/~grmorton/geo.htm. The W. H. Hunt Trust Larson #1 well, McKenzie Co., North Dakota is one of 80 wells in the Williston Basin that have drilled through rocks of all geologic ages in proper order. There are 23 other basins in the world in which the entire geologic column exists. These are: the Ghadames Basin in Libya; the Beni Mellal Basin in Morocco; the Tunisian Basin in Tunisia; the Oman Interior Basin in Oman; the Western Desert Basin in Egypt; the Adana Basin in Turkey; the Iskenderun Basin in Turkey; the Moesian Platform in Bulgaria; the Carpathian Basin in Poland; the Baltic Basin in the USSR; the Yeniseiy-Khatanga Basin in the USSR; the Farah Basin in Afghanistan; the Helmand Basin in Afghanistan; the Yazd-Kerman-Tabas Basin in Iran; the Manhai-Subei Basin in China; the Jiuxi Basin in China; the Tung t'in - Yuan Shui Basin in China; the Tarim Basin China; the Szechwan Basin China; the Yukon-Porcupine Province Alaska; the Williston Basin in North Dakota; the Tampico Embayment Mexico; and the Bogata Basin Colombia.

THE THEOLOGICAL THICKET

It was supposed to be a practical joke. The target was Johann Beringer. His colleagues considered him odd; he was always collecting fossils and claiming that his views of the fossils were correct. His colleagues, Ignatz Roderick and Georg von Eckhart wanted to humble Beringer. They thought Beringer was entirely too arrogant. They made baked clay models of fish, comets, Hebrew letters etc., and planted them where Beringer would find them. These 'fossils' fit Beringer's preconceived ideas. And therein lay the danger. When data fit our preconceptions, our skepticism goes out the window.

In the late 1600s, when fossils were first studied, there was a controversy about their nature. Some said fossils were remains of extinct animals. Others said that they were forms created by God and were not the remains of living creatures. Living animals were made of bone; fossils were made of stone. Fossils were not identical to living forms and so could not be said to be the remains of living animals.

Those who felt that fossils were the remains of extinct animals violated a widely held theological view of the early 1600s. The doctrine of plenitude held that God created the world as a perfectly interacting system . All parts were necessary for the well being of the whole earth. Extinction implied that the world was not created as a perfectly interacting system. Extinction implied that something was imperfect about God's creation.

The false fossils that were being planted by his foes strengthened his views. In both theology and science one must interpret data from the vantage point of a background world view. Beringer believed that fossils were inorganic imitations of living forms. He interpreted the fossils in this fashion. He felt they were evidence of God's designing principle in the world. He also believed that his views defended God's perfection and His perfect creation.

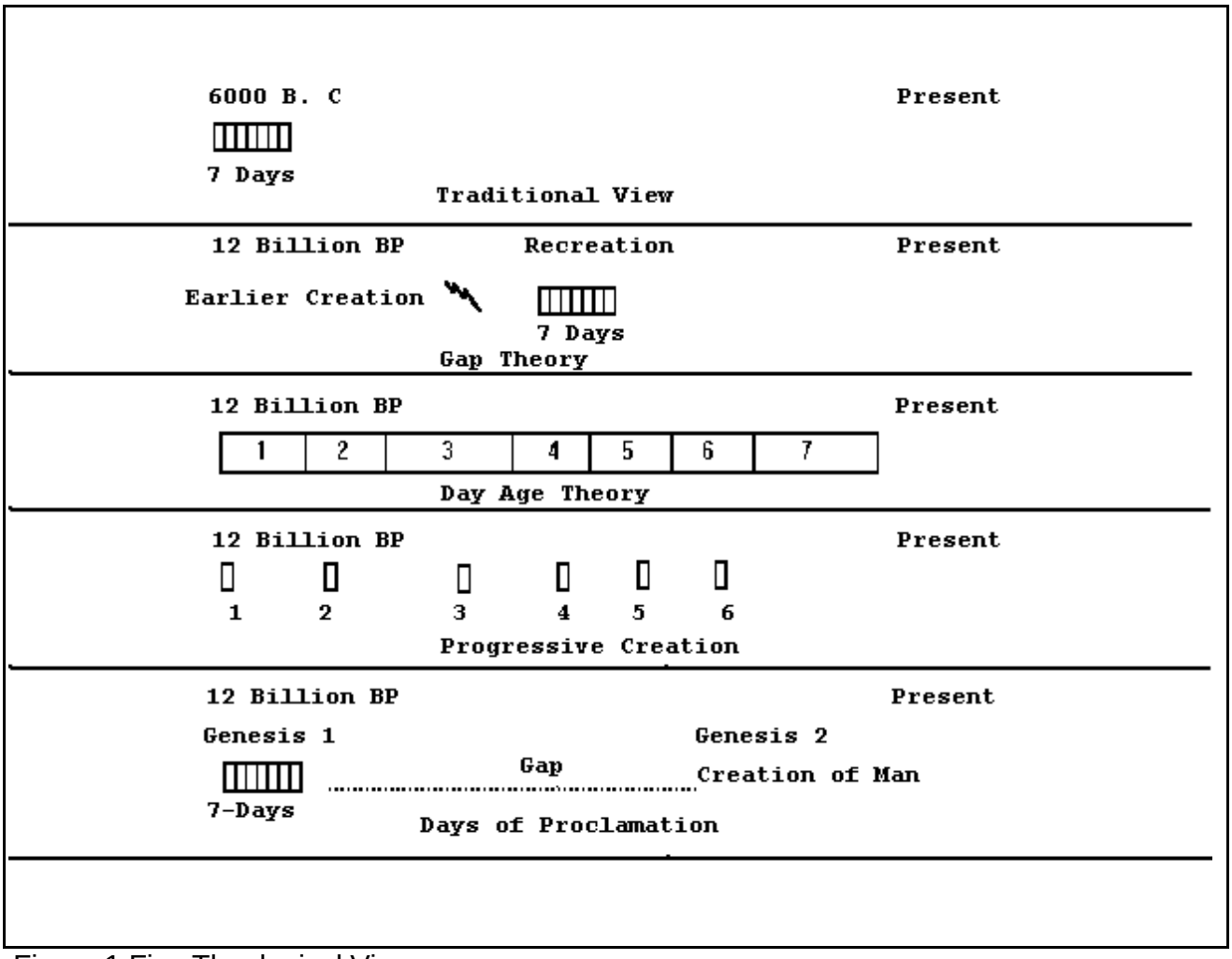

Figure 1 Five Theological Views

Beringer was delighted that the forms he was finding were verifying his beliefs. Hebrew letters were not a living form yet there they were dug up from the ground. God's designing principle obviously created letters in the sacred script also. Astronomical bodies, like comets and stars, were never a living form yet here they were. This was proof of God's organizing, and designing principle in the world.

Beringer let it be known that he was going to publish a grand book on the subject of the fossils he was finding. When the hoaxers saw that the hoax was getting out of hand, they told him that the fossils were faked. Beringer, sensing jealously on their part, didn't believe them. In fact, Beringer added a chapter specifically refuting the scurrilous charges of fake fossils. The hoaxers, seeing the extent to which the hoax was going, began to fear that it would bring them down also.

At huge personal expense and despite the warnings, he published a book to show the world what he had found. The book was illustrated by many color drawings-an additional expense. Seeing himself as the vindicator of the proper theological position, he inscribed his book, 'For the Greater Glory of God.' He was confident that his book would put to flight those who impugned God's perfection.

After the book was published, Beringer finally realized the hoax when he found a fossil with his own name on it. He was furious and embarrassed. Investigation showed that Roderick and Eckhart had paid Beringer's diggers to plant and then dig up the fake fossils. Beringer filed a lawsuit against the hoaxers and, honorably, tried to buy back every single book. Beringer incurred a huge debt and the perpetrators didn't help him at all financially. He remained in debt to the day of his death. When Beringer died his children, having less honor than dad, republished the book to pay off the debt. Today, his book is a monument to self-deception. In the end, his work did not glorify God as he wished.

What went wrong? While Beringer had the proper heart and desire to glorify God, desire does not automatically lead to truth. In both theology and science one must be sure that the interpretation fits the data not one's preconceptions. Beringer didn't believe that God would allow extinction and was unwilling to challenge that idea. Today we know he was wrong. Beringer had read his own personal concept of God into the Bible and then used it to interpret the data. Skepticism was nowhere to be found. His theological assumptions drove him to the wrong interpretation of the Bible and then to the wrong interpretation of science.

How do we avoid Beringer's blunder? We need to examine the assumptions of all theological positions. We need to ensure that the assumptions don't go beyond what the Bible actually says. This is what my crisis of faith forced me to do. And this is what we will do.

When I was a young Christian, I didn't examine the issues very closely. I went along with my teachers. What I didn't realize was that none of the books I read theologically justified a young earth. They just assumed it. A survey of the creationist books in my library shows an amazing lack of theological justification for the young earth position. A re-examination of the books in my library reveals this amazing lack. Most books simply avoid putting an age on the earth and the universe or start from the assumption that the universe is young. The few that do discuss the theological basis usually give only a cursory glance at the issue. The best theological defense of the young earth seems to be in an appendix in Whitcomb and Morris' The Genesis Flood. The best overview of the theories addressing the meaning of the days in Genesis 1 is in Creation and Evolution, by Alan Hayward. Most young-earth creationists believe that the Bible teaches that the earth is young and that the Bible is the error-free Word of God. With these two beliefs, any scientific evidence for an old earth logically must be dismissed or the Word of God is in error. Thus, due to the immense importance of the Scriptural interpretation to the argument about the age of the earth, we will examine the various interpretations of Genesis 1 in some detail.

Two issues must be addressed in examining the theological basis for a young earth. The first is the issue of the seven days of creation. The second issue is the chronologies by which the dates of the creation and the flood are calculated.

The creation account in Genesis 1 has been interpreted in at least six different ways throughout history. Figure 1 shows a graphical representation of five of these views.

Interpretation 1: Seven Literal Days

This view is the most widely accepted view by conservative Christians. It is the only acceptable interpretation in the view of the young earth creationists. The argument largely revolves around the meaning of the word that is translated as "day." The positive evidence for this viewpoint is that it fits with the normal use of the Hebrew word for day, "yom." According to Strong's Hebrew Dictionary, the word can mean a twenty-four hour day, an indefinite period of time, the period of daylight, or even the time of an event. With this many meanings, how are

we to distinguish how to interpret the word in Genesis 1 and 2?

Walsh claims that in 95% of the more than 1,125 occurrences, the word refers to a 24-hour period of time.[1] Because of this, he argues that the word must mean a twenty-four hour period in the first two chapters. Even if these statistics are correct, it is only a probabilistic argument.

Even though "yom" means a twenty-four hour period 95% of the time does not prove that it means a twenty-four hour period in any particular case. In fact, the first occurrence of the word in Genesis 1:5 refers to a 35 to 37 hour period, the original period of daylight plus the evening followed by morning, not the 24-hour period which probability would suggest. How is the word used in Genesis 2:4? Probability would suggest that it means a 24-hour period, but a careful reading suggests otherwise. Genesis 2:4 says,

> "These are the generations of the heavens and the earth when they were created. In the yom that the Lord God made the earth and the heavens. . ."

The use of the word day in this instance obviously refers to an extended period of time, at least a week. We see in the first two chapters of Genesis all three uses of the word.

Looking at all the occurrences of "day" in Genesis, except those instances from Genesis 1 and 2, which can not be used to define themselves, Walsh's percentages do not hold up. By my count, excluding the cases in Genesis 1 and 2, there are 41 occurrences, 30 obviously refer to a 24-hour period. Four refer to daylight and seven refer to a period of time. The statistics for Genesis, not including chapters 1 and 2, are as follows: 24-hour period, 73%; period of time, 17%; daylight, 10%.

The strongest argument for the interpretation of "day" as a twenty-four hour period, and thus, for a one-week completed creation, comes from the fact that each day is preceded by the words "there was evening, and there was morning." Walsh, after looking at the various usages of evening and morning concludes,

> "Hence, the <u>normal</u> usage of "evening and morning" is that of a 24-hour period. Unless something in the context of Genesis One dictates a rare interpretation the reader is to assign its normal usage. There is therefore absolutely nothing to warrant a rare interpretation of this phrase in Genesis One."[2]

If this is the strongest evidence for a seven-day, 24-hour-per-day creation, then the evidence is weak. Why is the seventh day never finished with the statement, 'there was evening, and there was morning the seventh day?' This would imply that the seventh day has never ended. This lack of parallelism with the other days is quite significant and implies that the seventh day is still continuing.

While Walsh might be correct that, if there were nothing in the context which required an unusual interpretation the reader should assign the normal usage, his assumption that there is nothing unusual is quite wrong. There is something quite unusual in the context of the sixth day. Genesis 2:19 states,

> "And out of the ground the Lord God formed every beast of the field, and every fowl of the air; and brought them unto Adam to see what he would call them: and whatsoever Adam called every living creature, that was the name thereof."

This event occurred on the sixth day because this event occurred before the creation of Eve. Eve was created on the sixth day. A literal interpretation of this verse requires that Adam name every land animal and every bird on the sixth day. There are 4,100 living species of mammals, 6,000 living species of reptiles, 2,400 living species of amphibia, and 8,700 living species of birds. This yields a total of 21,200 species needing to be named on the sixth day. If Adam took the entire daylight period, he would have needed to name and remember one species every two seconds. Even granting that Adam was a perfect human being, humans do not work that rapidly. Including the 715,000 species of insects, which the Bible does not specifically exclude, would require Adam to name and remember 17 species per second. This seems quite an inhuman feat. At least the sixth day must have been a period of time.

It can not be that God only brought a few of the animals for Adam to name. God brought Adam 'every' living creature; God brought them all! To elude the difficulties presented above by having God only bring a few of the animals means that the Bible is in error. God didn't bring 'every' animal, only selected ones. Unfortunately this is the fate that most young earth creationists are trying to avoid by advocating twenty-four hour days.

One possible escape from this mathematical problem is the suggestion that there were fewer species at the

creation than there are today. Assuming that the number of species was significantly less than the numbers cited above, then one can escape the dilemma. Morris suggests that Adam only had to name a thousand animals[3] but when it comes to the flood and the term 'all the animals' is used, Morris can't see any other possibility than that it means all animals on earth.[4] This is inconsistent, to say the least.

This suggestion is similar to the one made by Frank Marsh that God created types or kinds, called a baramin. Evolution and change within the baramin is allowed but evolution across the baramin is not. This means that maybe God only created one dog-like species and all the others have descended or evolved from the original type. But the price the young earth creationist pays for such an escape is quite high. If evolution within the baramin is true and the earth is only 10,000 years old, then all the diversity must have been developed within that time frame. Thus each species can take no more than a few thousand years to develop, which implies that the rates of mutation and change must be far faster than even the evolutionists or the creationists have ever observed or claimed. The jackal-headed Egyptian god, Anubis, depicted on the 3,500-year-old monument at Dayr el-Bahri, appears identical with jackals of today. In this picture the bed upon which the dead pharaoh lies has a carved lion's head which is identical to modern lions. Egyptian cats are depicted as being quite similar to those of today and their mummified skeletons prove they were identical. This proves that the rates of change are not that rapid. Evolutionists believe the average species life of a mammalian species is around 3 million years.[5] To believe in a literal six day, young-earth creation, rather than a period of time, leaves the young earth creationist believing in an evolution more rapid than the evolutionist.

The final piece of evidence that Genesis 2 did not occur on the sixth day comes from Genesis 2:23 where Adam finally meets Eve. The Revised Standard Version translates this verse as

> "This at last is bone of my bones and flesh of my flesh; she shall be called Woman, because she was taken out of Man."

Alan Hayward analyzes this verse best when he notes,

> "All commentators are agreed that the expression translated 'at last' in the RSV means just that. They usually express the literal meaning of the Hebrew as 'now, at length', and some of them quote numerous other passages in the Old Testament where this Hebrew word carried the same sort of meaning. Thus the Hebrew indicates that Adam had been kept waiting a long time for his wife to appear -and all on the sixth day."
>
> "Dogmatism about the length of the days of creation is therefore not justified. This is one of the many areas where it is wise to recognize the limitations of our own knowledge, and to respect alternative points of view."[6]

To believe that the days are twenty-four hours and that the activities of Genesis 2 are on the sixth day leaves one with an uncomfortable set of choices. Either Adam was able to work like a computer to name and remember millions of animals in a twenty-four hour period, the Bible is in error because God didn't have Adam name every animal, or that Adam had fewer animals to name but biological change has occurred more rapidly than evolutionists postulate so that the presently observed number of species can be accounted for. None of these choices are palatable to the young-earth creationist. Unfortunately, this predominant view in conservative Christianity leads logically and inexorably to this very distasteful trilemma. Probably the least damaging to the conservative position is that Adam could work like a computer, but who really is going to believe that? To choose Biblical error is out of the question. And if we choose rapid species change, then why is conservative Christianity fighting evolution so hard? But if you believe in this view, you must choose one of these options or violate the laws of logic!

Interpretation 2: Days of Re-Creation: The Gap Theory

This view of Genesis 1 holds that after the creation of the universe in Genesis 1:1 some sort of catastrophe befell the earth and it became formless and void in Genesis 1:2. In its modern forms, all geologic time is placed between Genesis 1:1 and 1:2. The fossils, the sediments and the time for light from distant stars to arrive at the earth are neatly tucked into this gap. The days are then seven historical days of the re-creation of the earth within the past few thousand years.

According to Arthur Custance, the view is not a reaction to the geological views.[7] He cites a number of pre-17th century scholars who believed that there was a space of time between the first two verses, including Origen, Caedmon and Hugo St. Victor. However, as D. F. Payne observed,

> "The 'gap' theory itself, as a matter of exegesis, antedated the scientific challenge, but the latter gave it a new impetus."[8]

The most important modern advocate of the view was Thomas Chalmers (1780-1847) who announced his advocacy to his congregation in 1804. He said,

> "There is a prejudice against the speculation of the geologist which I am anxious to remove. It has been said that they nurture infidel propensities. By referring the origin of the globe to a higher antiquity than is assigned to it by the writings of Moses, it has been said that geology undermines our faith in the inspiration of the Bible, and in all the animating prospects of immortality which it unfolds. This is a false alarm. The writings of Moses do not fix the antiquity of the globe. If they fix anything at all, it is only the antiquity of the species."[9]

The Gap Theory, as this view has often been disparagingly called, is criticized for the poor theological view it presents of God. The earth could not have been created as a waste and a void because anything that God does must be good. The void indicates a state of incompleteness and since God also can't create the incomplete, the creation must have befallen some tragedy. The weakness of this argument is that God might not have created everything all at once and Genesis 1:2 might simply be talking about an intermediate state of creation.

There is also little Biblical support for the view. Most advocates of the Gap Theory postulate that Lucifer was the prince of the previous world. When Lucifer fell, his fall destroyed the pre-Adamic world. Everything in the previous world died, and their bones are the fossils that we find today. The gap theory would fit well with the modern view that life and the universe are millions of years older than mankind. The evidence for this comes from the fact that fossil men are found only in the youngest geologic strata; those strata which lie on top of all other strata.

The perceived benefits of this view are that any geological or astronomical problem that requires more time than 6,000 years can be handled by having it occur during the gap of undetermined length. Unfortunately, the view fails rather miserably to account for the flood. Most global flood advocates believe that the fossils found in the geologic record are the result of Noah's flood. Thus if the geologic column is from the gap, then there is no geologic column attributable to the flood. Thus the flood would either have to be local or have left no evidence of itself. For instance, if it were a global flood, one would expect the receding waters to carve abandoned shorelines at precisely the same height worldwide at a variety of elevations. The waves on the surface of the receding waters would erode these features into the landscape. Recent wave-eroded surfaces are not found higher than 200 m and they are not found at a uniform height. If the flood was local, it would explain the lack of abandoned shorelines, but the gap theory lists no specific site as a flood location. And as we shall see, if Noah's flood was a river flood in the Mesopotamian valley, it left no evidence of itself. The gap theory really raises more geological problems than it solves.

Another criticism of this and all old-earth views of Genesis is that death must have entered the world before Adam sinned. According to the critics, this would violate the statement of Romans 5:12. The criticism goes on to point out that the Greek word translated as world is "cosmos". Cosmos, it is argued, means the whole universe. This verse, then, states that death did not enter the entire universe before Adam sinned. According to this view, no death, not even the death of an insect, occurred prior to Adam's fall. If this is true, then the gap theory and all old-earth views must be rejected.

The criticism is weak.. A careful look at Romans 5:12 reveals that the death which the verse is talking about refers only to man. The verse goes on to point out that death entered the world through one man and because of this death "came to all men." It does not say that death came to all creatures or animals but that death came to all MEN! It is quite possible that only man was destined never to die. Does the fact that death did not enter the cosmos prior to the fall require that animals also have been affected? The answer is no. The primary meaning of the Greek word for cosmos is the harmony or order of the universe. The Greek word has a connotation that is different from our word "cosmos"; it is more closely akin to the English term "natural order." If the "natural order" prior to the fall was for animals to die but man to live forever, then the meaning of Romans 5:12 would not be violated. To extrapolate the lack of death to the entire creation goes way beyond what this verse clearly states and

reads a whole lot into it.

The weakness of the young-earth view of death is that it is not required by the text. There are two great medieval Jewish scholars, Maimonides (died 1204 AD) and Nahmanides (or Ramban; 1195-1270 AD). Nahmanides, commenting on the statement, "And behold it was very good." (Genesis 1:31) stated:

> "The meaning of the word me'od (very) is 'mostly.' On this sixth day He added this word because he is speaking of creation in general which contains evil in some part of it. Thus He said that it was very good, meaning its me'od is good [thus conveying the thought that even the small part of it which is evil is basically also good, as is explained further on]. It is this thought which is the basis of the saying of the Rabbis in Bereshith Rabbah: And, behold, it was very good. And, behold it was good--this refers to death.' [10]

Recent	4631 species
Pleistocene	282 species
Pliocene	67 species
Miocene	2 species
No living mammal species found in earlier rocks	

Table 1 Living mammal species found in present vs. older rocks

Thus a Jewish scholar living at least 400 years prior to the advent of modern science believed in death before the fall. And given the fact that Nahmanides would have known the Hebrew quite well, his testimony as to the meaning of 'very good' should carry some weight. Death before the fall is allowed by the Hebrew text. Contrary to what many young-earth creationists believe and teach, death before the fall is not a view that only came up after the advent of modern science. Christians are wrong to be dogmatic about the lack of death before the fall.[11]

There is a more practical manner of looking at the problem of death prior to Adam's sin. Let's assume that Adam had never sinned and he and Eve would have lived forever as physical beings. Is it reasonable for the rest of the animal kingdom to also live forever? Most people who hold to the no pre-Adamic death view also believe that there were no carnivores. All animals, like man, were created as vegetarians. One is at once struck with the thought that, if no animal were to die but they were still allowed to reproduce, the world would quickly become overpopulated with hungry animals eating everything in sight. Presumably it would still have required plants a certain amount of time to regenerate their fruits and leaves after some hungry animal had them for dinner. This leads to the implication that the population of animals would eventually rise to the point that they were eating the plants much faster than the plants could grow. Is it really conceivable that the ability to avoid death extends to the ability of animals to go without food for long periods of time while the plants regenerate? Alternatively, the overpopulation problem could be avoided if the animals did not reproduce, but that violates the clear meaning of God's command in Genesis 1:22 for the animals to be fruitful and to fill the earth. Thus, if the animals were never to die, then in light of Genesis 1:22, they were doomed to live in an overpopulated world.

Geologic epoch	Total Genera	Living Genera
Pleistocene	830	417
Pliocene	762	133
Miocene	749	57
Oligocene	494	11
Eocene	569	3
Paleocene	213	0
Cretaceous	36	0
Jurassic	43	0
Triassic	4	0

Table 2 Number of Mammal genera in different geologic ages

One other aspect of the problem requires that animals not be exempt from death prior to the fall. Assuming that all the animals were limited to a diet of vegetable matter, then ants, cows, mites, grasshoppers must all munch on the same plants. So what happens when a cow bites a clump of grass upon which the ants, aphids and mites are also eating? If animals were not to die prior to the fall, then the only logical conclusion is that aphids, ants and mites would be able to withstand the grinding action of the cow's teeth and the digestive juices of the stomach. Miraculously, they would have been able to travel the entire length of the digestive tract and resume their lives when they emerged. Is this really plausible? It seems far more reasonable to believe that animals were never designed to live forever. Only man was given that privileged position and Romans 5:12 applies only to man.

Sediment, which eventually forms rocks, is deposited from above. Thus the oldest rocks are the lowest and the youngest rocks are the highest. As one starts from the youngest geologic strata and digs deeper, one finds a gradual loss of modern forms. In the youngest strata (Holocene) one finds only modern species. In slightly older, lower rocks (Pleistocene), he finds that more than 90 percent of the fossils represent still living species and less than 10 percent are extinct. In still older rocks (the Pliocene), the percentage becomes 50-90 percent living species and 10-50 percent extinct. In the Miocene rocks living species represent only 20-40 percent of all fossils and by the Eocene rocks, 1-5 percent of the fossils have still living representatives.[12] In Cretaceous strata there are practically no fossils of modern animal species. Table 1 shows the number of living mammal species in each geologic age. The Miocene is very shallow in the geologic column. When one looks at the geological distribution of living genera of animals, one finds the same pattern--a gradual loss of living genera as one digs deeper into older rocks. Table 2 shows the genera data for mammals and Table 3 shows the genera data for fish. One must ask the advocates of the gap theory: "Where is the gap?" This gradual loss of living species is inconsistent with the gap theory that requires a total break with the old world. This is true unless, of course, God re-created the same living forms in precisely the same percentage. But it would seem very perverse of God to do that.

Scientifically, the Gap Theory fails to harmonize geology with Genesis. Theologically, the Scriptural support is weak to non-existent. With these dual difficulties the Gap Theory must be rejected.

Interpretation 3: One Day is a Geological Age

This view is quite popular among the more liberal branches of Christianity. Its main attraction is that it allows for as much time as one could want to allow for the age of the earth and evolution. Its advocates often cite 2 Peter 3:8 as support. It says,

> "But beloved, be not ignorant of this one thing, that one day is with the Lord as a thousand years, and a thousand years as one day."

This is justification, they say, for altering the interpretation of the days in Genesis 1.

The admission of more time than the traditional interpretation of Genesis allows eases the interpretation of geologic deposits like the Green River formation. The Green River Formation is a deposit of thinly laminated shale that covers large parts of Wyoming. Adolf Knopf describes this layer in Whitcomb and Morris' book The Genesis Flood,

Geologic epoch	# Fish genera	# living genera	# extinct genera
Recent	3245	3245	0
Pleistocene	435	422	13
Pliocene	427	384	43
Miocene	503	332	171
Oligocene	327	217	110
Eocene	397	157	240
Paleocene	118	52	66
Cretaceous	339	37	302
Jurassic	143	5	138
Triassic	175	0	175
Permian	84	0	84
Pennsylvanian	101	0	101
Mississippian	161	0	161
Devonian	521	0	521
Silurian	56	0	56
Ordovician	5	0	5
Cambrian	1	0	1

Table 3 Fish genera in geologic ages

> "To obtain criteria by which laminated rocks believed to be built up of varves can be proved to be actually varved is the present urgent task of geology. The most thorough study of rocks thought to be varved are the Green River shales of Eocene age in Wyoming and Colorado. . . . The shales are very thinly layered; and each layer consists of two laminae, one of which contains considerably more carbonaceous matter than the other. The paired laminae are interpreted as representing the sediment laid down during one year, in short, a varve, an interpretation which is strengthened by the fact that the varves fluctuate in thickness in a cycle corresponding to the sunspot cycle. The varves average less than 1/2000 of a foot in thickness, and as the Green River shales are 2,600 feet thick, the time represented by their accumulation is about 6 million years."[13]

The reason for using this quote from the most

significant creationist book is to point out what is being overlooked in their explanation of the bed. Whitcomb and Morris started the idea that the Green River formation was a turbidity current deposit, but this was little more than a throwaway suggestion and is quite untenable. A turbidity current, in their context, is caused by the sudden influx of sediments into the lake. The turbulence mixes the sediment with water and the resulting slurry flows into the basin. While it is quite correct that laminations can be generated by such a mechanism, laminations are not the only sedimentary feature generated by a turbidity current. Reineck and Singh note,

> "An ideal single turbidite sequence is made up of five units with specific sedimentary structures:
> 1. Graded Interval. This is the lowermost part of a sequence showing a more or less distinct graded bedding. In well-sorted sediments grading may be inconspicuous. No other sedimentary structures are present. It is sandy or gravelly in nature.
> 2. Lower Interval of Parallel Lamination. This interval shows predominantly thick parallel laminae of sand. Grading may be present. The contact to the graded interval is gradual.
> 3. Interval of Current Ripple Lamination. This interval is made up of fine sand and silty sediments showing small-current ripple bedding. The height of ripples is less than 5 cm and the length is less than 20 cm. Ripple bedding may be developed in the form of climbing-ripple lamination. Sometimes convolute laminations are present with piled-up ripples. The contact with the lower interval of parallel lamination is rather sharp. Within the interval of current ripple lamination an indistinct grading is present from bottom to top. Megaripple bedding may be seen very infrequently.
> 4. Upper Interval of Parallel Lamination. This zone of very fine sandy to silty clay shows a distinct parallel lamination. The contact with the lower zone is distinct.
> 5. Pelitic Interval. This interval of clayey sediments does not show any distinct sedimentary structures. A decrease in sand content and grain size may be found toward the top."[14]

In other words, a sequence of laminae formed as a result of turbidity currents will show characteristically differentiated layers. If another turbidity current deposits new sediment we will find another series of characteristically differentiated laminae on top. The Green River formation shows none of the characteristics seen in turbidity currents. The Green River shows only the parallel lamination and has neither the ripple laminations nor the graded bedding intervals, nor the gravelly layers described above. Also, turbidity currents do not vary their thicknesses every 11 cycles as the Green River formation does. There is one very important 11-year cycle that affects the weather on the earth and that is the 11-year solar cycle. Only a deposit that is laid down year by year will show such a variation and the Green River Formation displays precisely such a variation. Whitcomb and Morris give no explanation for the 11-year cycle.

Modern lake deposits are identical to the deposits of the Green River. Lake deposition requires time, especially varved lake deposits. Every spring the algae blooms in Lake Suigetsu, Japan.[15] When the algae dies, it leaves a white layer on the bottom of the lake. During the rest of the year, dark clay is deposited. This process has been scientifically observed to occur for the past century. When Kitagawa and van der Plicht took a core from the lake, they found over 100,000 white layers. The algae had been blooming for 100,000 years. When they ran carbon-14 dates on the white layers they found that carbon-14 ages agreed with the physical count of the 45,000 uppermost varves, which was the limit to carbon-14 dating. This lake took more than 100,000 years to be deposited. The Day-Age interpretation does have this benefit - it allows for all the time one could want. One does not have to suggest impractical geological explanations in order to account for the world we see.

The Day-Age interpretation has a major drawback, however, in the order of the events. In Genesis 1:11, God created the plants and fruit trees, but did not create the sun until the next day. It wasn't until two days later that animals, and presumably insects, were created. Insects are necessary for the pollination of the fruit trees and other animals are necessary for the dispersal of seeds. It is difficult to see how the plants could have survived in the dark for millions of years or why God would choose such a method which required Him to sustain the plants so obviously designed for interaction with the sun and the animals.

An example of this is seen in the dependency of the Calraria tree on the Dodo bird. The dodo of Mauritius, Raphus cucullatus, became extinct by 1681. From that time a tree, Calraria major, failed to reproduce. By 1977, the tree was nearly extinct, when it was discovered that the reason appeared to be that the seeds needed to travel through the dodo's digestive tract and be scratched before they would germinate. The tree can be saved by scratching the seeds artificially.[16] But the point is that the plants could not exist for millions of years without the animals. Thus, according to this view, the Genesis 1 account must be merely symbolic not factually accurate. This

view destroys the authority of the scripture by making it illogical. Needless to say, conservative Christians find this unpalatable.

Interpretation 4: Intermittent Days of Creation

This view holds that the days are twenty-four hour long but that they are not consecutive days. According to Hayward, this view was first proposed by J. O. Means in 1855.[17] The six days are separated by vast geologic time frames. Like the day-age theory, this view can accommodate just about any piece of geologic or astronomic data that science can raise.

It is within this view that most of the progressive creationists lie. The progressive creationists believe that God created the successive forms of life by creation rather than evolution. The creative acts were spread over many millions of years.

The problem with this view is that there is absolutely no difference between what should be observed if either evolution or progressive creation were true. So how is one to tell which view is correct? New animals appear at thousands of different levels in the geologic column. Was God required to create every species in thousands different creative periods? If so then there must have been many more than seven days of creative acts and thus the Bible can not be historically true.

This view makes the Bible subservient to science and has the same difficulty as the Day-Age theory. Like the Day-Age Theory the Biblical order can't be true. It seems to be more of a capitulation than a harmonization.

Interpretation 5: Days of Moses' Revelation

The days in Genesis 1 are actual twenty-four hour days; not days of creation but days on which God revealed what he did to Moses. The six days are six visions given to Moses. Hayward traces this view back to J. H. Kurtz in 1857. This would require that God take a week of Moses' time to tell him about the creation.

While quite inventive, this view seems artificial. The Genesis account gives no hint that the days are days that Moses sat listening to God. And further, the order of events is not the order observed by scientists. It is no wonder that it took until 1857 for the first theologian to suggest this idea.

Interpretation 6: Days of Proclamation

Other than in Hayward's excellent book, this view seems to have been totally ignored and unmentioned by all modern writers this author consulted.[17] Hayward calls it the 'neglected theory.' Basically this views the six days as six actual and consecutive days upon which God made creative pronouncements which were not fulfilled immediately but, rather, set in motion a sequence of events leading towards fulfillment. God speaks and the fulfillment comes later. When Jefferson declared the independence of the United States from Britain, it took several years before that declared independence was a reality. Or more appropriately, if I command a rocket to travel to the nearest star at 50 km/sec. by giving it navigational instructions and punching the launch button, the rocket does not get to the nearest star for another 24,000 years. The fulfillment of my command to the rocket is nearly certain but far in the future. Biblically, God announced the coming Messiah at the Fall, but He didn't come until several thousand years later. David's kingship was announced when he was a child, but it was many years before he actually became king. So in this view, God declared the creation on seven consecutive 24-hour days, but the fulfillment took time. But what God commanded is not "nearly certain" of fulfillment as is my command to the rocket, His command is certain. Thus when God declared the creation of man, it took place long before mankind ever appeared, but the fulfillment of that declaration was more certain than the fulfillment of the Declaration of Independence penned by Jefferson or the arrival of our rocket.

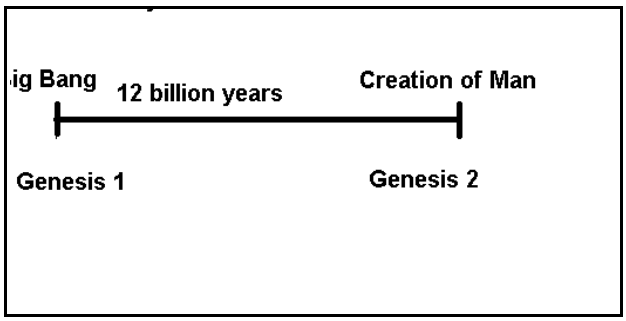

Figure 2 The proclamations of Genesis 1 set in motion events not completed for billions of years.

The Days of Proclamation view is quite old. Saint Basil (ca 400 AD) was the first to espouse the view in limited form. Basil believed three important doctrines about the

creation. First, Basil held that the first day was connected with eternity past. He notes that the first day in Hebrew is called 'one day'. Basil writes:

> "If then the beginning of time is called "one day" rather than "the first day," it is because Scripture wishes to establish its relationship with eternity. It was, in reality, fit and natural to call "one" the day whose character is to be one wholly separated and isolated from all the others. If Scripture speaks to us of many ages, saying everywhere, "age of age, and ages of ages," we do not see it enumerate them as first, second, and third. It follows that we are hereby shown not so much limits, ends and succession of ages, as distinctions between various states and modes of action."[18]

Thus, Basil believed that Day one was part of eternity past, not part of the present age.

Secondly, Basil believed that there had been a period of planning prior to the origin of the universe. He writes of this period before time. He wrote,

> "5. It appears, indeed, that even before this world an order of things (1) existed of which our mind can form an idea, but of which we can say nothing, because it is too lofty a subject for men who are but beginners and are still babes in knowledge. The birth of the world was preceded by a condition of things suitable for the exercise of supernatural powers, outstripping the limits of time, eternal and infinite. The Creator and Demiurge of the universe perfected His works in it, spiritual light for the happiness of all who love the Lord, intellectual and invisible natures, all the orderly arrangement (2) of pure intelligences who are beyond the reach of our mind and of whom we cannot even discover the names."[18]

> Thirdly, Basil believed that the world was not created in an instant. He writes:

> "Perhaps these words "In the beginning God created" signify the rapid and imperceptible moment of creation. The beginning, in effect, is indivisible and instantaneous. The beginning of the road is not yet the road, and that of the house is not yet the house; so the beginning of time is not yet time and not even the least par-title of it."[18]

God, Basil believed, planned his works prior to the advent of time.

The view remained at this stage until William Whiston, a contemporary of Isaac Newton, observed that the days in Genesis 1 must be long because it would take a long time for the land to dry out. From this Scriptural observation, Whiston suggested that there might be a long time between God's command and the fulfillment of that command.[19]

The next advocate of this view was Frederick Capron who wrote The Conflict of Truth in 1902. In it he noted the most amazing fact that is overlooked by almost everyone. In Genesis 1, God is not doing anything. God is speaking. Capron writes:

> "When we turn to the text, we observe that the history of each of the six days is uniformly introduced by the notable words, 'And God said, ' No reader, however superficial, can fail to be struck by this remarkable circumstance, that God on each day is in the first instance represented not to have done something, but to have said something (not to have made something, but to have commanded something)□"[20]

Capron illustrated his view by the following:

> "When we read the 7th verse, 'And God made the expanse,' the question naturally arises, 'When did he make it?' To this question almost everyone will reply 'On the second day, the day on which the command, 'Let there be an expanse' was uttered.' But is it certain that this is the right answer? Clearly we are not necessarily committed to it; for the text nowhere states, either expressly or by necessary implication, that the effect was produced on the day on which the command was given; and if, as we are endeavoring to show, the words are added not as part of the narrative proper, but by the way of an independent explanation, there is obviously still less reason why we should of

necessity be obliged to adhere to such an interpretation."[21]

In 1985, Alan Hayward, in a book I was privileged to review prior to publication, applied the Days of Proclamation to the origin of the earth, not the universe. He repunctuated Scripture to read in a pattern of God proclaimed 'let there be...' and a narrator, Moses, wrote much later 'And it was so'. Like Capron, Whiston and St. Basil, he believed that there was a long time between the command and the fulfillment.

Thus there are three different variations of the Days of Proclamation view. Basil applied proclamation to the formation of the universe and incorporates an old universe. Day one was totally isolated from the other days, there was a distinction between God's proclamations and action, and allowed for God to use a process to create the world. Basil lived 1400 years before scientific knowledge.

Hayward applied the Days of Proclamation to the events occurring at the formation of the earth. The phrase "Let there be light" applied to the first time light hit the earth's surface. Genesis is a description of the creation from the point of view of a hypothetical earth-based observer. The difficulties with this are that Scripture nowhere defines its viewpoint and it does not solve the problem of plants being created before the sun or insects after the trees which scientific data clearly refutes. Trees can't live without the sun and insects are found prior to trees in the fossil record.

Capron applied the Days of Proclamation to the origin of the universe as shown by the quotation above. By applying the Days of Proclamation to all of Genesis 1, Capron solved the paleontological problems, like plants before the sun and insects after the trees. Proclamations don't have to be in the same order as the fulfillment. Capron solved the astronomical problems because if God created the universe in a process following His great proclamation, light had time to travel billions of light-years. With Capron's view, there is very little that science can discover which will falsify this view. Capron's view makes the Bible true.

Is the Days of Proclamation view compatible with Scripture? There are several issues that must be examined. Many object to an old universe because they believe that death could not have been in the universe prior to Adam and Adam's sin. Since Adam is only recently created, they believe that any old earth view is biblically wrong. Christians have often viewed the initial creation as perfect and death as an imperfection. Henry Morris writes:

> ". . .'the heavens and earth which are now' (verse 7) are drastically different, with their primeval perfection and order now disfigured and chaotic in comparison."[22]

David Lane wrote:

> "The world was shaped not to 'accommodate fallen humanity,' as Blackmore and Page claim, but to accommodate mankind in its primordial perfection."[23]

James Dobson also states the same:

> "That was a perfect world, that the Garden of Eden was perfect, without flaw prior to Adam and Eve's sin, and at that moment sorrow and suffering came into the world."[24]

And Henry Morris in the Genesis Flood writes:

> "The Bible teaches a perfect Creation followed by a Fall and subsequent deterioration, requiring the intervention of God Himself, in Christ, to bring about redemption and salvation. Evolution postulates a gradual progress from crude beginnings through innate forces, to higher and higher levels of achievement and complexity. "[25]

With such a cloud of witnesses can they be wrong? They can and are. What advocates of this position overlook is that God, when saying that the creation was good, specifically did not use the word 'perfect'. There is a Hebrew word for perfect and God didn't use it of the initial creation. There are two words of interest in this context: tawmiym and towb. Tawmiym means 'perfect'; towb means 'good'. When God called the creation good, He used the word towb. This is the same word Lot used when he offered his very own daughters to the crowd outside of his house. Lot said "do ye to them as is good [towb] in your eyes". What Lot offered was not perfection! What Lot offered was disgusting, but he used the word 'good' [towb].

There is a word in the Hebrew language that God could have used to convey the concept that the creation was perfect. This is the word tawmiym. Tawmiym is the word God used of Noah, when He said that Noah was perfect in his generation (Genesis 6:9). It is also the word use to describe the paschal lamb, the lamb without defect. So, if God had really wanted to convey the idea that the world was perfect, it would have been very easy for him to do it. All he had to do was inspire the writer to use tawmiym. The failure to use that word fits very well with Jewish Rabbi Nahmanides' view that God called the world good because a small part of it was evil.[26] A perfect world certainly could not contain death; but a good world could. God created the world and called it 'good'. But whose death?

The primeval world could contain animal death but it could not contain human death. However, there is a subtle distinction that must be made. Adam was never, never told that he would live forever. He was told that if he ate of the fruit of the tree he would die. That is a different thing. If I eat a certain mushroom, I will die. That is different from saying, "I will have eternal life if I don't eat the mushroom". By eternal life, I mean an ability to live regardless of what happens to you. A being with eternal life should not be able to die from a meteor striking them.

The reason this distinction must be made is for the elucidation of the purpose of the Tree of Life. Genesis 3:22 clearly states that the purpose of the Tree of Life was to give eternal life. God removed man's access to that tree after the fall, presumably out of concern for what a fallen humanity would be like if they could live forever.

Since the purpose of the Tree of Life was to give Adam and Eve eternal life, it is not logical to believe that Adam and Eve possessed eternal life when they were first created. After all, how can the tree give what Adam and Eve already possessed? And if they already possessed eternal life at the time of the Fall, and the Fall was able to remove it from them, then they really didn't possess eternal life. This is like saying that you will live forever as long as you don't die. It is hardly to be called eternal life if circumstances can remove it from you. This line of reasoning implies that the young-earth view, in which there is no death before the fall is logically flawed.

There are three possibilities for the function of the Tree of Life. First it could provide eternal life after the Fall. Second, it could provide eternal life as a reward to Adam and Eve. Or, third, it could provide eternal life in increments, like medical treatments. Which of these functions for the tree is the correct one?

If the tree was to provide eternal life after the Fall then its removal afterwards seems odd. In fact, it rules out this possibility. The tree can provide for eternal life as a reward if and only if Adam and Eve did not already possess eternal life. If Adam and Eve did not possess eternal life in the garden, then this is a possibility. But the most likely function of the Tree of Life is to provide eternal life by treatments. Eating from the tree daily or monthly provided protection from death. Like us, they needed to remain close to God. And in this case, the removal of the Tree of Life after the Fall becomes understandable. When they were no longer able to eat of the tree, they began to age and die.

The Bible clearly indicates that mankind's death came from the Fall. David H. Lane writes:

> "This claim that physical death is not a consequence of the Fall, and that the spiritual death of man was its only result-undermines the theology of the atonement. Yes, Adam and Eve did die spiritually at the Fall, but this is learned from New Testament writers. However, they also received the penalty of physical death as a consequence of their actions (Gen. 3:17), 19 cf Ezek. 18:20; Rom 5:12,14,18-19;6:23)."[27]

James Stambaugh notes,

> "If death is not the penalty for sin then Christianity is meaningless. The death of Christ was made necessary because of man's sin. Man's sin brought death, which in turn brought God's Son to pay the penalty in our place."[28]

Death results when God removes the Tree of Life and it is no longer there to provide life. As I noted above, there is no human death prior to the fall. This view is consistent with the Scripture.

But what of animal death? Nowhere do the Scriptures say that animals will have eternal life. In Romans 5:17-18 uses the word 'anthropos'. Those verses say:

> "For if by one offence death reigned by one; much more they which receive abundance of grace and of the gift of righteousness shall reign in life by one, Jesus Christ.)
> Therefore as by the offence of one judgment came upon all men [anthropos -- GRM] to

condemnation; even so by the righteousness of one the free gift came upon all men [anthropos -- GRM] unto justification of life."

This verse does not say, and death came to all animals. Nowhere does the verse use the Greek word for animals, which is *therion*. Those who wish to claim that death was not part of the pre-Fall economy overlook this significant point.

Another verse which is often used to support the deathless pre-Fall world. Romans 8:19-22 talks about the creature being subjected to vanity and groaning in pain in the King James. More modern translations use 'creation' rather than 'creature'. Thus this verse may not mean that creatures were subject to death as it sounds in the King James, but rather, may mean that the whole creation groans because of man's sin. This is not a clear-cut case where animals were stated to be without death prior to the Fall.

There are other reasons animals must have died prior to the Fall. First, if Adam had never seen death, the threat that he would die if he ate of the fruit would have been meaningless. Secondly, animals that have eternal life have no need for reproduction. God could have just as easily created 10 billion eternal and sexless cows as He created the single pair. If the cows were eternal then they would have no need for reproduction and no need for the command to fill the earth. Insects, without death, would quickly consume the entire earth. Their reproduction rate is so rapid. Ocean sunfish spawn 300 million eggs per spawning. If half were female and they each spawned 300 million eggs the next year, the fish would number 10 followed by 2.45 billion zeros. At a single pound per fish, these fish would not only outweigh the earth, they would outweigh the sun. This is clearly not acceptable.

If the animals didn't die before the Fall, then it would create what I call a Wiley Coyote lifestyle. An animal could eat Wiley Coyote yet Wiley Coyote would live. A 20-ton meteor could land on Wiley's head, yet he would spring to life, pushing the meteor off of him. An ant could be chewed up by a cow, travel through a cow's gullet and still emerge in the manure alive and ready to go back to his colony. Logically, such a view of animal life does not comport to logic.

If animals had eternal life, why one earth would God tell them to eat from the green plants? If they really had eternal life, by definition, they had no need for food. They could not die of starvation if they refused to eat. Was God's command a meaningless set of words?

If living things could not die before the Fall, then cells could not die. Yet God's command for animals to eat green plants was a command to kill living cells. Plant cells die when an animal eats them. Human cells die as part of the normal fetal development. This includes brain cells, cells forming the webs between the fingers of a baby before birth and the cells of the placenta. If cells could die, then death was part of the pre-Fall economy. What prevents enough cells dying to kill an organism? Nothing. And if enough of your cells die, you too will die.

As we have seen, both logic and an analysis of the Scripture itself shows clearly that animal death occurred prior to the Fall. And with this analysis, the theological door is open to an old universe.

The Genealogies and the Date of Creation

When was the date of creation? Joseph Lightfoot, using a method suggested by Ussher, calculated that the date of creation was in 4,004 B. C. He based his calculation on the assumption that the genealogies in Genesis 5 and 11 are complete. If there are no missing people in these lists then indeed creation must have occurred when Ussher said it did. But hardly anyone believes that the Genesis 11 list is complete. Whitcomb and Morris outline eight reasons why the genealogies are not complete.[29]

First, the number of years in the genealogies is not totaled up. In Genesis 5, Moses gives the number of years before the birth of the son, the number of years after the birth, and the total number of years the father lived. In Genesis 11, Moses does not give the total number of years that the patriarchs lived. When Moses considers the length of time important, he totals the years. He did this in Exodus 12:40 where he gives the total years that the Israelites were in Egypt as 430 years. Since Moses totals the years elsewhere and does not do it in the case of Genesis 11, Whitcomb and Morris conclude that the genealogies are not complete.

The second reason to believe that there are gaps in the genealogy of Genesis 11 is that the genealogy in Luke (Luke 3:36) places a man named Cainan between Shelah and Arpachshad who is not present in Genesis 11. This puts the Biblical inerrantist in an awkward position. There is no hint in the Genesis 11 account to believe that there is a gap, but if there is no gap in Genesis then Luke is in error. If Luke is correct, then Genesis is in error. One can not escape the difficulty by assuming that Luke got the name from the Septuagint because that is equivalent to Luke being in error. The only way out is to postulate that the Genesis genealogies are true but

incomplete.

Adding Cainan to the Genesis 11 list makes the list in Genesis 5 and Genesis 11 symmetrical, which is the third argument for gaps. Each list would consist of ten people ending with the siring of three sons. Whitcomb and Morris suggest that Cainan was in the original Hebrew text and that the symmetry is used as a memory tool. Ten people in each list would help someone memorize the list. For this reason, it is not necessary to believe that the lists are complete.

Fourth, the extraneous information given in the genealogies about the patriarchs indicate that these genealogies have other purposes than merely defining biological lineage. The purpose was to show the Messianic line. Another purpose was to show the fulfillment of the curse. Each patriarch, save Enoch, died.

Fifth, if a strict chronology is true, then Shem, Selah and Eber would have outlived Abraham. Noah would have been alive when Abraham was born! Joshua informs us (Joshua 24:2,14,15) that long ago Abraham's fathers were idolaters when they lived beyond the river. If the chronology is complete, then this would imply that Noah, Shem and the whole gang had become idolaters late in their lives. At the very least the last few of the patriarchs would have fallen into idolatry. As long as Noah and Shem were alive, this would seem to be an unlikely proposition. Because of this, the strict chronology has to be wrong.

Sixth, the Tower of Babel and the flood must have been longer ago than the chronology of Genesis 11 would allow. There are two reasons for this, one historical and one Biblical. Abraham is believed to have lived at the end of the third millennium B. C. The exact date of Abraham's birth is, of course, unknown but, according to Peloubet's Bible Dictionary, it was around 2,100 BC.[30] Assuming this date, then the flood must have occurred somewhere around 2,400 B. C. The whole problem with this date is that the oldest Egyptian pyramid, the Step Pyramid of King Zoser as Saqqara, was built around 2,650 B. C. The largest pyramid, that of Khufu, was erected around 2,500 B. C. The last pyramid of the Old Kingdom was built somewhere between 2,345 to 2,181 B. C. Thus a strict chronology would force one to believe that several of the pyramids are from the ante-diluvian world. The last pyramid of the Old Kingdom was built somewhere between 45 and 220 years after the flood when there would have been very few people on the earth. For Egypt, there is an uninterrupted list of pharaohs going back to 3,100 B. C. where the list starts with Pharaoh Menes. Menes is no mythological figure; his tomb was discovered in 1897.

The Biblical reason for believing in the gaps is that all accounts of Abraham portray him as a member of a well-established, populous world. According to the strict chronology view, the Tower of Babel would have occurred somewhere around 2,250 B. C. But the Tower of Babel incident is depicted as being at an early time in the post-diluvial world. If the Tower of Babel occurred around 2,250 B. C. then Abraham would be one of the earliest inhabitants of Mesopotamia which he clearly was not. Also it is really strange to have multiple languages existing in several places on earth as long ago as 3,400 B. C. prior to Babel which was supposed generate those languages.[31]

The seventh item comes from a comparison of Genesis 11:26, Genesis 11:32, and Genesis 12:4. To read Genesis 11:26 alone would seem to indicate that in Terah's 70th year he became the father of triplets. But Genesis 11:31,32 and Genesis 12:4, taken together, indicate that Abraham left Haran shortly after Terah's death. If this is true, then Terah was 130 years old when Abram was born - not 70. This would imply that Abram was not the first born son of Terah and that Genesis 11:26 marks the age of Terah at the birth of his first son - not the birth of Abram. If this is true, then it raises the possibility that other people listed in both Genesis 5 and 11 were not the first born children. This would make it even more difficult to date the flood from the Genealogies.

The final point is that the Hebrew term that is translated as "beget" or "the son of" does not have the same connotation for the ancient Hebrews as it does in Modern English. In English the term clearly implies a father-son relationship, but the Hebrew term would be better translated as "ancestor of." This is determined by comparisons of one genealogical list with another. The King James Version translates I Chronicles 26:24 as "And Shubael the son of Gershom, the son of Moses was ruler of the treasuries." This use of the term "the son of" obviously means "descendant of," a fact which the New International Version recognizes in its translation. Many other examples could be cited. The important thing is that once again, the English translation is really no assurance that there was an unbroken chronological sequence in Genesis 11.

One atheist I discussed this with argued strongly that the genealogies in the Bible were father-son relationships. He argued for this position so that he could disprove the Bible. He knew that most modern people wouldn't believe that the world was created in 4,004 B. C. And he would use this to lead people into atheism. His argument was that there are two Hebrew words for beget: ben and yalad. Ben does mean 'ancestor of'. In 1 Chronicles 26:24 the word used is ben. And indeed Shubael is not a son of Gershom. Then my atheist friend said yalad is only used for parent-child relationships and never for relationships of ancestor. Strong's Hebrew Dictionary defines Yalad as:

> "to bear young; causat. to beget; med. to act as midwife; spec. to show lineage: --bear, beget, birth ([-day]), born, (make to) bring forth (children, young), bring up, calve, child, come, be delivered (of a child), time of delivery, gender, hatch, labour, (do the office of a) midwife, declare pedigrees, be the son of, (woman in, woman that) travail (-eth, -ing woman)."

He would point out that yalad is used in the genealogies of Genesis 1-11 proving that there were no gaps and proving that the Bible erroneously taught that the world was created in 4,004 B.C.

This argument at first took me back. It was an entire reversal in tone from the usual young-earth argument that viewed a complete genealogy as positive evidence that God did create the world recently. What was the solution? It turns out that yalad is used in at least one instance with the connotation of 'ancestor'. Genesis 10:15-18 uses yalad to indicate that Canaan was the father of the Hittites, Jebusites, Amorites, Girgashites, Hivites, Arkites, Sinites, Arvadites, Zemarites and Hamathites. Since there is no way that Canaan could possibly that promiscuous, yalad must indicate an ancestral relationship in this case. Could it indicate an ancestral relationship elsewhere in Genesis 5 and 11? Of course.

For all of these reasons, even the most conservative of creationists, Whitcomb and Morris, are quite certain that there are gaps in the Genesis 11 account. Whitcomb and Morris state,

> "All of this leads us to submit the following proposition: at least in this section of Genesis 11, if not in other sections, we have warrant for assuming that the term "beget" is to be understood in the ancestral sense."[32]

This means that the dates of the creation, the flood and the Tower of Babel are and always will remain uncertain. From this analysis, the Christian should feel free to postulate more time in prehistory than many conservatives presently do. Only tradition prevents it.

Now comes the most crucial question: How much time is the believer allowed to place in human prehistory? After presenting the excellent analysis above, Whitcomb and Morris then turn around and present five arguments against inserting very much time. Four of these are very anemic and only one has any real substance. After they did such an eloquent job defending an expanded human history, it was quite disappointing for these authors to then advocate an extremely young human history.

The first argument concerns a presumed symmetry between the time God spends dealing with man from Abraham to Christ and from Christ to the present. Whitcomb and Morris state,

> Approximately 2,000 years covers the history of the Church up to the present. Before Christ's first coming, the history of Israel covered a period of 2,000 years; and after Christ's second coming, according to Revelation 20, there will be another 1,000 years of earth-history before the commencement of the eternal state. The incongruity of insisting upon 100,000 years between Noah and Abraham, while granting that the entire history of redemption from Abraham to the eternal state may be only four or five thousand years, becomes obvious."[33]

They are thus depending upon some supposed chronological symmetry that they believe ought to be respected but they give no Biblical support or reference for this symmetry. Why is God required to deal with mankind for the same length of time prior to Christ as after Christ? This is most certainly an extra-Biblical requirement that has absolutely no theological justification.

The second argument for not extending the chronology is that the longest documented gap in the Biblical genealogies is merely 400 years - that between Shubael and Gershom. Whitcomb and Morris claim that this becomes an upper limit to the amount of time that can be inserted in any one gap. Frankly, this argument begs the question at hand. We are concerned that the gaps might be larger in Genesis 11 than anywhere else. Thus, to cite the fact that the gaps elsewhere are not thousands of years in duration is not particularly pertinent to the discussion. However there is one possible use of the term "son of" in the Bible that just might be relevant to the discussion. "Adam" means, "man."[34] It is less a name than an appellation. Jesus always referred to himself as the Son of Man, a title which is best understood, not only as referring to the Messiah, but also as referring to Adam, the first man. If that is what is meant by the title, "Son of Man," then the largest biblical gap in the genealogies is the one Christ

himself used. Even a strict chronology would place Adam at 4,004 B. C. At minimum, this gap is at least 4,000 years in duration and, in reality, it is much longer. Whitcomb and Morris's attempt to delimit the size of the gaps by internal Biblical evidence ignores the largest genealogical gap of all. A similar argument can be advanced for the term "Son of David."

The third argument against an old chronology concerns the date of the Tower of Babel. Whitcomb and Morris state,

> "As we have pointed out previously, the judgment of Babel occurred in the days of Peleg, the sixth patriarch listed after Noah. The centrality of the human race and its linguistic unity (Gen. 11:12), coupled with the magnitude of the building project at Babel (Gen. 11:4), presuppose a fairly high degree of civilization. That God's judgment upon Babel took place not more than a millennium after the Flood is suggested by the fact that the world's population was still confined to one comparatively small area of the earth at that time."[35]

Their argument is based upon the dubious premise that the most likely place for a significant break in the genealogies occurs between Peleg and Eber, when there is a relatively large decrease in the life span. Eber lived 430 years and Peleg lived only 209 years. They further assume without any discussion that the Tower of Babel incident could only have taken place during Peleg's life. Presumably it is because of the statement in Genesis 10:25 that the earth was divided during Peleg's life, the division being a division of language, but Whitcomb and Morris do not state this. Although this may be the correct interpretation of Genesis 10:25, it is far from certain. Others have speculated that the reference is to the division of land, private ownership or the creation of kingdoms. Since the 1960's still others have attempted to use this verse to support the idea of rapidly occurring continental drift by suggesting that the division spoken of was the separation of the continents. Of the five interpretations, how do we determine the true one? One certainly can not be too adamant about the Tower of Babel occurring during Peleg's life.

Another difficulty with Whitcomb and Morris's objection is that the level of technology described by Genesis actually implies quite the opposite of what they suggest. They assume that the technology of the post-diluvial world would be quickly re-developed, suggesting that 1,000 years is all that is needed. In reality, as will be demonstrated in Chapter 12, the requisite technology of Babel would require a much longer time to develop than merely 1,000 years. Their viewpoint vastly underestimates the difficulty of rebuilding a technological world, even one as primitive as described in Genesis.

Their fourth argument for not extending the history of mankind is based upon the idea that the only place in the genealogical record that one can place gaps is after the Tower of Babel, which they claim took place during Peleg's life. This leaves only three patriarchs that can have significant gaps between them. By then placing Babel a hundred thousand years before Abraham they set up a straw man argument. If Babel was 100,000 years before Abraham, they ask, how can the historical associations with names of Genesis 10 be explained? Why should Mesopotamian towns have names corresponding with Peleg, Reu, Serug and Nahor? They then conclude that Babel couldn't have been 100,000 years prior to Abraham and therefore human history must be less than 10,000 years in duration. Of course people are named Abraham today and they do not live close in time to the original Abraham.

There are several things wrong with their argument. The placement of gaps is not limited to the one between Peleg and Serug. The Bible itself (in Luke 3:36) places a gap after Arpachshad which they ignore. They overlook the possibility that the Babel incident may have occurred long after the flood and relatively closer to Abraham's day than to Noah's. If there are gaps in the genealogy of Genesis 11, then there are most likely gaps in the genealogy of Genesis 10. The similarity between the Genesis 10 names and historical tribes and clans might simply be due to the fact that the more recent names predominate on the list. This would also explain the similarity between the names of Mesopotamian towns and the patriarchs. The gaps are larger in the earlier part of the genealogy rather than later, as they assume.

The final argument, which does have some merit, is that if the flood was millennia in the past, oral tradition would be all that could link us with those events. Whitcomb and Morris do not believe that accurate details of the flood could have been transmitted from one primitive stone-age culture to another for such a long time. This obviously is a concern, since the story, once lost, would be unlikely to re-appear. What can one to say about this?

Oral tradition can be excellent depending upon the importance the culture places on accurate transmission of the information. The Maori of New Zealand arrived on the island around 800 A. D. When the Europeans arrived

in 1769, the Maori were able to tell Captain Cook about the 40 generations between them and Kupe, the chieftain from Tahiti who discovered New Zealand.[36] This information was passed down orally for nearly 1,000 years. The attitude that the Polynesians had towards the transmission of information probably is the reason the information was preserved. Ivar Lissner speaks of the Polynesian attitude,

> "They firmly believed that anyone who recited an important tradition incorrectly would perish before the wrath of the gods."[37]

With this attitude, the elders would be sure that the young people learned the information correctly.

There may be a case of oral transmission of the astronomical basis for the Chinese Calendar for a period of nearly 2,000 years. Sky and Telescope reports,

> "The key shred of information that led to Pang and Bangert's success was found in a passage in the 1st-century-B. C. text Hong Fan Zhuan, written by Liu Xiang. It reads: 'The Ancient Zhuanxu calendar began at dawn, in the beginning of spring, when the Sun, new Moon and five planets gathered in the constellation Yingshi [Pegasus].' Using accurate planetary ephemerides developed at JPL, the astronomers searched back to 2000 B. C. - and found only one possibility."
>
> "Sure enough, the dawn skies of late February and early March 1953 B. C. featured all five naked eye planets rising with Pegasus. The faithful match with Liu's statement suggests that the description was carefully recorded and passed down by eyewitnesses some 2,000 years earlier. As Pang explains, Liu and his contemporaries could not possibly have computed positions of the Sun, Moon and planets and the precession of the sky back to the previous millennium."[38]

There is the possibility that Liu found this information out by studying an earlier manuscript, but this reference is the first written account that we have concerning the origin of the Chinese calendar. It is also quite possible that the information was passed down from astronomer to astronomer for this period of time.

The most appealing case for long term oral transmission of ideas comes from the lower Paleolithic hunters. The technology of a primitive, illiterate, people is only transmitted by one means - word of mouth. Fathers must teach sons how to make arrowheads, bows, spears and other pieces of the tribe's technology. Mothers must teach daughters how to tan hides, gather food and other necessary activities. With this as a given, it is still amazing that the Lower and Middle Paleolithic societies produced nearly identical stone tools for their entire existence. Richard Klein states,

> "Before the beginning of the later Pleistocene some 40,000 years ago, vast areas were characterized by remarkably uniform artifact assemblages that differed from one another mainly in the proportions they included of the different kinds of tools common to them all. Furthermore, the artifacts did not change much over the course of time; basic assemblage types lasted tens or even hundreds of thousands of years."[39]

Jacquetta Hawkes notes,

> "In the Lower Palaeolithic period the hand axe, although it was gradually improved, remained in use for over a quarter of a million years."[40]

And Johanson and Shreeve report,

> "The 'biface' hand ax typifies a period called the Acheulean, which endures in the archeological record for a stunning length of time. Tools very much like the one I now held had been found in European sites as young as 500,000 years, as well as in Olduvai deposits dated at a million and a half."[41]

Australian aborigines have been making identical forms of jewelry for over 32,000 years.[42] If the dates cited above are correct (and we will attempt to prove that in the next chapter) then oral tradition was able to transmit unaltered information for an extremely long time. If technological information could be so faithfully transmitted over such a

vast time, then so could the cultural and religious information, including information about the flood and the creation. Thus, the claim falters that man must have been created within the past few thousand years in order for information to be faithfully transmitted.

Conclusion

A careful analysis of the theological data reveals that the Bible does not necessarily teach a young earth. The genealogies are not complete; everyone agrees with this. Thus an absolute date can not be placed on the creation. We have shown that every theological interpretation of the days in Genesis 1, except the Days of Proclamation interpretation, has major difficulties . Within the Days of Proclamation view, one can accept an old universe without disemboweling the authority of the Scripture because the days in Genesis are twenty-four hours long and consecutive. All other old-universe interpretations must twist the Biblical record to fit into the data of science. When we examined the various arguments against a major extension of the time since the creation and the flood, we saw how weak or invalid they all were. Theologically, then, we are justified in accepting an extended chronology of practically any length we feel the scientific evidence requires.

In the next chapter we will examine the arguments for and against a young universe.

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EARTH'S AGELESS ARGUMENTS

It was 1897. The old man put down his pen. He had just finished the revisions to his work on the age of the earth. He leaned back in his chair and thought about the struggle of the past 38 years although the battle had gone on far longer. He had been a child of 6, a commoner, when Charles Lyell had published his Principles of Geology which argued for an extremely old earth. He was ten when he had first read Fourier's paper on heat flow which he would eventually use to fight the ideas proposed by Lyell and Darwin. Now he was nobility at the top of his profession. He was president of the Royal Society from 1890-1895. This boy from Glasgow had come a long way. He had largely ignored the debate about the age of the earth the geologists were engaged in for most of his career. It had seemed so distant from his concerns in physics where he had invented a temperature scale, formulated the science of thermodynamics and fluid flow. He remembered with satisfaction that Queen Victoria had knighted him in 1866 for his work on the trans-Atlantic telegraph cable that carried messages from Great Britain to the Yanks.

He had gotten involved in the debate about the age of the earth only after Darwin published that infernal book of his which implicitly attacked the Bible and the God, he, William Thomson, now Lord Kelvin, believed in. He had fired the first shot at Darwin in 1862 by calculating how long it would take the earth to cool from a molten state. Darwin needed lots and lots of time in order for evolution to take place. Kelvin had given Darwin only 20 to 400 million years in which to evolve all living creatures. But that wasn't enough of a limit for Kelvin because it didn't force Darwin to admit he was wrong. He refined his calculations and showed that in only 40 million years the earth would cool to the present state. Darwin began to take notice and in later editions of The Origin of Species, he began to take into account a younger and younger earth.

Kelvin then turned his attention to the sun. The question was: how long could the sun shine and maintain a constant temperature on earth? The great German scientist, Herman Von Helmholtz, had shown that it would take a nebula 100 million years to collapse to the size of the sun. The gravitational collapse of the nebula caused the gas to heat up and shine. Kelvin used Helmholtz's model to determine how long the earth would be habitable. The answer was 24 million years or so. The evolutionists were on the retreat! Archibald Geikie, a geologist, had told Kelvin, I don't understand all your mathematics but I know that the earth is old. Kelvin arrogantly replied, 'You could if you would apply yourself.' Yes, Kelvin had made an impact on the evolution debate.

Within 10 years, an obscure discovery would undo everything he had written about the age of the earth in the past 38. And Kelvin would live to see all his work crumble. Kelvin had paid little attention to an obscure Frenchman, Henri Becquerel, who a year before had discovered a new phenomenon, radioactivity. It had seemed so innocent, merely the fogging of photographic plates by a uranium crystal. When radioactivity was finally understood, it provided the heat to keep the earth hot for billions rather than the 40 million years that Kelvin had calculated. And the study of radioactivity would lead directly to a different source for the sun's energy, not gravitational collapse, but hydrogen fusion.

Like Kelvin, I lived to see my best arguments for a young earth collapse before my eyes. I was a bit younger than Kelvin, and much less famous, but the pain was just as real. For years geological colleagues had been pointing out data that contradicted my young-earth views. I had spent years ignoring what my friends were saying. Being in the oil industry, I was able to examine the data first-hand and in my heart I knew that my colleagues were correct. I didn't want to admit it.

This, of course, raised serious ethical dilemmas. There was the ethical dilemma of being honest with myself, the dilemma of being honest with my colleagues, and most importantly, the dilemma of being honest with my readers. I looked to the future to bring about the amazing solutions to the geologic problems that so baffled me. This had the effect of pushing off the day of reckoning. Like kiting a check I could always draw on tomorrow's account the scientific solutions I desperately needed today. And this allowed me to avoid facing up to the failure of my views and facing up to my personal responsibilities.

The religious dilemma I faced was simple. God's Word is truth. Science didn't support what I viewed to be God's Word. So, I viewed the contradiction as merely a test of faith. But faith in the wrong thing is displeasing to God. It is useless faith and eventually it collapsed. What follows is the data that caused me so much pain over the years.

Throughout most of the history of Judaism and Christianity, the prevalent view has been that the universe was extremely young. Augustine, Eusebius, John of Damascus and nearly all of the other church fathers believed that the earth was less than 6,000 years old at the time of Christ. In those times there was no scientific evidence of an ancient earth to consider. The only challenge to a young earth were the beliefs from the philosophical and historical records of the Egyptians, Chaldeans and Greeks. The Egyptians believed that they were 8-9000 years old, older than the prevalent Biblical interpretation.[1] Many Greeks believed that the universe was eternal. But

neither side of the issue had any firm scientific or observational evidence to back up its claim.

It was not until the beginning of the Renaissance that scholars were really forced to deal with this issue. Prior to the advent of modern science, the age of the universe had merely been a minor side issue in the panoply of theological concerns. Christian scholars have more and more been forced to face the issue of the veracity of early Genesis. Geology progressively revealed more information which indicated that the earth was far older than the generally accepted 6,000 years, while theologians have cast about in vain for a viewpoint which would save the young-earth interpretation of Genesis and match the geologic data. Theologians immediately saw the issue's importance. If the early chapters of Genesis are untrue, then it calls into question the entire range of Christian doctrines such as original sin, the need for atonement and man's place as the highest of God's creation. The fossils raised questions concerning whether or not God's perfection was impugned if he had created beings that were unfit to live any longer and became extinct. The chronology implied by the genealogies in Genesis 5 and 11 was threatened by the evidence of age as well as the occurrence of the flood. Since Jesus spoke of the flood, if the flood did not occur, what does that imply about Jesus' divinity? Thus, for a variety of reasons, this issue has come to the forefront of Christian apologetics.

The most prominent reaction to the twin issues of an old earth and evolution has taken place in this century with the rise of the young-earth creationist movement. The proponents have advanced numerous arguments in favor of a young universe that they claim would disprove evolution and provide support for the Bible. Unfortunately, many of their arguments hearken back to the science of the 17th century. For instance, Whitcomb and Morris suggest that the order of the fossils is largely due to the action of hydrodynamic sorting of the dead bodies in the flood. This view was first suggested by John Woodward in 1695.[2] This view required that the largest animals be on the bottom of the geologic column and small animals at the top. Eighteenth century science rejected this view because observational data simply did not support it. Large and small animals were scattered throughout the column. In spite of this observational fact, modern creationism has re-embraced this idea. We will examine many of the young-earth arguments that have been advanced and show that they all have major weaknesses. The arguments will be divided into three different categories: geological arguments, astronomical arguments and biological arguments.

Geological Arguments for a Young Earth

Whitcomb and Morris present a young earth argument based on the amount of sodium in the oceans and the amount of sodium being added to the oceans by rivers.[3] Each year rainwater dissolves salt on the continents and carries it into the ocean. They claim that, once in the ocean, the salt can not get out. Thus the ocean simply gets saltier and saltier with time. They claim there is too little sodium in the oceans for an old earth. Seawater averages 10.8 parts per thousand while rivers average 0.0085 parts per thousand. Since the oceans contain 315,000,000 cubic miles of water and the rivers put 8,200 cubic miles of water into the oceans each year it is easy to calculate how long it took for the present salt in the oceans to get there. It is

$$\frac{(10.8)(315{,}000)}{(.0085)(8.2)} = 48 \text{ million years.}$$

Whitcomb and Morris cite G. Evelyn Hutchinson stating that the salt content of the oceans has been basically constant throughout geologic time. Based on this they conclude that the oceans must be quite young. This is a non sequitur. Just because the salt content is constant does not require that the oceans be young. The oceans could be young, as they suggest, but it might also be the case that as much salt leaves the ocean as enters it. This too would keep the ocean salinity constant. But, other than a dismissive reference to this possibility, they give it no serious consideration or mathematical treatment.

Austin and Humphreys update, with more detail, Whitcomb and Morris's argument and conclude that the earth's oceans could be no older than 62 million years old.[4] They ignore several arguments against their view such as planktonic removal of salt from the sea. Table 6 (page 28) shows that plankton concentrate sodium in their bodies and when they die, salt is removed from the ocean. They make no mention of this mechanism. Austin and Humphreys also ignore the existence of bedded salt deposits in the middle of the sedimentary column and its implications for the evaporative removal of salt from the sea. They claim that only a small fraction of the salt is removed by evaporation. However, evaporation is a major means by which salt is removed from the sea. As we shall see, this is wrong. And they ignore the present day observations which show that salt is removed from the oceans by hydrothermal activity at the mid-oceanic ridges.

Water flows into the sea floor by means of cracks. The water is then heated by being close to the volcanic magma that underlies the mid-oceanic ridge. Chemical reactions remove the sodium and the super-heated water is then expelled from this hydrothermal system in super-hot plumes that dot the entire mid-oceanic ridge. Seawater normally has a sodium/chlorine ratio of .8545. So if the hydrothermal plume has a sodium/chlorine ratio of less than .8545, sodium is being removed from the sea. Table 4 shows the sodium/chlorine ratio for various hydrothermal plumes.[5] As can be seen, with few exceptions, all plumes have less sodium than sea water. The average plume water has a low sodium/chlorine ratio of .8. With part of the sodium gone, the matching chlorine is then removed by other chemical reactions.

There is abundant evidence that salt has been evaporated from the sea. Occasionally, due to continental drift, the ocean basins become configured in such a way that evaporation deposits salt on the ocean floor. This leaves the salt sandwiched between other sediments. In the young-earth global flood view, all fossils are from the flood. Thus, any salt in the middle of the fossiliferous strata must be deposited during the middle of the flood. But salt is very soluble in water and is not easily deposited. Off the Canadian coast on the Grand Banks, 2,000 meters (6,600 feet) of salt has been drilled in oil wells. The salt has sediment both above and below.[6] The salt contains pollen fossil which one would expect to find in an evaporative basin open to the atmosphere.[7] The same 2,000 meters of salt is found in the Lusitannia Basin off the Iberian peninsula. Along the West Coast of Africa, more than 1,000 m of salt is found along the Moroccan coast. The varved anhydrite-salt deposits of the Delaware Basin in southwest Texas contain an immense amount of salt. The varves of this amazing deposit can be matched identically between two wells more than 70 miles apart![8] The Gulf of Mexico has the Louann salt sandwiched between sedimentary rocks.[9] It contains approximately 4 million cubic kilometers of salt.[10] The North Atlantic accumulated about 1 million cubic kilometers. The sediments of Kansas and New Mexico contain 30,000 billion tons of salt which equals 2.7 million cubic kilometers.[11] The Rot salt of the Permian Zechstein basin contains more than 2 million cubic kilometers of salt and the Mediterranean basin contains around 1 million.[12] Seventy cubic kilometers of Pliocene salt are found in the Sedom Formation of the Dead Sea region. It represents the evaporation of over 3500 cubic kilometers of ocean waters.[13] All this salt would equal an 18 m layer of Salt all over the earth.

Sodium/Chlorine ratio	
North East Pacific	
Escanaba Trough	.838
Juan de Fuca	
s. cleft plume	.7322
s. cleft vent 1	.7377
s. cleft vent 3	.8243
North Cleft Juan de Fuca	
Pipe organ	.7421
Monolith 1990	.7654
1991	.7794
Table Brigadoon	.7738
Axial volcano Juan de Fuca	
inferno	.7996
Hell	.8109
Mushroom	.8576
Hillock	.8112
Crack	.8100
Virgin Mound	.8409
Endeavour segment Juan de Fuca	
Hulk	.7742
Crypto	.7745
TP	.7812
Dante	.7833
Grotto	.7811
LOBO	.7850
Dudley	.7765
S&M	.7784
Peanut	.8537
North	.7924
Mid Atlantic Ridge	
MARK	.9123
Tag Mid Atlantic Ridge	.8861
(Von Damm, 1995, p. 229-230)	
Average of plumes	.8000
Normal Sea water ratio	.8545

Table 4 Hydrothermal sodium removal

All of these salt deposits lie within the sedimentary column. The salt lies both on top and below fossiliferous sediments. This is important; young-earth creationists believe that the entire fossiliferous sedimentary column was produced by the flood.[14] Salt in the middle of the flood-deposited sediments must also have been deposited by the flood. And it is hard to understand how salt can be evaporated during the middle of the global flood. The Salina salt beds can be traced, sandwiched in the middle of fossiliferous sediments, from New York to Michigan. In order to avoid this problem many young-earth creationists inconsistently believe that primary salt deposits were created during the Creation week. They say,

"In terms of Biblical geology, it would seem reasonable to attribute these original salt

beds to the activities of the Creation period, with the intrusions forming the salt domes being associated with the other volcanic and tectonic activity during the Deluge period."[15]

Two facts disprove this inconsistent view of the salt deposits. First, if the salt was created during the Creation week, then how did the fossiliferous sediments deposited during the flood wind up beneath the salt beds? Alternatively, did God create fossiliferous beds below the salt during the creation week? It is illogical to believe that God picked up the salt, allowed part of the flood to occur, and then put the salt back down so other fossiliferous sediments could be deposited above. If the primary salt deposits were created one would not expect to find pollen grains in the salt![16,17] Klaus notes that there are, on average, 50 to 2,000 pollen grains per cubic centimeter.[17] Ulrich Jux notes,

"Samples of diapiric and bedded salt from the Gulf Coastal Province were studied for their pollen-spores content. Twenty-four different species were observed, among them one new genus, Gordoniella atwateri. The microfloral remains also include forms of algae (Chroolepidaceae or Mikrothyriaceae) and fungi."[16]

In sum, then, the global flood should not be capable of depositing salt with pollen, and little other than pollen, in the middle of the geologic column, yet it is there.

Furthermore, young-earth creationists sometimes assert that no meteorites have ever been found in the sedimentary record.[18] This is not true. Not only are they found, they are found in salt deposits James M. Barnett determined the sedimentation rate of Silurian salt (circa 400 million years old) from the Michigan basin by studying the micrometeorites found in the salt.[19] One would expect to find such material in an evaporative basin open to the air but not in salt formed during the Creation week.

Why would God create pollen, fungal spores and micrometeorites with the salt? If God did this one would be able to charge him with deception - making a created salt deposit look like an evaporative one. To believe this would do irreparable harm to God's veracity. Yet that is precisely the logical conclusion which must be drawn from the position outlined by Whitcomb and Morris.

By 1989, Morris had changed his mind on salt deposits. He and his son wrote a book in which they suggested that salt was the product of the outgassing of the earth's interior.[18] The new position really doesn't deal with the data above. They state,

"Needless to point out, this much more reasonable explanation of the origin of salt deposits is not only catastrophic in nature but completely consistent with the flood model of geology."[20]

However, once again, the existence of fossil pollen in the salt, known to science since the time Whitcomb and Morris wrote their first book, destroys this view. Pollen is not found in the earth's interior!

Influx of Other Elements into the Oceans

In 1974, and again in 1987, Henry Morris published a list which includes values calculating the age of the oceans by the influx of various elements.[21,22] The method of calculating the age is identical to that described above. The list is quite interesting. It has been arranged according to the age calculated. This Morris states,

"The most obvious characteristic of the values listed in the table is their extreme variability - all the way from 100 years to 500,000,000 years. This variability, of course, simply reflects the errors in the fundamental uniformitarian assumptions."

"Nevertheless, all things considered, it seems that those ages on the low end of the spectrum are likely to be more accurate than those on the high end. This conclusion follows from the obvious fact that: (1) they are less likely to have been affected by initial concentrations or positions other than 'zero'; (2) the assumption that the system was a 'closed system' is more likely to be valid for a short time than for a long time; (3) the assumption that the process rate was constant is also more likely to be valid for a short time than for a long time."[24]

is the time required for river influx to account for the present quantity contained in the world's oceans.[23]

This statement makes absolutely no logical sense. If we take him at his word, then the youngest

measurement should yield the correct age of the earth. The age given by aluminum fits all three of Morris'

Table 5. Residence time of various elements and chemicals in the oceans.

Element or Chemical	Age (Years)	Element or Chemical	Age (Years)
Aluminum	100	Carbonate	100,000
Iron	140	Zinc	180,000
Titanium	160	Rubidium	270,000
Chromium	350	Antimony	350,000
Thorium	350	Molybdenum	500,000
Tungsten	1,000	Gold	560,000
Manganese	1,400	Bicarbonate	700,000
Lead	2,000	Calcium	1,000,000
Silicon	8,000	Silver	2,100,000
Nickel	9,000	Sulfate	10,000,000
Cobalt	18,000	Potassium	11,000,000
Mercury	42,000	Strontium	19,000,000
Bismuth	45,000	Lithium	20,000,000
Copper	50,000	Sediment	30,000,000
Barium	84,000	Magnesium	45,000,000
Uranium	100,000	Chlorine	164,000,000
Tin	100,000	Sodium	260,000,000

criteria. But obviously the earth can't be only 100 years old, so what is wrong?

As usual when a logical argument leads to an absurd conclusion, it means one of the assumptions is wrong. In this particular case the assumption that the aluminum-ocean system is a closed system is wrong. A closed system simply means that none of the material leaves the ocean via sedimentation or enters the ocean by any other means than river influx. If aluminum is not being deposited on the ocean floor, then there is absolutely no other conclusion that can be drawn than that the oceans are only 100 years old. This is unhistorical and ignores observational reality. In point of fact, aluminum is constantly being deposited on the ocean floor by various means. First, plankton accumulate various minerals in their shells which, when they die, are deposited on the ocean floor (Table 5). Some of these oozes average 25 percent alumina.[25] By this means much aluminum is removed from the ocean waters. There is also removal of aluminum in the fecal pellets of marine animals that feed on the plankton. Thus, Morris' assumption that aluminum is not being removed is wrong.

Now, if aluminum is being removed from seawater, then the date calculated is also wrong. We can now relax secure in the knowledge that the earth's oceans are older than 100 years. But iron, titanium and chromium also limit the age of the earth to unrealistic ages. A glance at Table 5 shows that these elements also are being removed from the seas. If this is not the case then the Christian has a real theological difficulty. An earth less than 2,000 years old would not allow for Jesus Christ to have actually lived, taught and then died on the cross. Without the death on the cross, there is no forgiveness for sin and Christianity is worthless.

Based on the list Morris compiled, how are we to decide the age of the oceans? We have ruled out, on historic grounds, that the first seven entries are wrong because the elements are being deposited on the ocean floor. But if the first seven are not indicative of the age of the earth, then the eighth, lead, can not be an age indicator since Caesar conquered Gaul prior to 2,000 years ago. Abraham, the patriarch, lived almost 4,000 years ago. So, is silicon to be the real indicator of the earth's age? It can not be special because silicon is also removed from the oceans by plankton. Cobalt is the first element in Table 5 which is not in Table 6. But the earth can not be 18,000 years old because cobalt is also being removed from the water during the formation of manganese nodules.[26, 27] Mercury is in Table 6 and is removed by plankton. Bismuth is 1,000 times more concentrated in marine organisms than it is in seawater, so when the animal dies, bismuth is removed from the system.

We could go on and on with our analysis of this issue, but each and every element in the list is useless for dating the oceans. Even the most rudimentary logical analysis shows how poor this argument is. There is no information relevant to the age of the earth here.

One of the most fascinating things about the list Morris published in 1974 is that he cites an article by Edward D. Goldberg.[21,23] A few pages after the data is presented, Goldberg, citing a 1956 paper, discusses at length the fact that plankton concentrates and removes these elements from the ocean waters. In spite of the fact that this removal mechanism had been known for 18 years prior to Morris' publication and that it was discussed in

the article he cited, Morris makes no mention of this mechanism in his report.

Juvenile Water

This was the first argument of Dr. Morris's that I ever tried to verify. It really was a neat argument. It had only one flaw. It didn't hold water.[28] The argument goes as follows: In 1953 Carl Fries, Jr. published a study of an erupting Mexican volcano which measured the amount of water that the volcano was spewing into the atmosphere in the form of steam.[29] During the 9 years of the eruption, Fries estimated that 9/1000 of a cubic mile of water was expelled by the volcano, 1/1000 of a cubic mile per year. Whitcomb and Morris then state,

> "In view of the fact that there are some 400 to 500 active volcanoes on the continents of the world with several times that number known to have been active in the recent geologic past, we feel it is not unreasonable to guess that the average annual activity of volcanoes in the world has been such as to produce at least one cubic mile of juvenile water each year."[30]

Since there are many, many other volcanoes which are now dormant, they then reasoned that if 1000 active volcanoes are each producing 1/1000 of a cubic mile of juvenile water each year the total new water added to the earth's surface each year is about one cubic mile per year. Since there are 340 million cubic miles of water in the earth's oceans and rivers, the oceans can not possibly be older than 340 million years. This value is one tenth of the age of the earth according to geology and astronomy.

Modern estimates of the number of active volcanoes range from 600 to 1300.[31,32] Although the argument sounds solid enough, the problem is that an active volcano is not necessarily an erupting volcano. There are 29 active volcanoes between Baja California and the Canadian Border.[33] There are certainly not 29 erupting volcanoes there. An active volcano is any volcano that has erupted in historical times. When one looks at how many volcanoes are erupting each year, one finds that it is around 40-50. Using 50 as the value gives 6.8 billion for the length of time necessary for the oceans to be filled by juvenile water. This argument falls flat on its face.

Table 6 Chemical composition of Plankton (micrograms of Element per gram of dry weight of plankton)

Element	Phytoplankton	Zooplankton
Silicon	58,000	-------
Sodium	110,000	68,000
Potassium	12,000	11,000
Magnesium	14,000	8,500
Calcium	6,100	15,000
Strontium	320	440
Barium	110	25
Aluminum	200	23
Iron	650	96
Manganese	9	4
Titanium	30	-
Chromium	4	-
Copper	8.5	14
Nickel	4	6
Zinc	54	120
Silver	0.4	0.1
Cadmium	2	2
Lead	8	2
Mercury	0.2	0.1

Source Karl K. Turekian, Oceans, (Englewood Cliffs: Prentice-Hall, 1976), p. 130.

Table 6 Removal of elements from seawater

Radioactive Dating

The radioactive dating methods present a severe challenge to the young-earth creationists. Much ink has been expended attempting to explain why the ages calculated by these methods really do not mean the earth is old. And much ink has been expended countering the young-earth creationist claim. Many authors have covered the technical details of the dating methods,[34] so instead of repeating their explanations of the methods of dating, we will take a different approach to the problem of whether or not dating works. We will examine the practical aspects of the dating issue. Do these methods work when compared to objects of known age and are they consistent with other methods of dating? If these two questions can be answered in the affirmative, then the reader does not really need a technical understanding of the methods.

Radioactivity is best defined as a change of one element to another. It can be divided into three different types: alpha decay, beta decay and electron capture. Alpha decay occurs in some elements when two protons and

two neutrons are ejected from the nucleus with the effect that the parent element is converted into the element two atomic numbers lower and four less in atomic weight. The atomic number is the number of protons; the atomic weight is related to the total number of protons and neutrons. Beta decay occurs when a neutron emits an electron, changing the neutron into a proton. In this case the atom remains at approximately the same atomic weight but moves its atomic number up by one. Electron capture is the opposite of beta decay.

Two different fundamental forces control these two primary types of decay: the strong force and the weak force. The strong force is the force that holds the atomic nucleus together. It is called strong because it is able to overcome the mutual electrical repulsion of all the protons in the nucleus. Without it every atomic nucleus in the universe would fly apart. The weak force acts only at atomic distances, so it is not observed naturally except by means of beta decay. This fact will become important when we discuss some of the creationist attempts to explain away radioactive dating.

In nature, the daughter elements are also often radioactive and their daughters in turn decay into other elements. In this manner long chains of radioactivity are produced. This can be explained by an analogy. Consider a fountain with lots of reservoirs for holding the water. As one reservoir fills the water spills into the next one. When they have all filled, the fountain is in equilibrium. The quantities of the various elements in the radioactive decay chain can be predicted if the chain has been in existence for a long enough time. Given enough time the chain reaches equilibrium. Observations of the radioactive chains confirm that the various uranium and thorium decay chains are usually in equilibrium.[35] Since the decay chains appear old, Whitcomb and Morris suggest,

> "It is perhaps possible that only the parent elements of the radioactive decay chains were originally created, but it is eminently more harmonious with the whole concept of a complete Creation to say that all the elements of the chain were also created simultaneously, most likely in a state of radioactive equilibrium.
>
> This means that, with each mineral containing a radioactive element, there were also at the original Creation all of the daughter elements in the decay series, including some of the final stable end product. Such a concept is undoubtedly shocking to the mind of a consistent uniformitarian, but there is nothing impossible or unreasonable about it. In fact, short of denying the existence of any Creator or original Creation at all, one must logically come to some place in the long chain of secondary causes where something was created. If so, that something, at the instant of its creation, must have had an 'appearance of age.' And the only way we could then determine its 'true age' would be through divine revelation. An 'apparent age' might of course be deduced for that something on the basis of any processes of change which were observed in connection with it, but this would not be the true age."[36]

So here we have God creating elements whose existence is not necessary, in order to give the universe an appearance of age. There is obviously no difficulty in believing that God could create anything He wants but there is a little worry here about God deceiving us. If God can deceive us in little things like daughter elements, can he not deceive us in big things like the security of our salvation or the way of Salvation itself? In addition, Whitcomb and Morris's approach will not work when one considers the next problem.

Suppose you were to buy a futures contract for 1024 gm of radioactive material on the Chicago Mercantile Exchange with the delivery date set in 100 days. Suppose further that the material had a half-life of 10 days and that the contract vendor set your material on a shelf awaiting shipment the day you bought the contract. After 10 days, your shipment has only 512 grams of the original material with 512 grams of daughter material. After another 10 days, your shipment has only 256 grams of the radioactive material and 768 grams of the daughter. On the day of shipment, when you receive your block, there is only 1 gram of the radioactive material left. Essentially it is all gone with only a remnant of the radioactive element remaining. By careful chemical analysis, you can tell the precise hour that the vendor placed your material on the shelf because the ratio of the parent to the daughter elements fixes that time.

In this fanciful bad investment scenario one item needs to be noted. After ten half-lives only a trace of the original material remains. This leads us directly into a means to determine the age of the earth. Table 7 is a partial list of radioactive isotopes with half-lives greater than 650 years. These are the isotopes that are not being produced today in any presently occurring nuclear reaction on the earth. All that is left today is what has not decayed from the quantity that was originally created with the earth. The date of earth's creation is determined which isotope still exists and multiplying its half-life by 10. Isotopes like carbon 14 are being created in present processes and so do not belong on the list. This list only contains those isotopes that are not being created today. Due to the fact that

after 10 half-lives an isotope is essentially non-existent, the only way these isotopes can exist is if their creation was less than 10-15 half-lives ago. What this means is that if the creation were 7,000 years ago, then every listed radioisotope in the list with a half-life greater than 700 years ought to be detectable in nuclear assays. The list immediately reveals that no isotopes with half-lives less than 450 million years exist!

Isotope	Half-life (yrs)	Decay type	% natural occurrence	notes
Si-32	650	Beta	0	
Cf-251	800	Alpha	0	
Tb-158	1,200	Beta,Elect.Captr	0	
Bk-247	1,400	Alpha	0	
Cm-246	5,500	Alpha, Fission	0	
Pu-240	6,500	Alpha, Fission	0	
Th-229	7,300	Alpha	0	
Am-243	7,300	Alpha	0	
Cm-245	9,300	Alpha	0	
Cm-250	17,000	Fission	0	
Nb-94	20,000	Beta	0	
Pu-239	24,000	Alpha, Fission	0	
Se-79	65,000	Beta	0	
Sn-126	100,000	Beta	0	
U-233	160,000	Alpha	0	
Tc-99	210,000	Beta	0	
Fe-60	300,000	Beta	0	
Cl-36	310,000	Beta Electr.Captr	0	
Pu-242	380,000	Alpha	0	
Cm-248	470,000	Alpha, Fission	0	
Al-26	740,000	Positron EC	0	
Dy-154	1,000,000	Alpha	0	
Zr-93	1,500,000	Beta	0	
Tc-98	1,500,000	Beta	0	
Gd-150	2,100,000	Alpha	0	
Np-237	2,100,000	Alpha	0	
Be-10	2,500,000	Beta	0	
Pd-107	7,000,000	Beta	0	
Hf-182	9,000,000	Beta	0	
Cm-147	16,000,000	Alpha	0	
I-129	17,000,000	Beta	0	
U-23 6	24,000,000	Alpha Fission	0	
Pb-205	30,000,000	Electron Capture	0	
Sm-146	70,000,000	Alpha	0	
Pu-244	80,000,000	Alpha Fission	Trace	
U-235	710,000,000	Alpha	.72	1
K-40	1,300,000,000	Beta,Pos.,EC	.118	
U-238	4,500,000,000	Alpha	99	1
Th-232	14,000,000,000	Alpha	100	2
Lu-176	30,000,000,000	Beta	2.6	
Re-187	70,000,000,000	Beta	62.5	
Sm-147	100,000,000,000	Alpha	15	
La-138	100,000,000,000	Electron Capture	.089	
Rb-87	500,000,000,000	Beta	28	

Table 7 Partial list of radioactive isotopes with half lives greater than 450 years. 1. percentage of occurrence taken from The Handbook of Chemistry and Physics, 47th edition, The Chemical Rubber co., 1966. 2. Percentage of occurrence taken from H. Semat, Introduction to Atomic and Nuclear Physics, (New York: Rinehart and Co., 1954), p.528

The only way to retain a young earth viewpoint and honestly deal with this data is either to believe that God did not create the missing isotopes or that the rates of radioactive decay were faster in the past. There is no other alternative. How much must the decay constant change to have all this radioactive decay occur in a 7,000-year-old universe? My calculations show that it must change by 642,000 times. That is a lot! In order to change the rates of radioactive decay, both the strong force and the weak force must change. If the strong force were slightly weaker, which would be required to increase the rate of radioactive decay, then multi-proton atoms would not hold together. There would be no iron, silicon, etc. and life would be impossible. If the strong force were only half of its present

strength, then iron, needed for hemoglobin, would not be stable. If it were 1/4 of its present strength, then even carbon-12, the basis of life, would be radioactive.[37] Thus it is impossible to change the rate of alpha decay enough to account for the missing isotopes. Besides laboratory measurements prove that these constants of nature are not changing their values today.[38]

This leaves only one option with which to account for the missing isotopes and still retain an intellectually viable young-earth viewpoint. God must not have created these missing isotopes when He created the rest of the universe because, if He did, they should still exist. But they don't. Now this seems terribly inconsistent. We saw earlier that in order to deal with the equilibrium in the uranium and thorium decay chains, Whitcomb and Morris postulated that God created isotopes that had the effect of making the earth appear old. Now we have .to postulate that God didn't create isotopes in order to make the earth look old. Is this the type of God that conservative Christians want to believe in? One that creates isotopes in one instance which fools us into believing that the earth is old and then doesn't create others which fools us into believing that the earth is old. Why would God do that? This author, for one, does not believe that God is deceptive. After all, it was God, Himself, who said, "You shall not bear false witness." If one believes in the young-earth viewpoint, one is inadvertently believing that God engaged in deceptive behavior, acting inconsistently with the result that the earth appears old when, in fact, it isn't. Since God can't deceive, the earth must be old!

As we saw in the last chapter, believing in a young-earth interpretation of Genesis leads to the distasteful trilemma that either Adam worked like a computer, the Bible is wrong, or evolution occurs much faster than even the evolutionists believe. So it is with the case of appearance of age. Believing that God created the world with an appearance of age leads to the distasteful conclusion that either God acted deceitfully or the earth is old. Of the two choices, I will chose an old earth every time and so should the young earth advocates.

It is certain the young-earth proponents will suggest that the missing isotopes somehow were unhealthy for man and God therefore couldn't create them and still have a good creation. There could be only one justification for saying this, and that is that the rates of decay in the missing isotopes are too fast and they would have been incompatible with the existence of life. But this could not possibly be the case, since C-14 has a half-life of 5730 years and is in our bodies. Humans are not dying of C-14 radiation. Secondly, many of the daughter elements in the uranium and thorium chains are even more radioactive than C-14. Polonium-214 has a half-life of only 164 microseconds. It exists and so do we! Thus any suggestion that God could not create these missing isotopes is nothing more than a blatant attempt to escape the logical conclusions of the young-earth position.

Do radioactive dates yield consistent ages? The claim is often made that they do not. About 15 years ago, John Woodmorappe searched through the literature collecting radioactive dates and compared them with the age expected from the stratigraphic (or geologic) position. He wished to prove that radioactive methods do not work. He collected 349 dates derived from various radioactive methods. He stated,

> "Many other dates could have been listed, but Table 1 is limited to dates which approach 20% discrepancy: being either 20% 'too young' or 'too old' for their biostratigraphical positions. Many are over 30% discrepant. A 20% discrepancy means that an indicated date is off by at least one geologic period in the lower Mesozoic and off by two geologic periods in the early Paleozoic."[39]

Woodmorappe didn't include any dates in his table that gave the correct answer. Only wrong dates are included because he does not believe that radioactive dating is accurate. He believes that the earth is only a few thousand years old.

It is amazing that anything can be learned from such a biased table, but a very important piece of information can be gleaned. Radioactive dates, when they are wrong, are more likely to be too young than to be too old.

Figure 3 shows Woodmorappe's data plotted on a graph. The line going up at forty-five degrees represents where a date should be if it is perfect. As can be seen there are more points below the line than above it. On this side of the line, the dates are wrong because they are too young. Remember that all the dates listed are believed to be in error by everyone, and yet they have a tendency to cluster along the correct value.

If the young-earth position is correct, wouldn't it be better for more dates to appear too old? After all, the young earth position has to basically boil down to the view that all dates are too old and yet here the majority of wrong dates are too young.

Carbon-14, at least in its early years, provided another example of a dating method that, when wrong, was usually too young, not too old. When errors began to be noticed with the C-14 method, studies were begun to compare the radioactive dates with tree rings of known age. Of these studies, Robert E. Lee, in an article in the

Creation Research Society Quarterly states,

> "Whether accurate, or merely approximate, comparison with tree rings did prove that radiocarbon dates were wrong - usually being much too young. At the same time, it seemed that the precise extent of the errors was indicated. When plotted against counted rings, radiocarbon dates fall into a wandering line that runs some hundreds of years from where it ought to be. By means of this calibration curve, any appropriate radiocarbon date can be corrected."[40]

The question is, if the date is usually too young, how does that help the young- earth position? It would seem that they would expect dates that are far too old.

It is often advocated that no radioactive system could possibly fulfill the assumptions that go into the dating methods, meaning that no date can be trusted. Paul M. Steidl lays out the assumptions,

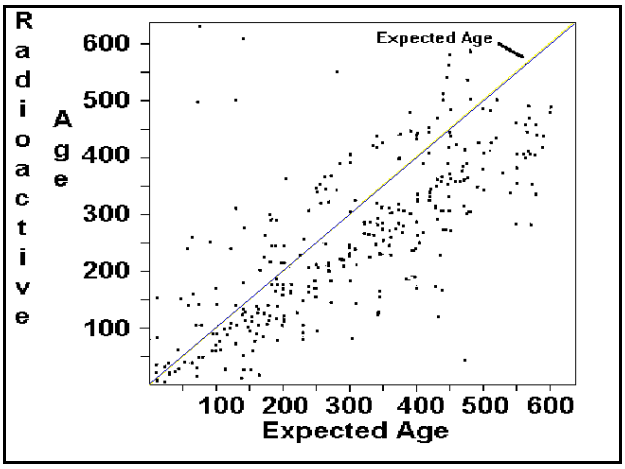

Figure 3 Radioactive vs Expected Age. Most Radioactive dates are too young.

> "In a rock that is to be dated there is a radioactive parent element and its daughter elements, those into which some of the parent has decayed. It is reasoned that by knowing the amount of the original radioactive element and the amount of its daughter elements one can determine how long the process has been going on, using the decay rate determined in the laboratory. This reasoning embodies a number of assumptions: (1) the decay rates have been constant in the past, (2) it can be determined how much of the daughter element is a result of the radioactive decay of the parent and how much is not, and (3) none of the parent or daughter elements have been added or removed during the whole time."[41]

Steidl's first critique of radioactive dating is that the rates of radioactive decay were not constant. He cites Whitcomb and Morris's The Genesis Flood p. 346 as the source for this information. Checking that source, Whitcomb and Morris cite Henry Faul, Nuclear Geology, where he quotes Segre and Wiegand who said,

> "Experiments with decay of two artificial isotopes thought to be the most sensitive to change in atomic structure (beryllium 7 and an excited state of technetium 99) have shown that the decay rate can be changed, but the change is extremely small."[42]

This sounds like the rates of decay can be changed, but what the authors do not tell their readers is that Faul is referring to one type of radioactivity which plays only a small role in dating. The type of radioactivity Faul is referring to is called electron capture. In this type of radioactivity, an electron is absorbed by a nuclear proton changing it into a neutron. Only the potassium-argon method involves this type of radioactivity. Neither uranium, thorium nor carbon-14 dating methods involve this type of radioactivity. The two isotopes, beryllium 7 and technetium 99, are man-made and have absolutely nothing to do with dating of any type. Beryllium 7 decays by electron capture and technetium 99 decays by internal conversion and is irrelevant for geologic dating. Segre and Wiegand removed all the electrons from the nucleus so that no electrons would be close enough for electron capture to occur. The manner in which this was accomplished was to heat the two elements to extremely high temperatures. By doing this they were able to change the decay rate by 0.07 percent for beryllium and 0.27 percent for technetium. This is an extremely small amount and the effect was to make the rate slower. If one used the slower decay rate in a dating method, the object appears even older which is not quite the direction that the young-earth creationists need to go. Besides, the method of changing the rate of decay (extreme heating) might work in the center of the sun but not on earth!

Whitcomb and Morris further state,

> "These changes were due to changes in the chemical compounds of which the elements were a

part, but similar small changes in certain decay rates can be effected by pressure."[43]

The above quote is also misleading as is seen by what Faul actually says,

> "Differences in pressure also change the electronic environment around a nucleus, but even pressures in the interior of the earth are not sufficient to induce changes much greater than the extremes of chemical combination mentioned above."[42]

Very few of the minerals, which the geologist dates, have been subjected to pressures even approaching the values at the earth's center. Thus this whole topic of variation of the decay rate is irrelevant to the actual practice of dating.

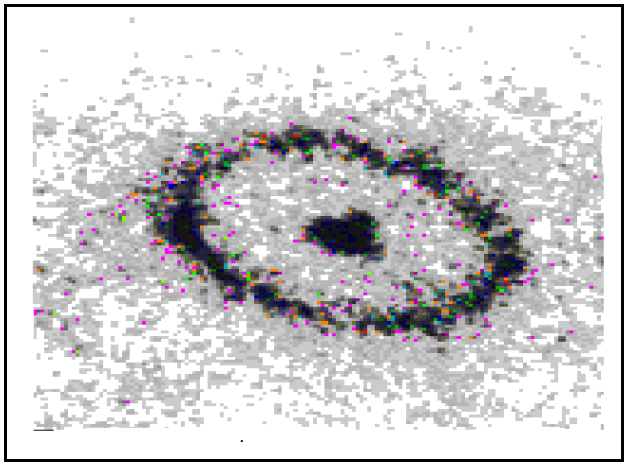

Figure 4 Negative image of Circumstellar Ring around SN 1987A.

There is a surprising confirmation from astronomy that the rates of radioactive decay have not changed. This information came to light in the early 1990s. It caused me much concern because it proved several things. It proved that the speed of light had not changed. It proved that the rates of radioactive decay had been constant for millennia and it proved that the universe was at least 169,000 years old. These three items struck directly at my attempts to solve the young-earth problems. The young-earth model, which I had advanced in the early 1980s, depended upon a change in the speed of light. My views were exploded by a supernova.

On February 23, 1987, a supernova exploded in the Large Magellanic Cloud. It was the brightest and nearest supernova since 1604, which was prior to the invention of the telescope. Over the next several months, a ring of material around the supernova began to glow. The ring had not been observed before but was made of material ejected by the star about 5,000 years earlier than the explosion. The ultraviolet light from the supernova was heating the material in the ring causing it to glow (Figure 4). Knowing the time it took for the light to travel from the supernova to the ring, and the angular diameter of the ring as observed from the earth, it was simple trigonometry to determine that the supernova was 169 thousand light-years away from the earth (Figure 5).[44]

Theoretical models of supernovas had predicted that the decay of cobalt-56, created in large amounts, would power the light given off by the later stages of the supernova event. As cobalt-56 decays, the brightness drops accordingly. By July 1987, the light curve was decreasing at exactly that predicted from the half-life of cobalt-56.[44] Thus we can say with certainty that the rates of radioactive decay when the supernova exploded were identical with those rates observed today! And from this we can be certain that the light from the supernova took 169 thousand years to reach us, meaning that the rates of radioactive decay have been constant for the past 169 thousand years. Some young-earth creationists have proposed that the speed of light was more rapid in the past, but all of these views require that the rates of radioactive decay vary as the speed of light varies.[45] If the rate of decay does not change then the speed of light could not have changed either.

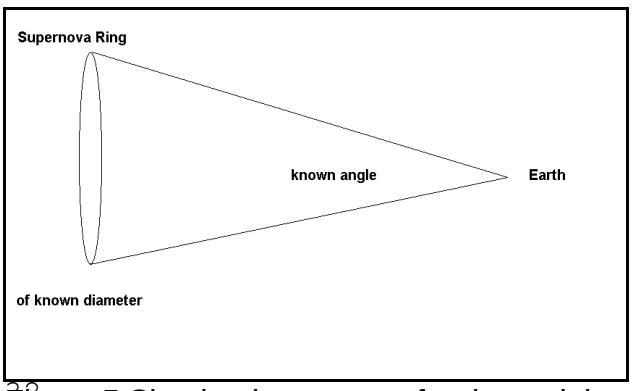

Figure 5 Simple trigonometry for determining distance to supernova

A young-earth creationist could claim that the light-decay curve does not prove that cobalt is actually powering the supernova. The following data should dispel that objection. Gehrels, et al, state,

> "Observations of Supernova 1987A stunningly confirmed the prediction. Cobalt 56 has a half-life of 77 days; from 1987 through 1990, the visible light from the supernova faded at exactly that rate. The Solar Maximum Mission satellite and instruments on National Aeronautics and Space Administration research balloons also

detected gamma rays from the supernova carrying 847,000 and 1,238,000 electron volts. These are precisely the energies associated with the decay of cobalt 56."
"Since 1991 the visible light from supernova 1987A has faded at a rate corresponding to a half-life of about 270 days, the exact half-life of cobalt 57. It seems that cobalt 57 is now the main radioactive isotope powering the supernova. OSSE has followed up on the previous observations by detecting the 122,000-electron-volt gamma rays characteristic of the decay of cobalt 57."[46]

Data from the supernova prove several things. The geometry of the ring and the time delay before the ring was observed prove that the supernova is 169 thousand light-years away. The gamma ray observations prove that short-lived cobalt 56 and 57 were produced by the supernova. The decay of the light curve with precisely the half-life of these isotopes proves that these isotopes power the light curve and that the rate of radioactive decay has not changed for the past 169 thousand years. The fact that the radioactive decay has been constant proves that the speed of light has not changed over the past 169 thousand years.

Steidl's second critique of radiometric dating, that one can't know the original parent daughter ratio, is overcome by a dating technique which is almost never mentioned by young-earth creationists. The isochron dating method[47] uses ratio of the parent element with a non-radioactive form of the daughter, and the ratio of the daughter element with the same non-radiogenic form of the daughter. When this is done for a number of elements (1,2,3 in figure 6) and plotted on a graph, the slope of the line always points to the initial daughter/non-radiogenic isotope ratio, no matter how old the rock is. When the rock is formed, the slope of the line is zero or flat (line A in figure 6). After one half-life, the slope is 1; after two the slope becomes 3 (line B in Figure 6). Measuring the slope of the line gives the age of the rock.

Steidl's third critique of radiometric dating, that one can't know if parent or daughter has been added to the rock is also overcome by the isochron technique. If a given mineral has been either leached from the rock or added to it, its isochron ratios will not lie on the line with the other minerals (1' or 1" in Figure 6). Thus, by using the isochron technique, one can tell whether the mineral's content has been altered during its lifetime. The usual young-earth objections to radiometric dating are simply straw men designed so that the young-earth creationists don't have to deal with the real data..

One final item on radioactive dating. As proof that radioactive dating does not work Steidl cites the case of the 1801 Hualalai lava flow in Hawaii. He states,

"The two scientists, using the radioactive method, arrived at an age of between 60 million and 160 million years."[48]

Obviously if the dating method can take a 200-year-old lava and say it is 60 to 160 million years old, then there is a problem. But Steidl then cites the Bible Science Newsletter, 14:2 as his source for this information. This is hardly a primary scientific source. If he had gone back to the original article he might have noticed that Funkenhouser and Naughton dated inclusions in the lava.[49] An inclusion is a rock that has been included in the lava but was not part of the lava itself. It is a rock that the lava ripped up out of the volcano's neck and then 'included' in the lava stream. If he had gone back to the original article, he might have seen the word xenolith in the abstract. The term comes from the Greek: xeno=foreign; lith=rock. Its age means nothing for the age of the lava.

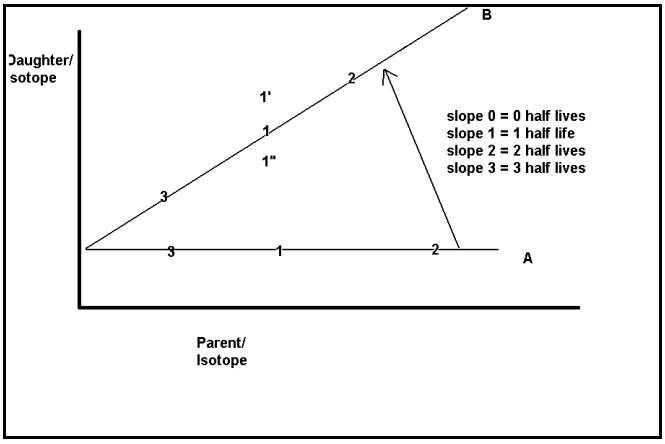

Figure 6 Isochron dating

The Earth's Magnetic Field

In 1973 Thomas G. Barnes proposed a means of dating the earth by means of the decay of the magnetic field.[50] He proposed that the earth's magnetic field was caused by a mechanism first suggested in 1883 by Horace Lamb.[51] The mechanism requires that electrical currents in the earth's core produce the magnetic field. These currents are essentially circular and are decaying because of the heat given off due to electrical resistance. Eventually, the current will use up all of its energy and then the magnetic field will vanish. Once gone, there would be no energy to restart the

magnetic field and the earth would remain without it.

Barnes then used the data in Table 8 to show that the earth's magnetic field was decaying and calculated that it was decaying with a half-life of 1400 years. Under this assumption, there would be a limit to the age of the earth because the further one looks back in the past, the larger the magnetic field would be. If this massive extrapolation were continued back one million years ago, the earth's magnetic field would be greater than any magnetic field in the universe. Barnes states,

> "One cannot date the origin of the magnetic field because we have no way of knowing its initial value. However, it can be seen that this rapid decay process requires that it be a very 'young' age. For example, the magnetic field on the surface of the earth in 20,000 B. C., namely 1.8 tesla (18,000 gauss) is stronger than the most powerful radar magnets. It is not very plausible that the core of the earth could have stayed together with the Joule heat that would have been associated with the currents producing such a strong field."[52]

He further concludes,

> "It would appear from these arguments that the origin of the earth's magnetic moment is much less than 20,000 years ago."[52]

Barnes' results have been often quoted by creationists.[53] It is true that the earth's observed magnetic field is decaying. In that respect, Barnes matches observation. The problem is that there are observations that Barnes can not explain with this method. Remember that once the electrical current decays away, there is no way to restart the current. Barnes states,

> "The evidence simply shows that the field strength is decaying. Langel's 1,200 year projected time at which the magnetic field will reverse polarity is actually the time for the magnetic field to vanish. At that time there will be no magnetic energy, and no magnetic poles. A reversal requires new magnetic energy and associated poles. If there are to be magnetic poles some new magnetic energy must be generated. But no valid mechanism for accomplishing this 'reversal' in the earth's magnetic field has yet been developed, not even theoretically."[54]

DATE	MAGNETIC FIELD STRENGTH (10^{22} GAUSS CM^3)
1829	8.45
1835	8.56
1845	8.49
1880	8.36
1885	8.35
1885	8.34
1885	8.33
1900	8.20
1920	8.17
1922	8.17
1940	8.10
1942	8.01
1945	8.01
1945	8.07
1955	8.06
1960	8.02
1965	8.00

M.W.MCELHINNY, PALAEOMAGNETISM AND PLATE TECTONICS,CAMBRIDGE UNIVERSITY PRESS, 1973, P. 7

Table 8 Strength of Earth's Magnetic Field

This means that magnetic reversals are impossible under Barnes' thesis. Barnes and Dalrymple have argued in the literature over whether the reversly-magnetized rocks on the earth mean that the earth's magnetic field has reversed. We will not follow that thread. What we will look at is the magnetic field of the sun.

If Barnes' view is correct, then all magnetic fields in the solar system should also be due to circulating electrical currents. The sun's magnetic field should also be decaying exponentially. What do we observe? George Abell notes,

"H. W. and H. D. Babcock, of the Mount Wilson Observatory and the Hale Solar

> Observatory, however, have investigated magnetic fields on the sun for many years, and in the 1950s established the existence of a general polar magnetic field with a strength of a few gauss. Because the sunspot polarity reverses each cycle, the general magnetic field of the sun also reverses, but in a rather irregular way."[55]

Since the solar magnetic field is able to reverse its polarity, then even the lack of a theoretical understanding of the process does not mean that it can't happen. It happens every 22 years in the case of the sun. What this data means is that, at least in the case of the sun, there is a mechanism which allows the magnetic field to reverse. So what is the big problem with having this same mechanism at work in the earth? The young-earth creationists must explain why the mechanism at work in the sun is different from the one at work in the earth.

Now, the effect of a reversing magnetic field is to completely destroy Barnes' argument because one can no longer extrapolate the decay of the magnetic field as an ever-increasing value. The magnetic field is cyclical. It builds up strength in one direction, then decays and vanishes briefly. After which the field builds up strength in the other direction. If the magnetic field of one object in the solar system can reverse, then why can't the others?

In 1981 a co-worker of mine, Mark Montie, told me at work one day that he had just read that the sun reversed magnetic polarity every 22 years. Over the next few months, I encouraged him almost weekly to publish that in the Creation Research Society Quarterly. Eventually, in 1982 he did.[56] This apparently spurred Humphreys to develop a mechanism for handling magnetic polarity reversals.[57] Humphreys attacked Barnes position on several counts. He showed that magnetic field didn't simply decay as Barnes had said. He also showed that the present steady decrease in the field strength didn't begin until 500 AD.[58] Thus Humphreys disproved Barnes' theory.

While there is nothing physically wrong with his mechanism, it can not be used to support his conclusion, namely that the earth is young. Just because you can come up with a model of the magnetic field, does not mean that that is the way nature operates. Science is full of theories that have been discarded because observation did not support the view. The Ptolemaic, earth-centered astronomical system was marvelously accurate for predicting planetary positions, but it was wrong. Humphreys has no observational data that the core operates in the fashion he postulates.

Humphreys also depended upon the lack of a dynamo theory. The dynamo theory is what old-earth geophysicists believed caused the magnetic field. They had worked on it for years and failed to produce a mathematical theory for it. Humphreys claimed to be correct because he had the only theory that would explain reversals.[59] But in 1995 Glatzmaier and Roberts produced a fully functional mathematical model of a geomagnetic dynamo which was able to explain the behavior of the earth's magnetic field through time.[60] It mimics the magnetic patterns seen in the earth's rocks. Humphreys had erroneously claimed that he was correct because geophysicists couldn't create a dynamo theory. Such claims usually end up being false.

Erosion of the Continents

In 1973, Steve Austin, writing under the pseudonym, Stuart Nevins, published an argument for the age of the earth based upon the rates of erosion presently observed.[61] He took the estimated mass of continental rocks above sea level (383 million billion tons) and divided it by the rate at which sediment is added to the ocean (27.5 billion tons/year). The result (14 million years), Nevins argued, is the maximum age that the continents could have existed. After 14 million years, the continents would be eroded to sea level. Thus, he concludes, the earth must be young.

Austin then takes the mass of oceanic sediment (820 million billion tons) and divided it by the rate sediment is added to the ocean (27.5 billion tons) and concluded that it would only take 30 million years for the oceanic sediment to have been deposited. Austin concludes,

> "After careful analysis of the erosion of continents and associated sedimentation in the world ocean, we must ask two urgent questions. Where is all the sediment if, as the evolutionist assumes, the ocean is over 1 billion years old? Who has the better model for the ocean - the evolutionist or the creationist? We feel confident that the true answers concerning the origin of the ocean are presented in Scripture. 'The sea is His and He made it' (Psalm 95:5)."[62]

All responses to this argument that the author has encountered are inadequate. Davis Young[63] merely states that the sediment which is placed in the ocean is subsequently re-cycled back onto the continents but he does not even state a mechanism nor does he give rates for this process. Young begins with an irrelevant analogy

about Ping-Pong balls in jars. Even the response from a geological textbook, while better, is similar in its response.[64] There are two problems with Austin's argument. First, Austin measure the amount of material presently above the sea level. What he calculates is the amount of time the present continents can remain above sea level. He doesn't allow for the fact that the continents were higher in the past. This is because sediment currently in the oceans was formerly on the continent making it taller. The second problem is that the rates of erosion which he assumes probably were smaller in the past than they are today and the fact that very little of the sediment deposited in the oceans today reaches the abyss. What will be presented here is a new approach to answering Austin's argument.

The total area of the Gulf of Mexico is 619,000 square miles. Now, we are only going to consider the northern half of the Gulf (area 309,500 sq. Mi.), since the sedimentation data is more easily available and the sediments of the southern gulf are largely limestone, which is not an erosional product. Seismic data shows that the average thickness of clastic (sand and shale) sediment in the Gulf of Mexico is 30,000 feet, then the volume of sediment eroded from the U. S. portion of the North American Continent is 1,758,000 cubic miles. How much sediment does this represent if spread over the entire area that drains into the Gulf of Mexico? Dividing the 1.76 million cubic miles by 1.7 million square miles, which is the area of the drainage basin of all the rivers entering into the Gulf, yields 1.03 miles, or 5466 feet of sedimentary material, which has been eroded off the continent. Is this an unreasonable number? Not really. The number does not mean that the continents once stood one mile higher than they do today. If the weight of this sediment were to have been placed on the continental platforms, the laws of buoyancy would cause the continents to sink. Thus, the continents would not have been too much taller with all this added sediment than they are today.

If one assumes that the sediment was deposited from the beginning of the Jurassic Period to the present, a period of 230 million years, then the average rate of erosion calculated is .285 inches per thousand years. This compares with 1.2 inches per thousand years observed today.[65] The discrepancy between these two values is due to two factors. First, agricultural practices, plowing etc. make it difficult to determine the pre-agricultural erosion rate. Attempts are made to correct for this bias but no one can be positive of their accuracy. Secondly, a look at any geological map of the U.S. shows that marine Jurassic and Cretaceous sediments were deposited 600 miles north of the present coastline. The only way this could have occurred was if the ocean actually covered modern St. Louis. At that time there was less continental area exposed to the destructive forces of erosion. Less area means less erosion and less sedimentation. And what was eroded was not deposited on the floor of the Gulf of Mexico. The earlier sediments coming down the Mississippi River when the shoreline was at St. Louis were deposited in Arkansas and Mississippi, not in the Gulf of Mexico. As the ocean retreated, those sediments were re-eroded and then redeposited in Louisiana, where the cycle of erosion and sedimentation occurred again, this time taking the sediments into the Gulf. Because of these factors, an average rate of erosion much lower than that assumed by Austin is quite reasonable.

Sedimentation occurs largely near the seashore with very little taking place far from the shore. With the shorelines of the past far from the present ocean basins, there was little sedimentation occurring in the ocean.[66] Austin's figure of 30 million years for the filling of the ocean with the sediments is wrong because the rate he assumed was much much smaller in the past. Thus instead of taking only thirty million years to fill the ocean, it would take many times that number. Austin's erosion arguments fail on all counts.

Varves

Often in the geologic record one comes across a cyclical sediment which consists of the alternation of two different lithologies. Deposits like these have been named varves and are often believed to be an annual deposit, each couplet of layers representing one year. Since some of these deposits have compiled many thousands or even millions of layers, young-earth creationists have attacked the interpretation of varves as annual deposits. They say that these deposits are turbidites. Whitcomb and Morris state,

> "There are several important difficulties with the varve method, however, one of which is the impossibility of knowing that the bands actually represent annual layers. Many other phenomena could produce such bands; for example, variation in flow and sediment burden of the stream or streams feeding the lake. Any brief flooding discharge into the lake would cause an initial layer of larger-sized particles followed by gradual settling of the finer particles, and this would give the appearance of a lamination."[67]

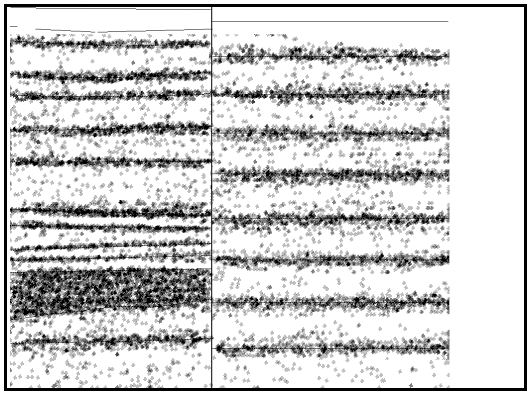

Figure 7 Left: Turbidite storm layers; Right: Varves

More recently, Steve Austin cited a study done by Lambert and Hsu which reported that five varves formed in one year in Lake Walensee, Switzerland.[68] The five varves were formed by turbidite flows. Obviously, Austin did not read the article carefully enough, for Lambert and Hsu conclude,

> "We do not intend to make an unwarranted generalization that no varves are deposits of annual cycles. Figure 4 shows varves from the mesotrophic Lake Zurich where the light laminae represent chemical sedimentation prevailing during summers and the darker laminae detrital sedimentation during winters. A comparison of those varves with the non-annual varves of the oligotrophic Walensee shows that the annual rhythms of Lake Zurich varves are more regular, while the irregularity of the Walensee 'varves' reflects the unpredictability of the weather."[69]

Even a cursory look by any objective observer at the figure cited by Lambert and Hsu shows that there is no similarity. A drawing of it is shown in Figure 7.

Recently, the young-earth creationists have begun to claim that sedimentary layers can be laid down rapidly because Mount St. Helens deposited several layers in a very short time. Steven Austin states,

> "These deposits include fine pumice ash laminae and beds from one millimeter thick to greater than one meter thick. Each representing just a few seconds to several minutes of accumulation. Conventionally, sedimentary laminae and beds are assumed to represent longer seasonal variations, or annual changes, as the layers accumulated very slowly. Mount St. Helens teaches us that stratification does form rapidly by flow processes."[70]

The claims that stratified deposits can form quickly is not of itself sufficient to prove that all microlaminations can occur quickly. Flint notes,

> "A rhythmite deposited in a lake near Interlaken in Switzerland consists of thin couplets each containing a light-colored layer rich in calcium carbonate and a dark layer rich in organic matter. Proof that the couplets are annual, and therefore varves, is established on the organic evidence, first recognized by Heer (1865). The sediment contains pollen grains, whose number per unit volume of sediment varies cyclically being greatest in the upper parts of the dark layers. The pollen grains of various genera are stratified systematically according to the season of blooming. Finally, diatoms are twice as abundant in the light-colored layers as in the dark. From this evidence it is concluded that the light layers represent summer seasons and the dark ones fall, winter and spring. Counts of the layers indicate a record that is valid through at least the last 7,000 years B. P."[71] [B. P.- Before Present- GRM]

If this deposit does not represent an annual deposit, then how are the young-earth creationists to explain why the pollen and diatoms vary over each layer? If there were five varves per year, as Austin suggests, then the pollen grains should vary over five couplets, not just one as is observed. If there were five couplets per year then the diatoms should vary in abundance over the five couplets, not just one as is observed. There is no way to explain the pollen and diatoms if there is more than one couplet per year.

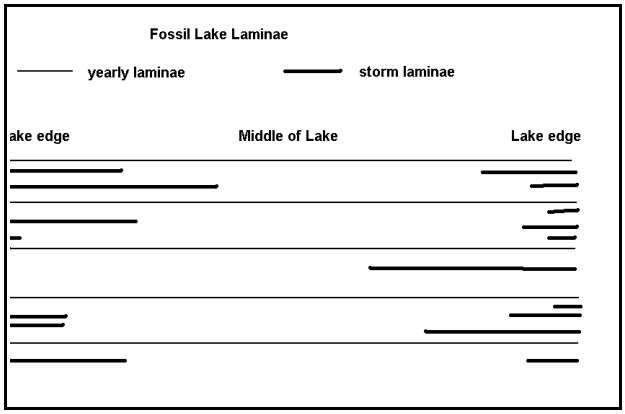

Figure 8 Relationship between varves and storm laminae in Green River

Ancient varves record the variation of astronomical

parameters of the earth's orbit and the sunspot cycle in the variation of the varve thicknesses. The solar cycle has been shown to affect all sorts of meteorological variables such as rainfall, temperature, storm tracks, thunderstorm activity and atmospheric pressure. Although the causal mechanisms are not entirely clear, the fact that the solar cycle is influencing weather is clear. The lamina of the Mississippian Sunbury shale has been shown to have periodicities related to several of the solar cycle. [72] The only way this can occur is if the Sunbury lamina are yearly deposits.

Another astronomical periodicity which is recorded in many varved sediments is the variation of the earth's orbital parameters. Regardless of how old one believes the earth to be, the orbital parameters of the earth will vary cyclically over the next half million years.[73] The equinoxes precess, or cycle, with a period of around 21,000 years due to lunisolar and planetary gravitational pulls. The obliquity of the earth's axis (the tilt) has a cycle of 41,000 years. The first, second and third terms of the eccentricity have periods of 95,000, 123,000 and 413,000 years respectively. Left alone, these cycles will be observed over the next few hundred thousand years. When Paul Olsen studied the 40 million laminations of the Triassic Lockatong and Passaic formations in the Newark Basin of New York and New Jersey, he found several periodicities.[73] By measuring the varve thickness, he found periodicities of 25,000, 44,000, 100,000, 125,000 and 400,000. These values are extremely close to those periodicities in the earth's orbital parameters. Considering that there probably is an occasional extra lamination laid down and possible changes in the orbital periodicities in the Triassic, 225 million years ago, the similarity is remarkable. There is only one way that the periodicities of the orbital parameters of the earth could have been imprinted on the periodicities of the Lockatong and Passaic and that is if the laminations represent yearly deposits.

The 2,600-foot-thick Green River Formation of Wyoming has 13 million layers of sapropel and carbonate. The average lamina thickness is .06 millimeters. These layers are interpreted to be the remains of a lake. The carbonate was produced and fell to the bottom rapidly during the summer. The sapropel was produced by the decay of organic matter that fell slowly to the bottom during the winter. These layers are believed to be yearly varves.

There are several lines of evidence that support the view that the Green River laminae are varves. These are the unsorted particles, the periodicities seen in the varves, and the radioactive dates, which agree with the yearly count. Wilmot H. Bradley was the first to seriously study the Green River Formation and in his initial work, he refutes the idea that is often advanced by creationists that the laminae are due to a turbidity (density) current. He wrote,

> "For storms to have produced a regular series of uniformly perfect pairs of laminae such as that illustrated in Plate 11 it is necessary to postulate one or the other of two conditions - (1) that each successive storm stirred up only the ooze that had accumulated since the completion of the preceding couplet of laminae, or that it stirred up the fresh supply and in addition one or more complete couplets of laminae, but never only part of a couplet; or (2) that between the formation of each couplet of laminae and the next storm the stratified material became so much indurated that it was unaffected by subsequent storm waves. Either of these necessary postulates seems to the writer adequate to rule out periodic storms as agents competent to produce the regular, uniform series of paired laminae observed in the rocks of the Green River formation. Moreover, there is a small but significant difference between pure density stratification and that observed in most beds in the Green River formation. In pure density stratification the grain size should diminish regularly upward from the base of each pair of laminae, but the grains in most laminae in the Green river beds are practically unsorted, even though the distinction between the layers rich in organic matter and those poor in organic matter is very sharp. If the material had been thrown into suspension in saline water coagulation would have prevented a clean separation of the various sizes of mineral grains, but at the same time it would just as surely have prevented a distinct separation of organic and mineral constituents."[74]

Fischer, Roberts and Ripepe studied the periodicities in the Green River laminae.[75] Assuming that the varves were yearly, they found a 4.5-year periodicity, which corresponds to the El Nino cycle, a 12-year periodicity, which corresponds to the solar cycle, a 20,000-year periodicity, which corresponds to the precession of the earth's equinoxes, and a 100,000 year periodicity which corresponds to the period over which the earth's orbital eccentricity changes. If these deposits were not yearly deposits, there is no reason to expect that we would find periodicities corresponding to the earth's orbital and weather cycles and the solar cycle.

The third line of evidence that supports the yearly deposition of the Green River laminae concerns the

radioactive dates from some volcanic ashes found buried with the laminae. Over a few days to a few weeks, a volcano eruption can spread pure ash over a wide area. The ash layer represents a time marker in the geologic column. We know that it was geologically an instantaneous deposit because in the flood model the ash should not be pure ash since the turbulent waters of the flood would disperse it and mix it with other sediments carried by the floodwaters. But in the still waters of a lake, the ash can settle to the bottom quickly with little time to mix with the lake sediments. Thus the ash marks the instant at which the volcano erupted.

We can radioactively date these ash layers to directly and independently time the laminae. Robert B. Remy dated two ash layers in the Green River.[77] One ash layer was 55 meters above the other layer. The upper ash layer dated around 46.2 million years ago and the lower at 47.2 million. One million years separated the ash layers. This means that the 55 meters of sediment between the ash was deposited at a rate of .055 millimeters per year which is very close to the observed and well documented average laminae thickness in the Green River of .06 millimeters. The radioactive dates support the varve interpretation.

Young-earth creationists have fought back by citing some data gathered by Buchheim's study of the Green River. They claim this data shows that the laminae are not yearly deposits. Bill Hoesch, the information director of ICR claimed,

> "Regarding the laminated shales of the Green River Basin, the 'varve' . . . interpretation is by no means an open and shut case. It seems to have become the rule rather than the exception to interpret these as turbidity current generated, as opposed to annual lake deposits."[78]

As we have already seen, it is certainly not the rule to 'interpret these as turbidity current generated'. It is only the rule among young-earth creationists. As noted, even the first serious study by Bradley ruled out turbidity current as causing the Green River. Hoesch cited several articles including Lambert and Hsu's article that we discussed above and one of Buchheim's articles that claimed that the varve count between two volcanic ashes was not constant but varied. If the number of layers varied between two ash layers (both of which are geologically instantaneous time markers) then the layers could not be yearly. What is the explanation for this?

Buchheim and Biaggi studied the Green River Formation in the Fossil Lake basin. This fact becomes important to a discussion of the Green River. The Green River formation consists of deposits in several different locations (or basins). There is Lake Gosiute, which is where Roberts, Fischer and Ripepe found solar cycle periodicities. There is Fossil Lake basin, which is where Buchheim and Biaggi counted their varves. And there is Lake Uinta to the south of these. These localities are in three separate basins. The Gosiute deposit represents the remains of a lake which was 200 miles in diameter. So the location where the periodicities were found was about 100 miles from the nearest shoreline. Buchheim and Biaggi studied the much, much smaller Fossil Lake. Fossil Lake is 12 by 18 miles. The center of that lake was only 6 miles from the nearest shore. Buchheim and Biaggi counted 1089 laminae in the lake's center compared with 1589 laminae near the shore. They even noted that the varve count increased as one went toward the ancient shoreline.[79] Thus they conclude that the Fossil Lake laminae are not yearly. And most geologists would agree Buchheim and Biaggi that some of the laminae are not yearly. But they would argue that some are.

How do we explain this? The young-earth creationists fail to distinguish between storm deposits and yearly deposits. Remember Lambert and Hsu's work? Lake Walensee had laminae that were non-uniform in size. They were storm laminae. These occur when rainwater runs into a lake carrying sediment with it. These storm laminae occur when there are big storms. When you have a situation where storm-laminae interfinger with varves, you can have exactly the situation that Buchheim and Biaggi describe where there are more layers near the shore than in the center of the basin. This is because almost every storm leaves laminae near the shore but only the biggest create laminae in the center of the basin. (Figure 8)

Fossil Lake, where Buchheim and Biaggi worked, is only 12 by 18 miles. Nowhere in that lake is much more than 6 miles from shore so even small storms can create laminae in the center of the basin. But in Lake Gosiute, where Fischer, Roberts and Ripepe studied the periodicities of the laminae, was 100 miles from the nearest shore. This distance protected the section they studied from storm laminae. Thus there can be yearly laminae unaffected by storm laminae in Lake Gosiute deposits which were 100 miles from shore but not in the much smaller Fossil Lake. The sediment settles out before reaching the center of Gosiute. The fossil distributions also support this interpretation. In the center of Lake Gosiute, no fossils of shore creatures are found.

We have seen above that varves are truly yearly deposits. If as we contended above, radiometric dating works, then the age of a layer determined by varve count should be nearly equal to the age deduced from carbon-14. Alan Craig, from the University of Minnesota, counted the layers in a core from the bottom of Lake of the Clouds

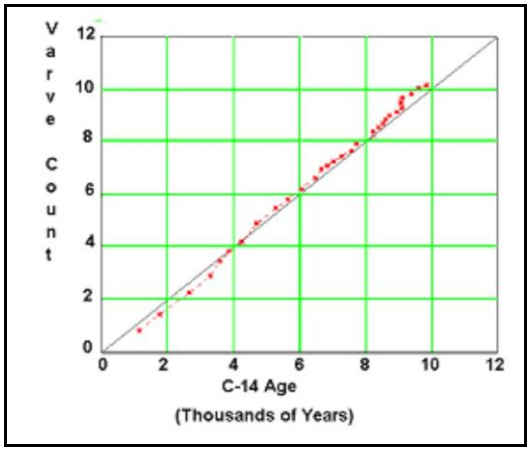

Figure 9 Comparison of C-14 ages with varve count in Lake of the Clouds, MN

in Minnesota.[80] He then carbon-dated various layers. The results are shown in Figure 9. As can be seen, the carbon-14 dates appear too old only in the younger part of the column, while appearing slightly too young in the older part. Craig's work proves that the varves in the Lake of the Clouds are yearly deposits and it proves that the carbon-14 method is consistent with the varve count back to at least 10,000 years before the present. This comparison in one fell swoop provides proof of two independent means of dating the past.

Buried Rivers and Deltas

One of the most amazing facets of geology is the similarity between the features that are seen on the surface and those which are seen in the subsurface. Most young-earth creationists rail against this concept as a submission to uniformitarianism, which they view as not only wrong, but also an evil. Although geologists have been able to map buried reefs, deltas, river channels, and the like for years, the fact that only information from oil wells was used to figure out the pattern meant that the creationist would always view the data with suspicion. As far as young-earth creationists are concerned, nothing a geologist says can be trusted since his entire education has been aimed at accepting and promoting uniformitarianism. This attitude is very unfortunate because the problem is not in the educational system of the geologist but in the data they have to work with.

In recent years, three-dimensional seismic data has become very common in the oil industry. Much like a CAT scan of the earth, fine details of the earth's structure can now be viewed in three-dimensional form. Features like deltas and river channels are now clearly seen meandering across a seismic volume. Figure 10 is a drawing of a river channel found on a seismic survey buried 1,670 feet deep in Baylor County, Texas. When this feature is penetrated by oil wells it is found to be an isolated body of sand - exactly what is expected if it really is a river channel! For anyone interested in seeing the original picture, it is in the AAPG Explorer, June 1993 p. 14. Other articles show pictures taken from three-dimensional seismic volumes of reefs, oil fields, deltas and river channels.[81]

When showing this to one friend, he asked if the river could be a buried pre-flood river? It can't. Most young-earth creationists believe that all the fossils were formed during the flood. There are several thousand feet of fossiliferous sedimentary rocks beneath this river channel[82] and 1,600 feet of fossiliferous sediment above the channel. If all the fossils were a result of the flood then the river channel must also have been deposited during that year. But there is no time. The reason that the river channel is so visible is that the channel is incised into a limestone bed. In other words, over 5,000 feet of sedimentary rock was deposited before the Breckenridge limestone bed was deposited. After its deposition the river eroded the channel into the limestone. Nor could the erosion have taken place under the ocean. To erode the limestone in the fashion that it is eroded would require fresh water. The ocean is close to being saturated with calcium carbonate (lime), and so seawater would not easily erode a channel into limestone. This channel must have been deposited above sea level.

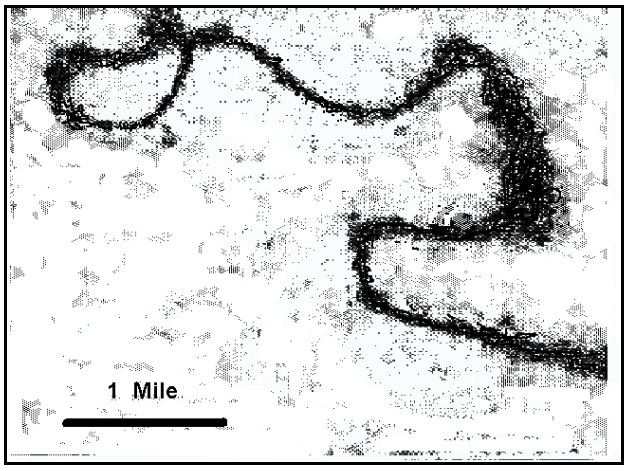

Figure 10 Buried River Channel

Bill Hoesch, the PR director of ICR, told a friend that meandering channels occur under water and therefore this river channel doesn't require subaerial erosion.[83] It is true that meandering channels are found underwater, but they never cut into limestone as the buried river of Baylor County is doing. Rivers bring clastic sediments (sand and shale) to the oceans. The channels form at river mouths and distribute the sand to the deeper waters. The shale remains in suspension much longer and is distributed by the water. And it is the shale filled waters that ensure that these channels will not cut into limestone. The shale-clogged waters kill almost all limestone-depositing animals like coral. Without those lime-secreting organisms, there is no limestone for the river to cut into. So, the fact that there

are channels underwater is irrelevant to the channel cut into limestone in Baylor County.

What does this have to do with the age of the earth? There are equations which relate the wavelength of the meander with the rate of flow in the channel.[84] The length of the meander observed is quite similar to that which is seen in rivers today which are forming on the earth's surface. Additionally, we must consider the length of time it took for the river to erode the limestone? It could not have been an instantaneous event.

When faced with such a clear picture of a buried river channel, what is the Christian geologist supposed to do? Should he reject what his eyes have seen? Is he supposed to lie? Isn't the scientist supposed to explain how what he sees came to be? For his efforts, he is denigrated by the young-earth creationists. Morris and Morris state,

> "The time has come for such Christian men of science to cease teaching Christian young people how to distort and disbelieve Scripture, and for each to stand instead as a child of God and as a scientist in submission to Scripture, interpreting scientific data in light of the unchanging Word of God rather than interpreting the Word of God in light of current scientific speculation."[85]
>
> Rivers always create deltas. The Mississippi River delta is enormous in size. Could a delta be deposited during the flood, as many young-earth creationists believe? Morris writes,
>
> > "Not only do the fossils contained in the sedimentary strata demonstrate the necessity of catastrophic deposition, but the very strata themselves indicate this. As already noted, most of the earth's surface is covered with sediments or sedimentary rocks, originally deposited under moving water. This in itself is prima facie evidence that even under modern conditions most sedimentary deposits are the result of brief, intense periods of flood run-off, rather than slow uniform silting."
> >
> > "Laboratory evidence that a typical sedimentary deposit may form quite rapidly is found in the work of Alan Jopling at Harvard, who made a long series of studies on delta-type deposition in a laboratory flume and then applied the results to the analysis of a small delta outwash deposit supposedly formed about 13,000 years ago. His conclusion was as follows:
> >
> > > 'It may be concluded therefore that the time required for the deposition of the entire delta deposit amounted to several days. . . Based on the computed rate of delta advance and the thickness of the individual laminae, the average time for the deposition of a lamina must have been several minutes.'"[86]

Morris' quotation of Jopling comes from page 34 of Jopling's article. But long before that quote was reached, Morris must have read on page 17 that the delta Jopling was referring to was only 16 inches high and 20 feet long![87] Of course it only took a brief period to deposit, but Morris fails to mention this fact so his readers can evaluate the data. To allow the reader to infer from Jopling's work that river deltas can be deposited in days is very poor writing and scholarship.

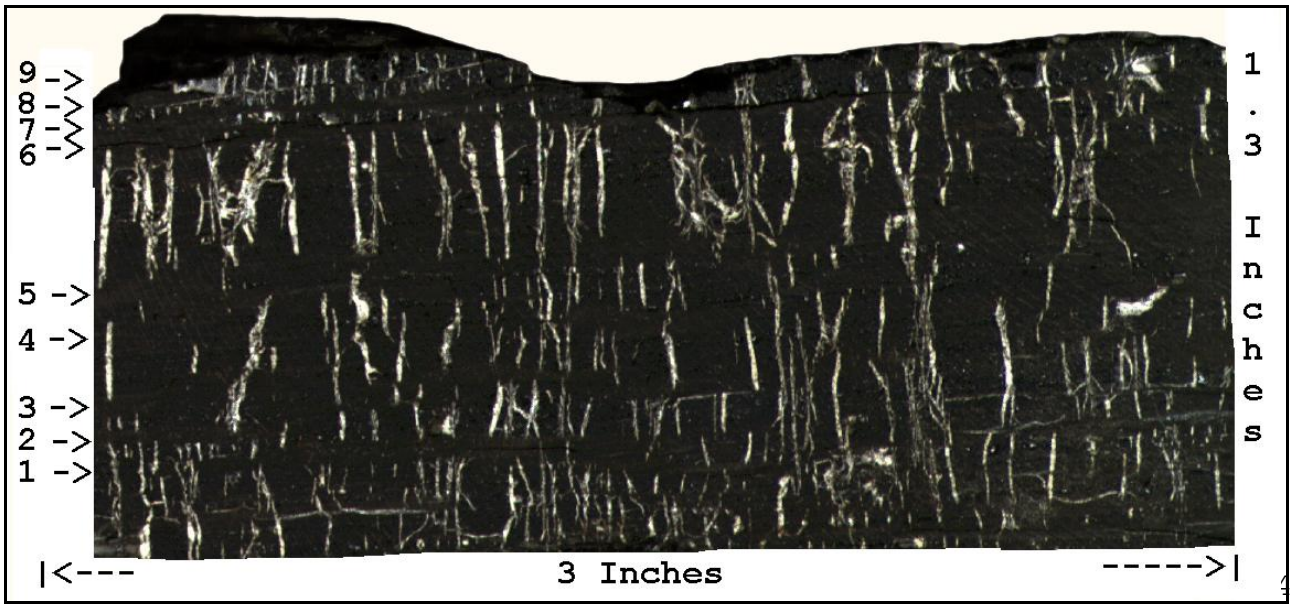

Figure 11 Multiple layers of roots from 7,000 feet deep. Southeastern Colorado.

Roots at 7,000 feet

Figure 11 shows a slab of rock brought up from around 7,000 feet deep in a well in southeastern Colorado. The well is the Murfin Drilling Co., Colorado State No. 1-16, drilled at the end of 1983. The core was loaned to this author by a co-worker who had worked on that well. The core is from an organic-rich shale. The white vertical lines are the roots of plants that grew in the Lower Pennsylvanian Morrow abandoned river channels 320-330 million years ago. According to my co-worker, there was about 3 feet of rock, which looked just like this, three feet of layer after layer of roots.

A close examination of the core shows layers in which there are very few roots. These are layers representing floods - periods of slight erosion. The sediments, which were deposited there, caused the plant roots to go out of the plane along which the core was cut. At the very least, these represent periods between successive floods and if the floods occurred yearly then this 1.3 inch tall core represents at least 9 years of deposition. There may be some very small erosional layers, which are not easily visible. The full 3 feet would represent about 250 years of deposition that is what is observed today in ox-bow lakes which is a cut off river channel. This deposit shows that the geologic column is deposited slowly and thus the earth is old.

Oil and Gas

Another faulty argument from the young-earth creationists needs to be discussed. It concerns the length of time that oil could remain trapped in the geologic strata. Basically the argument states that due to high pressures in many oil reservoirs, oil and gas could not remain trapped for more than 10,000 years and thus the world is less than that age. I read this argument in Petersen's book Unlocking the Mysteries of Creation.[76] Having worked in the oil industry for over twenty years I was quite interested in this argument and wanted more information. I wanted to see the equations. Petersen referenced the 1966 version of Melvin Cook, PreHistory and Earth Models.[89] Not being able to get that book immediately, I looked further and once again found this argument in a book by Huse from 1983. Huse actually stated that "calculations" proved that oil could not be retained in reservoirs for the millions of years required. Huse cited a book published by the Institute for Creation Research. On the page Huse referenced, there was nothing on oil and gas. Out of luck. But Huse also referenced Robert Kofahl's book, The Handy Dandy Evolution Refuter.[90] I found the argument on pages 122-123, but no calculations to prove the assertion that oil and gas would leak at such a rate. But, eureka, Kofahl cited two other sources, one from Science,[91] a respected scientific journal and an older book by Melvin Cook, PreHistory and Earth Models.[89] Immediately, I got the Science article and found that it said nothing about oil and gas leaking out of the reservoirs! I also found the argument in a 1976 book, The Creation-Evolution Controversy, by Randy L. Wysong.[92] He also cited the Science article and Melvin Cook's book. Finally I discovered a way to get a copy of Cook's 1966 book, which I had seen cited in other books in other contexts over the years. Turning to the cited pages, I found a simple statement that oil could leak from high-pressure reservoirs but there were no references for that assertion nor any calculations. Apparently the whole argument was generated by a few lines of unsupported assertions in a book from 1966.

But like all the arguments for a young earth there is a serious process that is being overlooked. While it may be true that abnormally high pressure can not exist forever in the subsurface, it is most often found in the most recent of sediments, like those found in the Gulf of Mexico. The Gulf of Mexico is currently undergoing active and rapid deposition from the Mississippi and other rivers. This rapid influx of sediment has the effect that sediments are buried more rapidly than the water can escape causing the pressures to rise. In sediments water escapes from permeable rocks. Permeability is the connectivity of the pore spaces. Water can escape through permeable rock. The Gulf of Mexico is undergoing observable tectonic activity that increases the pressure on the sediments. A former employer of mine bought a building in Houston in the late 1970's. By 1986 one half of the building was 4 inches lower than the other half because the building had been constructed over a previously unknown active geologic fault. As the fault moved over the next few years, it carried the seaward side of the building with it. This type of tectonic activity can easily replace the pressure that leaks due to permeability. By this means the pressure can be maintained, even in a permeable rock. The argument is a straw man. Sadly, none of the young-earth creationists tried to verify Cook's assertion; they just believed it because it fit their views.

The Geologic Column Lives!

Finally, this is a good place to discuss another misconception on the part of the young-earth creationists. Over and over one will find an assertion that there is no place on earth where the entire geologic column exists.

Rehwinkel in 1951 wrote of the geologic column,

> "The student, when first confronted with this table, believes, of course, that the geologists have actually found these various strata of rocks together in serial order, one following in regular succession upon the other, in one locality where the rock is built up after chart indications. But nothing is farther from the truth. Nothing resembling such a series has ever been found together in one place on the face of the earth."[93]

Henry Morris and Gary E. Parker stated in 1987,

> "Now, the geologic column is an idea, not an actual series of rock layers. Nowhere do we find the complete sequence. Even the walls of the Grand Canyon included only five of the twelve major systems (one, five, six and seven with small portions here and there of the fourth system, the Devonian."[94]

Scott Huse, in 1983, writes,

> "It is important to realize that nowhere in the world does the geologic column actually occur. It exists only in the minds of evolutionary geologists."[95]

And finally, Dennis R. Petersen asserted in 1990,

> "No such progression of rock layers and corresponding fossils is found anywhere on planet earth!"[96]

All of these gentlemen are simply wrong. The entire geologic column exists in Poland and in China. The Jiuxi Basin in northwest China covers an area of 2,700 km^2. This basin contains the rocks from every geologic period from the Cambrian to the present.[97] Large parts of Northern Alaska have all but the very last geologic age.[98] John Woodmorappe, a young-earth creationist, set out to prove that the geologic column did not exist but he was forced to conclude,

> "All ten geologic periods are undoubtedly represented in the Swiety Kryzys (Holy Cross) Mountains of south-central Poland (20-22 E and 50-52 N) as is evident from the local map of the mountain region enclosed in the work of Ksiazkiewicz, Samsonowich, and Rule. In fact, the presence of all or almost all of the geologic column (in terms of sedimentary lithologies that are unambiguously biostratigraphically dated) can be shown to occur over much of Poland. But only a very small percentage of the earth's land surface has most or all of the geologic column in place."[99]

But these are not the only places. The Robertson Group, a London based oil consulting company, has compiled a list of rocks in the basins around the world. Other basins which have rocks of all geologic ages include the Farah and Helmand basins in Afghanistan, the Yazd-Kerman-Tabas basin in Iran, the Yellow Sea, the Tung T'ing-Yuan Shui, Tarim, and Szechwan basins in China, the Yeniseiy-Khatanga, and Baltic basins in Russia, the Moesian Platform in Bulgaria, the Hebrides and North Minches basins in Great Britain, the Adana and Iskenderun basins in Turkey, the Oman Interior basin in Oman, the Western Desert basin in Egypt, the Ghadames basin in Libya, the Beni Mellal basin in Morocco, the Tunisian basin in Tunisia, the Bogota basin in Colombia, the Tampico Embayment in Mexico, the Copper River District in Eastern Alaska and the Williston Basin in North Dakota. The W. H. Hunt Estate Larson No. 1 oil well from McKenzie Co. North Dakota drilled through rocks of every geologic age! At least 30 other wells in North Dakota have also drilled the entire column.

Thus we can conclusively state that the entire geologic column does indeed exist, contrary to the above assertions. This idea that the geologic column does not exist has been in creationist literature for over forty years and is utterly erroneous. I have personally heard Christians repeat this error many times. It is truly a shame that those whom Christians trust to teach them the truth can be so wrong for so long and never correct it.

The evidence from geology clearly points to an age of the earth much older than the few thousand years advocated by the young-earth creationists. For them to continue to distort the facts both of science and the Scripture does a real disservice to Christianity. We will next look at the astronomical arguments for the age of the

earth.

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AN ASTRONOMICAL AGE

His friends called him Indicopleustes--Indian Navigator. He had been a merchant and traveled widely. Cosmas was his real name. Unlike most of his contemporaries, he had been to India and Ceylon and was familiar with large geographical regions. He was also familiar with the phenomenon that a boat's sails could first be seen before the boat itself, as it came over the horizon and he was aware that this was evidence of a spherical earth. Having been to India he knew that one of the beliefs of his age was wrong. People believed that India was excessively hot since the sun came near the earth there. It was because of this heat that the Indians were believed to have been burnt to a dark color.

When he became a Christian, he gave up his lucrative profession. He also gave up his previous pagan beliefs such as a belief in a spherical earth and belief in lands separated from Eurasia by water. He became a monk. He knew that the Bible was the infallible word of God. He also believed that he was able to correctly interpret the Bible. From these two beliefs came the most remarkable theory of the earth.

Cosmas took Hebrews 9:1-2 literally and from it, he deduced the correct structure of the world or so he thought. Hebrews 9:1-2, as Cosmas understood it says,

> "Then verily the first covenant had also ordinances of divine service, and a temple terrane. For there was a tabernacle made; the first, wherein was the candlestick, and the table, and the showbread; which is called the sanctuary."[1]

Cosmas' eye fell on what the Greek clearly said, 'kosmikos hagion'--temple terrane. This was the key to the structure of the world. The candle was the sun, moon and stars. The world was flat like a table and the universe was shaped like a tabernacle. The Tabernacle was twice as long as it was wide (Ex 37:10) with a tent-like canopy over it. Thus, the earth was twice as long as it was wide with a canopy over it. This fit the tabernacle scheme and separated the waters above the firmament from those below. The sun revolved around a northern mountain. Sunset consisted of the sun going behind this mountain. The sun was much smaller than the earth.

Cosmas justified his flat-earth geography by noting that water would fall off of a spherical earth. Only on a flat earth could water be held. On a spherical earth, people would have to walk upside down. The stars could not fall at the final judgment on a spherical earth. Jerusalem was at the center of the earth in Cosmas' scheme. There was no opposite side of the earth, called the antipode, because the earth was flat. Scripture even stated this, indirectly. Romans 10:18 indicated that the Gospel had gone out into the entire earth. And everyone knew that it had not gone to the antipodes. And since the Gospel had not gone to the antipodes but had gone to the entire world only one conclusion could be drawn. There was no antipode and no people there.

Cosmas justified his view on the only important basis. The Bible told him so. In fact, Cosmas believed that you could not be a Christian and differ from his views. He said,

> "It is necessary for those who wish to be considered Christians to inquire into which of these eight or nine heavens Christ has ascended, and into which they themselves hope to ascend, and what is the use of the other seven of eight heavens. For, having already delineated the world in accordance with the scriptural view, we assert that the two places were created, one adapted to the present state of existence, and the other to that which is to come, since we have such hope, one that is better than the life here. And you, if as Christians you hold such hope, will of necessity be asked what is the use of the seven or eight other heavens. For the pagans who hold the theory of the sphere, if consistent with themselves, neither entertain such hope, nor allow that there are waters above the heaven, nor are found that the heavenly bodies and the world will come to an end; but expect that the world in the state of corruption will continue forever."[2]

And concerning sphere believers he confidently stated,

> "Is it not evident that you argue against the hope held out by the Christian doctrine? "[3]

Cosmas appealed to both common sense and the word of God to support his view. Heathen scientists that believed in the spherical earth didn't honor God's word. Thus, it was a clear choice, God's Word, or man's fallible word.

Cosmas' views held wide sway among the uneducated peoples of the Middle Ages.[4] They were never accepted by the educated people. Columbus, when he was trying to convince people that he could sail west and hit China had to deal with this belief among the sailors. Shortly after this, as more of the world was claimed by Portugal and Spain, conflicts arose between these two countries as to who owned what. The conflict rose to the point where the two countries were about to go to war. The Pope sent negotiators to resolve the dispute. Depending upon Cosmas' geography and the fact that no one had sailed around the earth, the parties agreed to the Treaty of Tordesillas. Spain got all the lands west of the Line of Demarcation and Portugal got all the lands east. This is why Portugal got Brazil and Africa and Spain got Mexico and western South America. The negotiators had overlooked the fact that the earth was spherical[5]

But Magellan, an enterprising sea captain, saw an opportunity to give Spain the East Indies and the Spice Islands by sailing west to them. And this is what he did. Because of Magellan's voyage, the entire concept of the world was changed.

But this was not the end of Cosmas' legacy. In the 1850s, Father Cullen ran a school which taught that the sun was smaller than the earth. Indeed, the sun was only 6 feet in diameter.[6] In this century, there are still Christians who hold to Cosmas' view that the sun revolves around the earth and that there is a solid firmament in which the planets are embedded. Gerardus de. Bouw has advocated such a view.[7] And Henry Morris repeated Cosmas' claim that Jerusalem was at the center of the earth. He wrote ICR Impact #2 that asserted that the Biblical lands were at the geographic center of the earth. So even today we have not totally escaped the views of Cosmas

What went wrong? Why was Cosmas so sure of his beliefs and yet so wrong? First, Cosmas believed he was an infallible interpreter of Scripture. And if his interpretation of Scripture said something that was contrary to observation, he discounted the observation. He was also a very proud man. He disbelieved anything that the pagan scientists of that day told him. He wrote:

> "And do not, because you are adepts in the science of nature, jauntily treat us to nothing but empty phrases."[8]

This approach, which is so similar to that of the young-earth creationists, can no longer be tolerated. It leads to apologetical dead ends.

From my earliest memories, I was interested in astronomy. When I was seven, my mother brought me a college astronomy text. I didn't understand a lot of that book but I did read it. I remember the feeling of insignificance as I learned of the vast distances to the galaxies. My interest in astronomy led me to begin college as an astronomy major. Due to circumstances beyond my control, I ended up being moved from the astronomy department to the physics department. But I still graduated with an astronomy minor.

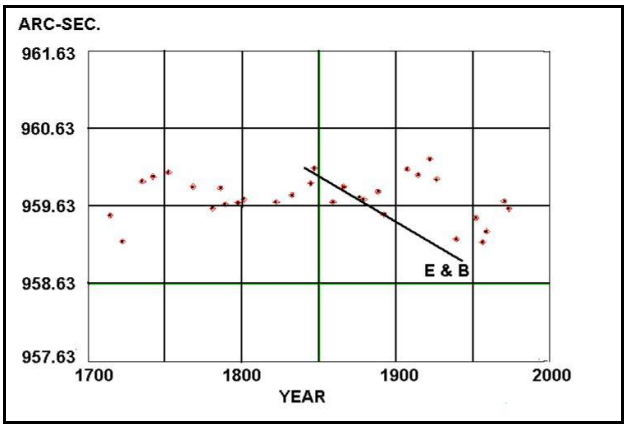

Figure 12 Radius of the Sun 1700-1980

When I became a young-earth creationist, I knew that the astronomical problems must be solved. My astronomical knowledge was also the reason I would not accept just any young-earth theory. My search for answers would eventually lead me out of the young-earth movement.

Young-earth creationists have advanced many astronomical arguments that they claim require a young universe. We will examine eleven arguments that have implications for this issue. Many of the arguments were at one time valid arguments but subsequent data have disproved them. Unfortunately young-earth creationists are not exceptionally diligent at updating their material.

A case in point is the issue of the shrinking sun. At the 1979 meeting of the American Astronomical Society in Wellesley, Massachusetts, John A. Eddy and A. A. Boornazian presented evidence that the sun's diameter had decreased from 1836 to 1953 at a rate of .1% per century.[9] The importance of this goes back to the middle of the last century, before the discovery of nuclear energy, when scientists were first trying to understand how the sun could shine. The first serious scientific attempt to explain the sun's energy source came in 1850 when Herman Von Helmholtz proposed that the energy was produced by the slow gravitational collapse of the sun. The sun was

getting smaller with time, according to Helmholtz. Kelvin took Helmholtz's suggestion and showed that in the past the sun gave off more energy and in the future would give off less. Thus the earth could only have been habitable for 20 to 40 million years.[10]

In 1896, Henri Becquerel discovered radioactivity. Astronomers quickly realized the implications of this discovery to the energy mechanism in the sun. Geologists had long maintained that the earth had to be older than a mere 20 to 40 million years so with this discovery physicists began looking for another energy source for the sun. After all, if the earth is billions of years old, then so, too, must be the sun. Helium was discovered on the sun in 1895, before it had been discovered on earth! As more knowledge was obtained, it became clear that hydrogen fusion was the energy source. Hydrogen fusion is the process of two hydrogen atoms joining together to create an atom of helium, thereby giving off energy. Theory showed that this process would keep the sun shining for more than 5 billion years.

In the early 1970's a neutrino detector was built with the intention of measuring the neutrino production in the sun. When hydrogen fuses to form helium, a small particle, called a neutrino, is given off. The detector should have picked up around 40 neutrinos per month if all of the energy given off by the sun is produced by fusion. The detectors only picked up 4 neutrinos per month, one-tenth of the expected number. This disturbing result implied that fusion is not presently occurring in the sun. John Gribbin reports,

> "It is, in fact, just possible that the Sun is not being maintained by nuclear burning at present. Several lines of evidence suggest that something odd is going on inside the Sun, and has been for perhaps a few million years and certainly for a few thousand years. One key clue comes from attempts to detect particles called neutrinos, which should produce in great quantities if the nuclear fusion processes are operating in the Sun as theory predicts. No more than one-third of the expected flood of neutrinos has been detected, and the simplest explanation is that the nuclear burning has temporarily 'switched off.'"[11]

In 1979 Eddy and Boornazian[1] claimed that the solar radius had been shrinking over the last century. Dunham, et al performed similar measurements and also concluded that the sun is shrinking.[12] Both of these works concluded that the rate of shrinkage was more than enough to account for the energy given off by the sun. If this were true, then the sun just might be getting its energy from gravitational contraction and not from fusion. It is this that the young-earth creationists have seized upon as proof of the youth of the sun.

The young-earth creationists have generally ignored subsequent developments on this issue. In 1980 Shapiro[13] and another team led by Parkinson[13] both showed that the solar radius was essentially constant. Shapiro used data from the timing of Mercury transits while Parkinson's group examined all the data from the 1700's to the present. In Figure 12 the points are the observed angular size of the sun measured from the transits of the planet Mercury.[14] The line labeled E & B is the rate of change suggested by Eddy and Boornazian. As can be seen, the line, if continued back to 1750, would have been contradicted by the observational data. The young-earth creationists never cite these authors and these facts. Akridge used the rate of shrinkage (5 feet/hour) to calculate that the sun would have swallowed the earth 20 million years ago.[15] Even today, Kent Hovind is stating that the sun is young because it is shrinking.[16] Other creationists who have advocated this view include Barnes[17], Chaffin[18] and Morris.[19] These authors ignore the fact that almost no one in the astronomical community accepts the shrinking of the solar radius and that the researchers who initiated this issue, Eddy and Boornazian, have not referred to that work ever again in spite of the controversy.[20] In the scientific community, this is a sure sign that the authors wish to disown their own work.

What is unacceptable in the way this argument has remained in the young-earth creationist literature is the way citations are handled. Hovind, mentioned above, cites Dennis R. Petersen as one of his sources. Petersen has produced what must be a classic in avoiding the scientific literature.[21] In Volume 1 Petersen has 56 references: thirty-two to other creationist literature, twenty-three to secular sources, like Reader's Digest and Ranger Rick magazine, and only one to a legitimate scientific source and it is a 44-year-old book! Petersen does not even give credit to Eddy and Boornazian for having first suggested the solar diameter was shrinking; instead he cites Akridge.[15] Petersen states,

> "As far as researchers can tell this rate of shrinkage has been consistent since the origin of the sun. But astronomers also admit that stars much larger than the present size of our sun burn hotter and faster than the sun. From the pure simple evidence it is clear that life would have been totally impossible on Earth even a million years ago."

"Or perhaps the sun and Earth just aren't all that old!"[22]

It is not clear how Petersen knows what "researchers" believe since he didn't refer to any of them and thus gives no indication that he has read any of their articles. Christians should demand higher standards from their leaders.

More recently, Ribes et al. published a study of a 53-year record of solar diameter measurements made by Jean Picard during the 1600's which they claimed showed that the sun was larger in the 1600's. O'Dell and Van Helden[23] studied the optics of the instrument used by Picard and wrote,

> "We conclude that the early measurements of the solar diameter by Jean Picard and his immediate successors must be corrected for systematic instrumental effects whose optical component can be estimated from similar observations made of Jupiter with the same or similar instruments. The small remaining difference between the corrected micrometer measurements during the deep Maunder minimum and the modern values can be attributed to errors in the micrometer. The optically corrected transit observations are in agreement with the modern values."[24]

The telescope and measurement system were giving anomalously large values.

Morrison, Stephenson, and Parkinson[25] followed O'Dell and Van Helden's study with new information concerning the path of a 1715 eclipse. They state,

> "This new result from the path width of the 1715 eclipse, and our earlier result from the timed duration at the places shown in Fig. 1, lead us to the conclusion that the semi-diameter of the Sun in 1715 was not significantly different from the present-day value (959.63 arc s at unit distance). Ribes et al. must have underestimated the effects of the optical imperfections on the image size in the telescopes used by Picard and La Hire, as argued recently by O'Dell and Van Helden."[25]

Once again, the consensus of astronomical opinion is that the solar radius is essentially constant. Why would the young-earth creationists continue to use this.

What is interesting is that very recent developments may remove the original neutrino problem. R. S. Raghavan comments that one way to solve the neutrino problem is for the neutrino to have a small mass.[26] Recently, D. Hywel White and his colleagues at Los Alamos claim to have experimentally verified that the neutrino mass is between .5 and 5 electron volts.[27] Since that time, Fukuda et al, at the University of California at Irvine, have confirmed that neutrinos have a small mass, .02 to .07 electron volts (a measure of mass).[28] The whole problem of where the sun gets its energy is no problem at all.

Coral and the Length of the Year

When run backwards through time, calculations of the orbital parameters of the earth and moon and sun system reveal several interesting features. Due to tidal friction, energy of rotation of the earth is slowly being transferred to the orbital speed of the moon. This means that the days on earth are getting longer and the distance to the moon is increasing. The orbital physics predicts that the length of the day 400 million years ago was about 21 hours[29] The length of the year during that time period would have been approximately the same. This implies that 400 million years ago there were about 417 days in a year.

Young-earth creationists who believe that the universe is only a few thousand years old would not expect to find any evidence that the length of the day has changed. Over the past few thousand years the changes in day length have been so minuscule that no one would be able to detect them. This prediction of orbital physics gives us a means by which to judge the age of the earth.

In 1898, R. P. Whitfield was the first to observe that coral created annual growth increments. Seventeen years later T. W. Vaughan confirmed this result. In 1963 John W. Wells with Cornell University, published the results of his study of recent corals which indicated that corals also created daily growth lines which varied in thickness throughout the year.[30] The West Indian scleractinian coral, Manicina areolata, hovers around 360 growth lines per year. The variations were probably due to subtle changes in temperature during the year. When Wells looked at ancient, fossilized corals he found that the older the coral was the more daily lines there were in a yearly band! Coral from Pennsylvanian strata in Pennsylvania contained 390 lines per year while similarly aged coral from

Texas gave 385 lines per year. In slightly older rocks, Middle Devonian, the corals had an average of 400 lines per yearly band.

This phenomenon is not limited to coral. Pannella, MacClintock and Thompson[31] published a study on bivalves, cephalopods and stromatolites, which indicated that the number of months in a year was different in the past geological ages. Their values are consistent with the orbital physics outlined above. Berry and Barker[32] stated that there were 370 days per year in the Cretaceous fossils. S. J. Mazzullo[33] studied 400-million-year-old corals and brachiopods and determined that there were 420 growth lines in corals from the early Silurian, consistent with the prediction of the orbital physics!

It is a shame that this data is never discussed in creationist literature. It certainly does not support the idea that the earth is only a few thousand years old. Probably the response from the young-earth creationists, if any, will be that the flood somehow changed the rotation rate of the earth. But that is like saying the magic wand makes the bunny pop out of the magician's hat. The audience may not know how the bunny got into the hat, but it most assuredly is not to be explained on that basis. Similarly, a flood would not alter the rotation of the earth! Young-earth creationists need to deal with this issue.

The Size of the Universe

According to modern astronomy we live in an immense universe. Young-earth creationists often claim that there is no direct proof of by geometric triangulation of distances greater than 300 light-years and therefore the universe is not that large. These views are terribly outdated. The Hipparcos satellite, launched in 1989, has been quietly measuring distances to stars for the past 10 years. In 1997 the first results were released and triangulated the stars out to 500 light years. This information was told to me by Bill Jeffreys, the principle investigator for the Hubble Telescope star triangulation project.[34] But that is not all that Bill told me. He pointed out that the Hubble has the ability to triangulate stellar parallaxes out to a distance of 650 light-years. Within six years, the Space Interferometry Mission should be able to directly triangulate stars out to a distance of 30,000 light-years.[35] Christian apologetics should prepare for the day that astronomers achieve this goal, and it is only six years away. This will finally have astronomers doing direct measurements of stellar distances further out than light can travel in the 6000-year history that young-earth creationist hold to. Of course, as noted above, they already have done that with supernova remnants. Christians need to keep up with the areas of apologetics about which they write.

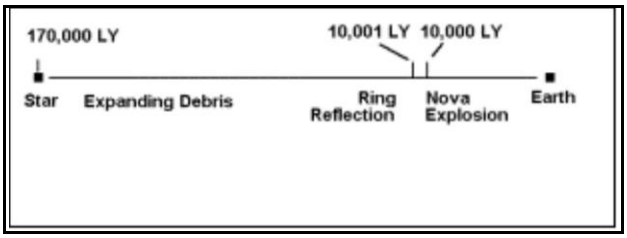

Figure 13 Events God must create for a recent creation

There are other methods for measuring distances greater than the parallax. Everyone knows that the farther you are from a streetlight at night, the dimmer is the light. You can read a book while standing directly under it, but even 100 feet away, the light is too dim. The brightness of the light diminishes by the square of the distance. Astronomers can use this to estimate the distance to a star. The dimmer the light, the farther the star.

Early in this century, it was been discovered that galaxies are receding from us. The light from the galaxy was shifted to the red. Laboratory observations showed that a light source moving away from the observer would be shifted to the red. It was also discovered that the dimmer the galaxy the faster it was receding from us. This was independent confirmation that the distances measured by the redshift are correct.

Using the redshift technique amazing distances have been observed. The farthest galaxy observable by the early 1990's is more than 12 billion light-years distant.[36] At the current speed of light, it took more than 12 billion years for the light from that distant galaxy to reach us. The distances are determined by the red shift of the light.

Young-earth creationists have only four responses to such a distance in order to maintain that the universe is young. The first response is that God created the light between the galaxy and us. Secondly, the speed of light changed. Third, Einstein is wrong and light does not travel the way we think it does. Fourth, the galaxies are much nearer to us than we believe. Failing in all these suggestions leaves only the option that the universe is large and old.

The idea that the light was created between us and the distant galaxies just a few thousand years ago has been suggested by many but was probably most effectively advocated by Akridge.[37] This suggestion would certainly explain how we can see distant galaxies with great ease, but it raises certain ethical problems for our

concept of God. In the case of the supernova discussed in the last chapter, it never happened. The distance to the supernova, as we saw, is 170,000 light years. If the universe is only 10,000 years old, then there is not enough time for light to get here. God must have created the light for the explosion 10,000 light-years away from the earth. Light for a normal star was created within that distance and light for an evolving explosion was created Figure 13 Events God must create outside of that distance. Eight light-months out from the explosion, God must have created the light for the ring reflection. And further towards the supernova, He must have created an expanding cloud of debris (Figure 4 page 33). He must have created the light in such a fashion that the geometric relationships would lead us to believe that the ring was a particular diameter. This would make us believe that we could measure the distance to the supernova by the principles of surveying that we use on the earth. But none of this occurred! Thus, God elaborately created a hoax to make us believe something that never happened. Why would God do that? If He would do that, then what is to stop Him from making us believe that Christ paid for our sins when He didn't? Once you allow God to be deceptive, then the entire basis of Christianity falls. We must trust God for our salvation, but that implies that God is trustworthy. God could not have created the light in transit, precisely because He is trustworthy!

Along these lines, believing in creation with the appearance of age leads to some amazing mental gymnastics. Consider Adam who was by all accounts created with the appearance of age by having been created full-grown. Nobody, however, thinks about the details. Did Adam have the wrinkles appropriate to a man his age or was his skin as smooth as a baby's behind? The day he was created, were his intestines filled with the bacteria normally acquired through a lifetime and which are vital to proper digestion, or were they relatively empty as are an infant's intestines? If he were truly created with an appearance of age, his brain would have a lifetime of memories, obviously from events that never occurred! If he did not have a lifetime of memories, then he was not really created with an appearance of age because you would be able to tell that he was not actually old.

A memory consists a particular arrangement of chemicals and neurons in the brain. In order to give Adam a full complement of memories, God would merely have to arrange the brain in a particular configuration. However, the concept that God would create false memories for Adam is an anathema for most Christians. "This would be a lie! God doesn't lie. Those events never happened!" they would say. But why do those who would feel this way about God creating false memories in Adam's brain, not feel equally uncomfortable with God creating false memories in the fabric of an extremely young universe? Those events never happened either!

At the instant of creation, did the light from the sun reflect where the sunspots would have been 8 minutes prior to the creation? Did the light from Jupiter reflect the position it would have been 34 minutes prior to creation? Did the light from Alpha Centauri reflect where it would have been four years prior to when it was created? Today, if the universe is really only 6,000 years old, does the light from a galaxy one million light-years distant reflect what wasn't happening there 1 million years before the creation? Such questions should disturb an honest student.

The second response to stellar distances, that the speed of light has changed, must also fail because God must be trustworthy. Barry Setterfield has been quite popular among the young-earth creationists for his suggestion that the speed of light has decayed from 4,004 B. C. to the present time.[38] The speed was infinitely fast at the creation and has slowed since, allowing light from distant galaxies to arrive at the earth in about 6,000 years. Scott Huse states of this suggestion,

> "Radioactive decay is also known to be proportional to the speed of light, and Barry Setterfield has recently shown that the speed of light has not remained fixed but has actually decreased. This decrease in the speed of light suggests that the decay of radioactive material in the rocks in the past would be much greater than it is today. Thus, the high decay rates of the past would account for the apparent vast age of the rocks."[39]

Huse got this "fact" from Setterfield.[40] Setterfield's views have received a wide promulgation among young-earth creationists and his views are totally erroneous. Setterfield has used the historical measurements of the speed of light and claimed that he has detected an historical decrease. Many have latched onto these views because of this historical analysis.

As long ago as 1983 Morton, et al.[41] noted several observations which conflict with predictions derived from Setterfield's suggestion. Due to the fundamental nature of the physical constant Setterfield wants to change, the values of other physical constants should also change. One can calculate how much the other constants should have changed over the past two centuries and compare those values with the values actually measured over the past two centuries. When this is done, it is clear that the changes Setterfield's theory requires have not occurred. Since Setterfield's theory would increase the rates of radioactive decay, on can calculate the heat given off by the

crust of the earth during different times back to the time of the creation. When this is done, it is discovered that the heat given off by radioactive elements in the earth immediately after the Creation was so great that the earth would melt. And since the physical constant which Setterfield wants to change would also cause the mass of the earth to change, it would mean that the earth would have to rotate faster in the past. So fast, in fact, that there should have been 417 days per year when Christ was on earth 2,000 years ago. This is contradicted by historical data.

More recently, several other young-earth creationists have raised serious concerns about Setterfield's original analysis of the historic measurements of the speed of light. Gerald E. Aardsma,[42] D. Russell Humphreys,[43] Roy D. Holt,[44] R. H. Brown[45] and Maurie G. Evered[46] performed independent statistical analyses of the data used by Setterfield and all five concluded that the data does not show any alteration in the speed of light.

There is still the issue of God's trustworthiness. If, as we agreed above, God is trustworthy, then the data observed from the 1987 supernova is trustworthy and proves that the object is 169 thousand light-years away. Thus, we see that the rates of radioactivity at the supernova are the same as those today. If the rate of decay is unchanged, then so is the speed of light! Setterfield's views were blown up with the first supernova of 1987.[47]

When a young-earth creationist this author also had suggested a change in the speed of light.[48] The technical details were different from Setterfield's. My views led to a different set of predictions and avoided the problems raised by Setterfield's theory. But the supernova 1987a destroyed both Setterfield's view and my view.

The third response, that Einstein was wrong, is one that was made popular by Henry Morris. He cites a paper by Moon and Spencer.[49] Moon and Spencer did not accept General Relativity and preferred another view, but their view had no observational support. There was much evidence against their view. Their article is an attempt to fit their views into the data of their day. They postulate that light travels on Riemannian surfaces and could travel anywhere in the universe in 15 years. Whitcomb and Morris state,

> "We do not propose to evaluate this theory but only to point out that all cosmological theory is still highly speculative. The very fact that such a theory can be developed and seriously considered demonstrates that astronomy has nothing really definite as yet to say about the age of the universe."[50]

What is amazing about this statement is that it was wrong even when it was written and it has become even more erroneous since then. Moon and Spencer's astronomical article was published in an optical journal. That is definitely not the most prestigious place for an astronomical article to be published. If it had been regarded well by the astronomical community, it would have appeared in Astrophysics or a comparable journal. For Whitcomb and Morris to say that the theory was seriously considered (which it wasn't) and then use this article, as evidence that astronomy has nothing to say about the age of the universe is poor scholarship. If I write an article stating that the moon is made of green cheese and get it published in Bon Apetit, this does not allow one to say that astronomy has nothing to say about the makeup of the moon!

Also, the rejection of Einstein's theory of relativity in Moon and Spencer's article, is the rejection of one of the most accurately verified physical theories ever devised by man. As Clifford M. Will says,

> "[Einstein's] theory has passed every one of the tests with flying colors."[51]

Whitcomb and Morris's plea that they do not intend to evaluate the theory seems disingenuous. They have already endorsed it by merely bringing it up. And if they do not have the capability of evaluating whether the view is of any value, are they not possibly guilty of being blind leaders of the blind?

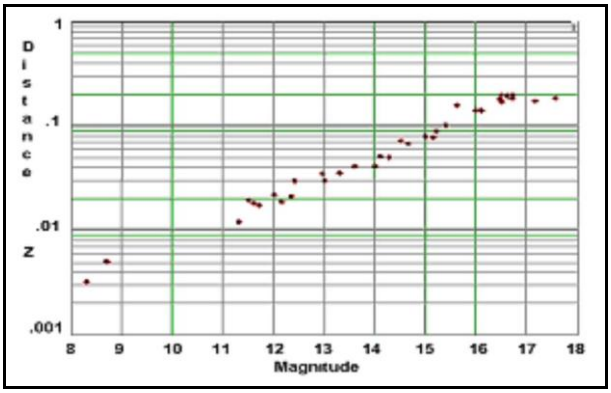

Figure 14 Distance magnitude relation for galaxies.

The final response, that the galaxies are not as far as is believed, is a possibility that can not be taken seriously. We have already seen the distance calculation to SN1987A and that the Large Magellanic Cloud is 170,000 light-years away. But there is another indication that the galaxies are very far: the amount of light received from them. Modern physics tells us that if we look at a light bulb from 2 feet away we receive 4 times less energy from the light than if we looked at it from 1 foot. If we move back to 4 feet, then we receive 16 times less light. This relationship

holds even for the galaxies.

Figure 14 shows a relationship between the distance, z, and the observed galaxy magnitude.[52] The larger z is, the farther the distance. The greater the magnitude is, the dimmer the galaxy. On this semi-logarithmic scale, the inverse square relationship between distance and magnitude should be a straight line and, as you can see, it is. It is also clear that the farther away the galaxy is, the dimmer it is. When the angular size of the galaxies is measured and then plotted against the distance and magnitude, we find the obvious relation that the farther a galaxy is the smaller it appears.[53] Thus, from all observational evidence, the galaxies are as far away as is generally believed. There is also no satisfactory young-earth explanation for the fact that we can see distant galaxies when the speed of light has demonstrably remained constant. The universe is huge and much time is required to explain what we see.

Galaxy Clusters

In 1980, Harold Slusher, published a book full of arguments for a young universe.[54] In it he discusses the dynamics of galactic clusters. A galactic cluster is a group of galaxies that are gravitationally bound to each other. In order for the cluster to be gravitationally bound, the velocities of the individual members must be below a critical value. If any galaxy has a velocity above that critical value, it will escape from the cluster. Astronomers have developed techniques that are quite accurate for measuring the mass of a galaxy. Usually these involve measuring the speed of rotation of the stars in the galaxy that can then be used to determine the mass. Knowing the masses of all galaxies in a cluster, the critical value above which a cluster member will escape can easily be calculated. Slusher cites the case of the Coma cluster,

> "In the Coma Cluster the mass is too small to counter-balance the velocity dispersion by a factor of seven. In other words, for every 7 kilograms of mass necessary to hold the cluster together, only one kilogram can be accounted for. This is not a trivial matter. There is only fourteen percent of the matter in the cluster that should be there in order for the cluster to stay together. Astronomers have looked 'high and low' for this 'missing mass' but it is nowhere to be found."[55]

Other galaxies have even less of the necessary mass. Slusher concludes,

> "The obvious conclusion seems to be that the 'missing mass' is not really missing since probably it was not there to start with. . . . This means that the clusters, since they have not been destroyed, are young, as well as the galaxies that form them."[56]

The problem with this argument is that it depends upon the non-existence of something that has not been observed. One of the first rules of science is that absence of evidence is not evidence of absence! Depending upon the continued missing mass runs the risk that someone will go out and find the missing mass. As telescopes have improved and astronomers have been able to see increasingly faint objects, a new type of galaxy has been discovered - those with low surface brightness (LSB). Sky and Telescope reports,

> "Astronomers now believe that these objects characterized by low surface brightness (LSB) and hence a dearth of stars, are the most abundant type of galaxy in the universe."[57]

Very dim giant galaxies have been found. Sky and Telescope reports,

> "In addition to the small LSB galaxies, researchers have detected three dim giants, the latest being 1226+0105 in Virgo. Galaxies of similar size still lurking beyond the detection threshold may hold part of the 'missing' mass needed to explain the observed motions within galaxy clusters."[57]

A recent study of the galaxy NGC 2300 has shown that it contains about four times as much dark matter as visible matter.[58] Remember that neutrinos have mass which may help hold clusters together.[59] If this galaxy is typical and a galaxy cluster contains a few of the dim galaxies, the problem goes away and the cluster will not disperse as is claimed by the young-earth creationists.

At the same time as these galaxies were being announced, a new study has detected the existence of small dark bodies in the universe. R. S. Hawkins has studied the brightness variations of distant quasars and has

shown that most of these variations are due to micro-gravitational lensings. This means that a small, dark, gravitating body traveling between the quasar and the earth causes the light to be slightly bent, focusing the light towards earth. In his report from Nature,[60] Hawkins claims that these small dark bodies, ranging in size between Jupiter and very small stars, could contain up to 90 percent of the mass needed to cause the universe to collapse. If the universe is full of such small bodies, then once again, the dark matter even in between galaxies might outweigh the visible matter. Due to all these considerations, the idea that a galaxy cluster would disperse is not a valid means to age the universe.

Formation of Dust Grains

Harold Slusher presents an argument for a young universe based on the rate of formation of small grains in interstellar space.[61] He follows the calculations outlined by Martin Harwit[62] in which atoms in interstellar space condense by collision with each other and gradually grow to a typical size of 0.00001 centimeters. Harwit points out that to form a small grain this size would take 3 billion years. Slusher goes on from that point and notes that to form a grain the size of .1 centimeter would require 30 billion years, larger than the age of the universe! From this fact Slusher states,

> "If formation of interstellar grains (1×10^{-5} cm in diameter) on a basis involving naturalistic assumptions is nigh impossible, it would seem to be a tremendous 'quantum' jump of presumption to suppose that star formation (an object ordinarily 1×10^{16} times larger than a grain) can be explained on a naturalistic basis."[63]

and,

> "If it takes as long as indicated to form such a simple body as an interstellar grain as the calculations indicate under the most optimistic conditions (which actually do not seem to exist), how can the huge ages for the stars and galaxies postulated by the evolutionists have any credibility and thus be taken seriously?"[64]

There are two things wrong with this argument. Slusher cites no astronomer who believes, or has believed, for a long time that stars form by condensation of extremely sparse atoms into massive objects. Stars form by the collapse of gaseous nebulas.[65] Secondly, it seems that, since Harwit's disproof, no one even believes that the interstellar grains form by condensation. J. A. Wood says,

> "How did the interstellar mineral grains form? Probably not by condensation in interstellar space. There the density of atoms is so low that nucleation of the grains would be very unlikely. Furthermore, if condensation did occur at the extremely low temperatures of interstellar space ($\sim 20^{o}$ K for dust grains), it would be unselective. Any type of atom except hydrogen or helium striking a dust grain should stick, resulting in grains of mixed composition, whereas the spectrographic evidence indicates that interstellar grains consist of discrete minerals having particular compositions."[66]

There is no way to determine the age of the universe by grain formation. The argument seems to be irrelevant to the question since opinion doesn't seem to favor this method of grain formation and no one has suggested that stars form by nucleation! Evidence seems to point to dust grains being formed in giant stars.[67]

Olbers' Paradox

Why is the sky dark at night? This question has plagued astronomers for several centuries. This may seem like a stupid question but there is an interesting scientific difficulty with a dark night sky. If you go into a forest and look around, what you see are the trunks of nearby trees. If you look in between the trees, you see tree trunks that are farther away. If you look in between those, you see still farther tree trunks. As you look closer you realize that everything you see is tree trunk, nothing but tree trunk. The same thing would be expected for stars in the universe. In the early nineteenth century, Heinrich William Olbers realized that what we should see when we look out at the night sky is nothing but the surface of a star. This would mean that the night sky would be as bright as a

stellar surface.

Obviously the night sky is not that bright. Slusher,[68] in discussing Olbers' paradox, outlines three possibilities for why the sky is dark: 1) The density or luminosity of the distant stars diminishes, 2) the constants of physics have been changed or 3) the universe is young. Slusher and everybody else rules out option 1 since that would put the earth in a very special place in the universe. Slusher rules out option two by simply stating that there is no evidence of any such change. He chooses option 3 that the universe is too young for the night sky to become bright.

Surprisingly, Paul S. Wesson, no young-earth creationist, agrees with Slusher that the universe is too young for the night sky to be bright. But Wesson does not agree with Slusher on the definition of "young." While Slusher's book is aimed at providing evidence for an earth that is exceedingly young, Wesson shows that even a universe that is 15 billion years old is too young for the night sky to glow![69]

Influx of Cosmic Dust

Slusher presents another argument for the age of the earth based upon the influx of cosmic dust into the atmosphere. Slusher states,

> "Estimates of the influx of cosmic dust on Earth's surface range considerably, with different investigators (from 10,000 tons/ day to 700,000 tons/day). The Swedish geophysicist, Hans Petterson, estimates 14,300,000 tons of meteoric dust come onto the surface of the earth per year. Consequently, if Petterson's figure is used, in five billion years there should be a layer of dust approximately 54 feet to more than a 100 feet in thickness on the earth, depending on the density of matter, if it were to lie undisturbed without the various erosional agents acting on it. Using the 700,000 tons/day value, the layer should be about 965 ft. in thickness. Because erosional agents are acting, some of the extraterrestrial nickel (since it is one of the major constituents of meteorites) will be carried into the oceans. There it will add to the amount going into the oceans directly from the settling through to the atmosphere."[70]

This argument was first presented by Whitcomb and Morris.[71] They calculated that at these rates of influx cosmic dust should have accumulated to a depth of 54 feet. When the astronauts landed on the moon they found only a thin layer of dust. Creationists have used this data as evidence that the moon, and hence the earth, are young.

This is among the most easily overturned young-earth arguments. The data from Petterson was a vast over-estimate made in the late 1950's. Since that time, studies have shown just what an overestimate it was. Brownlee reports that only 26,000 tons of interplanetary dust enter the atmosphere every year.[72] This is 538 times smaller than the 14 million Petterson reported. Because Petterson's estimate is so far wrong, the entire argument for the age of the moon fails. At these rates of cosmic dust influx, we would expect that the dust layer on the moon would be about 1.2 inches thick rather than the 54 feet calculated by Slusher, and cited by Whitcomb and Morris.

What is so frustrating in the area of creation/evolution is the lack of research that goes into some of the arguments that are then bandied about by apologists. The moon dust issue is a case in point. Young-earth creationists claim that NASA didn't know what the lunar surface was going to be like before the lunar landing.[73] Other creationists claim that NASA built the landing pads to deal with the dust because NASA was uncertain of the depth of the lunar dust.[74]

The young-earth creationist claims are simply erroneous. NASA landed Surveyor on the Moon in 1966 and it didn't sink. A National Geographic article written about three years prior to the first human landing on the moon shows what the state of knowledge was at that time. Newell writes in the following three quotations,

> "Ranger's pictures did little to settle this controversy, for they were unable to resolve surface details smaller than 18 inches. A good many scientists tended to see in them what they hoped to see.
>
> "Surveyor changed all this. Now we know that, at least in one place in the Ocean of Storms, little if any loose dust threatens the Apollo Astronauts. At the same time, the moon's surface seems not to consist of hard rock. Instead, scientists who study Surveyor pictures find a layer of material that looks and behaves much like earthly soil."[75]

and

"Dr. Eugene Shoemaker of the U. S. Geological Survey, one of the principal investigators for the Surveyor project, puts it this way:

'The moon's face is certainly not a deep sea of very fine dust. Undoubtedly half the materials are finer than the smallest particles we can see in the Surveyor pictures, and we have measured and counted particles no bigger than a fiftieth of an inch. That is to say, it is like fine sand, or finer, in grain size.'"[76]

and

"How can we be so sure about the absence of loose dust? First, by looking at Surveyor's footprint. The robot's foot has sunk a little way down, just as it would in freshly cultivated soil or in wet beach sand.

"Second, the very fact that Surveyor landed so well indicates that there could not be a thick bed of loose dust. Had there been, the landing signal would have penetrated deeply into the dust, and would have deceived the radar about the craft's altitude in the last moments before landing."

"There is still another indication. No continuous layer of dust was observed by the television camera on any of the parts of the spacecraft. And obviously, no dust gathered on the camera lens, or our pictures would have been fogged and blurred."[77]

Why then did NASA put the big pads on the lunar lander? Because Surveyor had been successful and there was no reason to change what was successful.[78] And finally just a few months before the first men set foot on the moon, Weaver wrote,

"Ranger increased a thousandfold our ability to see detail. But the Apollo planners needed more. They needed actually to test the surface, to assure that astronauts and spacecraft would not be swallowed up, as some people feared, in a deep, treacherous sea of dust.

"Five successful Surveyors, out of seven attempts in 1966, '67, and '68, soft-landed on the moon and gave unequivocal answers. Their TV cameras were able to see particles as small as a fiftieth of an inch. But more important, as each spindly, spraddle-legged craft dropped gingerly to the surface, its speed largely negated by retrorockets, its three footpads sank no more than an inch or two into the soft lunar soil. The bearing strength of the surface measured as much as 5 to 10 pounds per square inch, ample for either astronaut or landing spacecraft."

"'It will be like treading on old snow with a set of oversize galoshes,' says Gene Shoemaker. A man will sink enough to leave footprints, but he will be able to walk without a great deal of trouble."

. . .

"All these tests and observations gave a consistent picture of the lunar soil. The long debate about whether the moon is covered with something like ashes, or light fluffy dust, or fragile 'fairy castles' of cemented particles or hard rock, was settled. The surface, at least in the five regions where Surveyors landed, is made up of gray, finely divided, granular material that is slightly cohesive, much like terrestrial garden soil."[79]

The first moon landing took place in July 1969.

The most comprehensive discussion of this problem is by the young-earth creationists Andrew A. Snelling and David E. Rush. They conclude,

"Should creationists then continue to use the moon dust as apparent evidence for a young moon, earth and solar system? Clearly, the answer is no. The weight of the evidence as it currently exists shows no inconsistency within the evolutionists' case, so the burden of proof is squarely on creationists if they want to argue that based on the meteoritic dust the moon is young."[80]

Cometary Lifetimes

Comets are those rare astronomical bodies that frightened ancient man so thoroughly. They were considered to be omens of disaster. The very fact that we occasionally can see these objects is an omen of

disaster for the comet itself. The long tails are made of dust and gas that have been evaporated off the surface of the comet. Eventually, after enough passages near the sun, the volatile material, water and dust will have been evaporated. After that, the comet will no longer shine. Slusher correctly observes that the estimates of the lifetime for a short-period comet are somewhere between 1,000 and 10,000 years. John A. Wood notes,

> "Clearly, each comet has a finite lifetime; every time it approaches the sun a portion of it is irretrievably lost. After 100 to 1,000 (?) passes through the solar system, the comet's ices are gone. It is unclear whether the comet is totally dispersed at this point, or if a dead, dark core of nonvolatile mineral material is left in orbit."[81]

Slusher argues,

> "Obviously these estimates are far apart, but several thousand years seems to be the best estimate of the lifetime of a short-period comet. This seems then to put an upper limit on the age of the solar system, if the comets came into existence at the same time as the solar system. Thus the solar system is quite young."[82]

The usual answer to Slusher's argument is that the comets are replenished from a cloud of cometary objects far outside of the orbit of Pluto. The primordial comets are found in the Oort Cloud and Kuiper Belt. Occasionally a passing star will perturb the clouds sending showers of comets towards the inner solar system. Slusher presents arguments against all the suggested sources of comets (which the Hubble Telescope recently took pictures of) but he does not really deal with the issue which needs to be dealt with. First, the Hubble Telescope has taken pictures of Kuiper Belt objects. There are an estimated 35,000 objects in the Kuiper belt with diameters greater than 100 km.[83] This certainly implies the existence of many more small objects. But the Achilles heel of Slusher's argument is the observation that we discover new comets every year. Baker and Frederick observe,

> "Five or six comets are picked up each year in the average, and two thirds of them have not been previously recorded"[84]

The other item is that many of the comets have orbits that are so close to a parabola that it is difficult to tell if the comet is even a member of the solar system. Some comets have been observed that have hyperbolic orbits.[85] Comets with hyperbolic orbits are definitely not members of the solar system and most of the near parabolic comets are probably not members of the solar system. The near-parabolic comets come from all directions in space and show absolutely no preference for the ecliptic plane (the plane that the planets orbit in).[86] This is probably indicative that they are wanderers through the galaxy. In that case, the supply of short period comets can be replenished by capturing the wanderers. Thus, the short lifetimes of comets does not limit the age of the solar system.

Poynting-Robertson Effect

The final astronomical argument used to establish a young universe is the Poynting-Robertson effect. When a small grain of dust is orbiting the sun and a photon hits it, it is more likely that the light will strike the leading surface of the grain rather than the trailing surface. This has the effect of slightly slowing the particle down. But as an orbiting particle slows, it will get slightly closer to the sun. As this continues for a long time the dust in the solar system will gradually spiral into the sun. Slusher argues that since the lifetime for the typical dust grain is about 10,000 years, the solar system must be young or the solar system would not have any dust in it.[87] Since the solar system has dust, it must be young.

The problem with this argument is that the dust might be young but the solar system old.[88] For example, as mentioned above, as comets orbit the sun they emit gas and dust! So what is the problem? The dust given off by comets replenishes the dust that spirals into the sun. Thus this argument also fails because it fails to account for all the sources of dust in the solar system.

Age of Lunar Craters

Unfortunately, when I was a young-earth creationist, I was responsible for the advancement of an argument

for a young universe. It was based on an article by Z. F. Danes at the U.S. Geological Survey.[89] Danes calculated that with known viscosities of earth materials a crater would flow away like taffy in only ten thousand to one million years. Slusher, Mandock and I published an article expanding on Danes work also concluding that the craters would flow away in comparable times.[90] The error we and Danes made was that if the craters could flow away that rapidly then we should see flowage in caves, tunnels and astronomical telescopes which are a hundred years old. If glass flowed as my article expected, astronomers would have to re-grind their mirrors and lenses every 50 years or so. They don't. I want it clearly understood that I was in error when we wrote that article and I wish to correct it. Those who have subsequently cited that work are also in error but their error is less than mine.[91]

Conclusion

As we have seen, not a single astronomical argument for a young universe can withstand scrutiny. Look at the wall in the room in which you are reading. If I stated that your wall is bright purple with pink polka dots and yellow lightning bolts, you would say that I am in error (presumably no one would really have such walls). If I continued to insist that your wall were like that, you would probably want to invite me over to examine your walls to see for myself that they are not as I described them. But if, after seeing your walls, I still said that they were bright purple with pink polka dots and yellow lightning bolts, you would realize that I am crazy. The young earth arguments place the scientist in just that position. Scientists tell the young-earth creationists of the data I have presented in the last two chapters, but the data is ignored. The young-earth creationists continue to assert the same old arguments. What are the scientists to think? Do the young-earth people believe that they will attract the non-believer to their position? The fact is that the continued advocacy of the same young-earth arguments can do nothing but bring dishonor upon the Lord.

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THE MOUSE THAT MOVED NOAH

Mice are amazing creatures. They can alter history and change the past. Sethos was the pharaoh of Egypt and he was a wimp. He did not honor the warrior class as previous as previous pharaohs had done. He took the normal 12 acres of land each of them were allotted away from them. He ignored them in the counsels of government. And then Sethos did a dumb thing. In 701 BC wanting to incorporate Judah into Egypt, he persuaded Judah to rebel against Assyria, promising to protect Judah from the Assyrian wrath.

So Judah rebelled against Sennacherib, the king of Arabians and Assyrians. The king of Judah, Hezekiah, believed Sethos rather than Isaiah, who had called the king of Egypt a 'broken reed'. When Sennacherib besieged Jerusalem, he demanded 300 talents of silver and 30 talents of gold as the price of lifting the siege. Hezekiah paid the tribute but Sennacherib maintained the siege anyway.

Finally, instead of doing things his own way, Hezekiah prayed. God answered the prayer through Isaiah. God told Isaiah that Sennacherib would not come into the city. God would put a hook in Sennacherib's nose. But the siege continued.

Sennacherib decided that he needed to deal with Sethos and the siege of Jerusalem was taking too long. He left his general Rabshakeh in charge of the Jerusalem siege and went to fight the Egyptians.

It was at this point that Sethos' treatment of the warrior class came back to haunt him. Seeing the approaching Assyrian army, the warriors deserted Sethos. Why die for a man who didn't like you and didn't treat you well. Sethos was afraid and went to his temple and prayed for help. In a dream, Sethos was told that Sennacherib would fail. In the morning, Sethos mustered what army he could and went to face Sennacherib at Pelusium. The two armies came together just at sunset so the battle was put off until the next day.

That night the mice went to work. Mice ate the quivers, shields and bowstrings of the Assyrians. And they probably gave the Assyrians a plague, like the Hantavirus that is contracted in the southwest United States by breathing rodent feces. The next day, Sennacherib lost the battle because he had no archers and no shields. Sennacherib beat a hasty retreat to Jerusalem. The Egyptians built a statue of their god with a mouse in his hand.

When Sennacherib returned to Jerusalem, he brought the plague with him. One night, after Sennacherib's return from Egypt, 185,000 of his men died of this plague. Sennacherib was forced to withdraw to Assyria thus lifting the siege of Jerusalem. Mice can do marvelous things. Now we will see how they change the past.

This will be a very short chapter - just a few pages - but the subject deserves to be set aside on its own. There are biological constraints on the age of the earth and the timing of the flood that are never discussed in creationist literature because they are very serious contradictions to their views. For the young earth creationists not to inform their readers of these issues seems deliberate, especially since many in their ranks are biologists and biochemists.

The issue is generated by three verses. Genesis 7:7-9 states, "And Noah and his sons and his wife and his sons' wives entered the ark to escape the waters of the flood. Pairs of clean and unclean animals, of birds and of all creatures that move along the ground, male and female, came to Noah and entered the ark, as God had commanded Noah."(NIV) Surprisingly this information can be used to place limits on the date of the flood.

In order to understand the argument we must first look at the mechanisms of genetics. Animals have two copies of each chromosome; one inherited from the father and one inherited from the mother. Each chromosome contains the genetic information in the form of genes which are units of inheritance. Each parent contributes one gene for each trait to its offspring. But the expression of each gene in the offspring is not an average or mixture of the characteristics exhibited by the parent. A blue-eyed man and a brown-eyed woman do not produce brownish-blue or bluish-brown eyed children. All the children's eyes will be either brown or blue. What happens is that certain genes are dominant and others are recessive. It so happens that the gene for blue eyes is a recessive one and whenever a person has one gene for blue eyes and one for brown eyes, the person will always have brown eyes. The gene for brown eyes always "wins." The brown-eyed gene and the blue-eyed gene are called alleles. An allele is one of a group of genes that code for a given trait, in this case eye color. In the case of eye color there are several alleles, blue, brown, green and gray. But any individual can have only two of these alleles, and no more.

What does this have to do with the question of the time of the flood? Noah was commanded to take on the ark only two of every unclean animal. Each individual animal can only have two alleles for any given trait. Therefore, at the time of the flood when only two individuals were allowed on the ark, there could only be a maximum of four alleles for every genetic trait in every unclean animal aboard the ark. In the case of clean animals, there would be a maximum of 14 alleles. The flood would have the effect of severely restricting the amount of genetic variability in all species if the flood occurred only a few thousand years ago. We should be able to examine the variability of various creatures and determine whether or not we see evidence of such a genetic restriction. If we

don't, then there are three options, another trilemma. Either the flood did not occur, or it occurred much longer ago than the young-earth creationists allow or the rates of mutation are much faster than currently believed. There are no other options.

The major histocompatibility complex (MHC) is a complex of genes, which enables your immune system to be able to recognize itself and to identify foreign tissue and infections. It is an extremely complex set of genes with multiple known alleles. For instance, in humans this complex is known as HLA and is located on chromosome 6. The location DRB1 on this gene has 59 known alleles.[1] These alleles could not have all been passed down to us from Noah, his wife, his three sons and daughters-in-law. At most there could be only eight passed down to us from them - four from Noah and his wife through their sons, and two each from their daughters-in-law. The other 51 alleles must have arisen by mutation since the flood.

How rapidly can these alleles form? Unfortunately, with presently observed rates of mutation, it would take much longer than merely 5-10 thousand years for all of these alleles to develop. Winchester notes,

> "Haldane estimates that a single human gene has a life expectancy of 2,500,000 years without change. This estimate was obtained partially from observations of mutation which occurred in large hospitals in proportion to the total number of births. It is quite likely of course, that this study includes genes which are among the most mutable in man, and it is possible that the average mutation rate for genes in mankind as a whole is even lower than Haldane figured."[2]

This rate of mutation is far too slow to account for the variability observed if there had been a recent genetic bottleneck caused by the flood. Notice that Haldane's estimate of the rate of mutation does not include any assumption of the age of the earth. It is merely based upon hospital records so the young-earth creationist can not claim that the estimate is wrong or is based upon evolutionary assumptions. In fact, young-earth creationists are on record agreeing with these slow mutation rates. Scott M. Huse states,

> "Mutations are not only harmful, but they are also very rare. They occur once in about every ten million duplications of a DNA molecule!"[3]

Duane Gish writes,

> "The genes are ordinarily very stable. A particular gene (in the form of its successors) may exist many thousands of years without alteration in its structure. Very rarely, however, the chemical structure of a gene does undergo a change. Such a change is called a mutation."[4]

Morris and Parker note,

> "Fortunately, mutations are very rare. They occur on an average of perhaps once every 10 million duplications of a DNA molecule (10^7, a one followed by 7 zeros). That's fairly rare."[5]

So if, as young-earth creationists agree, mutations are very rare and an individual gene has even a life span of several thousands of years, where did all the variability we see in the living races of men come from? Assuming the flood occurred even 10,000 years ago, there should only be 8 alleles in the human MHC complex, but many locations have far in excess of that number.

The MHC complex in other animals has as many alleles, if not more alleles, than human MHC. Leviticus 11:29 classifies rats and mice as unclean animals and as such only one pair would have been included on the ark. From these two animals all of the mice in the world would have to be descended. A maximum of four alleles would have existed immediately after the flood. Jan Klein enumerates the number of alleles for various locations in the mouse genome.[6] They are listed in Table 9. As can be seen, there are less than four alleles at only one position. All of this variability must have arisen since the flood, which is supposedly less than 5,000 years ago. In the case of the K

Location	Number of Alleles
K	92
D	63
L	2
Aa	12
Ab	62
Ea	9
Eb	63

Table 9 Mouse MHC Alleles

location with its 92 different alleles, there must have been an average mutation rate of one mutation every 56 years since the flood! The D, Ab, and Eb locations are evolving at a rate of one mutation every 85 years. This is far faster than Huse, Gish, or Morris and Parker suggested and is much faster than the rate advocated by the evolutionist Haldane. The rates of change required by the young-earth creationists should actually classify them as more evolutionistic than the evolutionists! If DNA changed this rapidly, we would be able to observe evolution occurring over a few hundred years. Cows depicted in statues from ancient Crete should look quite different from cows today. They don't! The genetic diversity of the mouse requires that Noah and the flood be moved chronologically farther back in time than Huse, Gish and Morris believe. Literally, the mouse has moved Noah - moved him back in time or made any recent flood a local rather than a global affair.

There is another type of DNA that displays far too much variability if the flood occurred only a few thousand years ago. It is the mitochondrial DNA. The Mitochondria are small organelles in the cell, numbering between 3000-5000 per cell. Their function is to provide energy for the cell's activities. Inside each of the mitochondria is a short circular molecule of DNA that consists of around 16,000 nucleotide pairs.[7] These mitochondria were formerly believed to be inherited only from the mother. They mutate at a rate 10 times that of the nuclear DNA. At this rate of variation, 2-4% of the DNA would be altered in a time of one million years. It is now known that fathers pass some mtDNA on to the children also.[8] This has the effect of slowing down the mtDNA clock and moving all dates calculated from this clock back in time.

Wallace and Torroni, studying American Indians, found that their mitochondria could be divided into four separate groups with an average of 0.084% variation. Wallace and Torroni observe,

> "Assuming an mtDNA evolutionary rate of 2-4% per million years, these lineages would be between 21,000 and 42,000 years old."[9]

In a study of Asiatic races, Horai et al. found that the average mtDNA diversity was 2.26%.[10] Using the same rates of mutation as above would lead one to believe that the Asiatic races have been diverging for around 600 thousand to 1.1 million years.

One final item must be discussed in this context. Many young-earth creationists advocate the position that there were fewer animals on the ark than one would expect based upon a current list of species. This is done in part to lessen the number of animals to be cared for on the ark.[11] Gish defines "kind" as follows:

> "In other cases, the basic kind may be at the genus level. It may be, for instance, that the various species of the coyote, such as the Oklahoma Coyote (Canis frustor), the Mountain Coyote (C. lestes), the Desert Coyote (C. estor), and others, are of the same basic kind. It is possible, even likely, that this basic kind (which we may call the dog kind) includes not only all coyote species, but also the wolf (Canis lupus) and the dog (Canis familiaris)."[12]

Whitcomb and Morris expand upon this definition of kind by including fox and hyenas in the definition of dog-kind."[13] The numerous varieties of species are believed to have evolved from the kinds after the animals were released from the ark. Morris and Parker advocate,

> "'Horizontal variations' (e.g., the different varieties of dogs) are not real evolution, of course, nor 'mutations' which are always either neutral or harmful, as far as all known mutations are concerned. A process which has never been observed to occur in all human history should not be called scientific."[14]

These "horizontal" variations that Morris and Parker are talking about are the genetic changes necessary for the various 'kinds' carried on the ark to evolve or change into their present forms.[15]

If dogs, foxes, hyenas, jackals and wolves are supposed to have evolved over the past 4,000 years then why do pictures of jackals from Egyptian tombs, built over 4,000 years ago, look like jackals from today? The picture at left is a rendering of Anubis the Egyptian jackal-headed god who took the dead souls to be weighed before the judge of the nether world. His form is identical to the form of modern jackals. The lack of change between ancient and modern jackals argues strongly against the rapid post-flood evolution required by a recent flood.

If rates of "horizontal evolution" were as rapid as Morris and Parker suggest, then we would expect to find significant differences between our existing animals and those of the past. The fact that we don't would seem to

rule out their suggestion that "horizontal evolution" could happen after the flood.

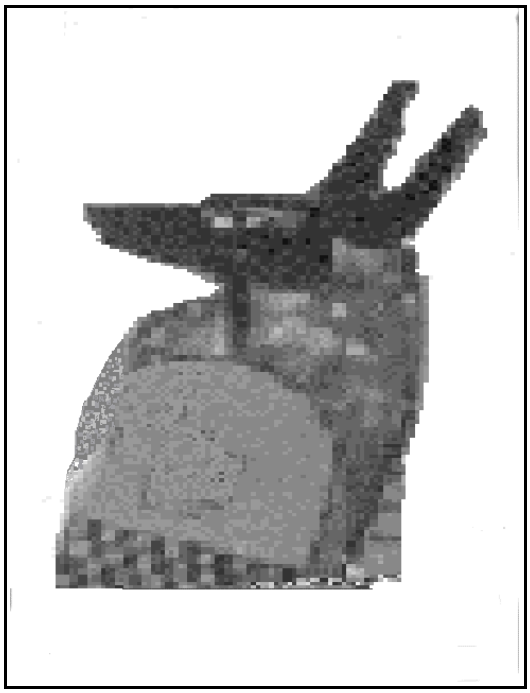

Figure 15 Anubis the Jackal Headed Egyptian God.

Conclusion

From all of the above, we can confidently conclude that the flood did not occur in 2,346 B. C. as some young-earth creationists assert.[16] But this data can not be used to rule out the flood as some would contend. The genetic data does require that any anthropologically universal flood must have occurred a long time ago; much longer ago than the current position advocated by young-earth creationists. Since the Bible implies that all humans descended from Noah and his family, the mitochondrial data from the Asiatic races would imply that this genetic bottleneck occurred more than 600 thousand years ago. The allele data implies an age of several million years for the flood. If we wish to stay within the boundaries of what observation tells us we must account for these facts. It is truly unfortunate that no creationist book even discusses the genetic data and its implications for the date of the flood. It gives the impression that they are only interested in discussing data that supports their views and are ignoring data that doesn't.

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Drowning in a Flood of Problems[1]

Maybe his interest in the Flood came from the fact that he was the son of a Parson. Maybe because he was a namesake to the first man and the Flood stood between him and his namesake. And maybe it was because his job required it. In any event, Adam Sedgwick would make a mark on the history of the defense of the Noachian Flood.

Adam was born in 1785 and showed early promise as an intellect. By 1804 he was a student at Cambridge and in 1810 he was awarded a fellowship. The fellowship required that he tutor mathematics and that he had to be a bachelor. In 1817 he finished his theological degree just in time for the opening in the Woodward chair at Cambridge.

John Woodward, the great natural theologian, had written, "Essay Toward a Natural History of the Earth." In it he had defended the reality of Noah's flood. It was the second attempt to unite geological data with the Noachian Flood. From Woodward's estate a sum of money was set aside to fund a chair at Cambridge. It paid 100 pounds per year, required a bachelor and was supposed to curate the geology collection at Cambridge.

Adam won the competition for the chair. With no formal geological education, he was not a geologist. After the selection he was reported to have said, " I had but one rival, Gorham of Queens' and he had not the slightest chance against me, for I know absolutely nothing of geology, whereas he knew a good deal--but it was all wrong'"[2]

The predominant apologetic at the time Sedgwick became a professor of geology was Backland's theory. Geologists had been forced to admit less and less of the geologic column was due to the Flood. Cuvier had presented a theory that the earth had gone through numerous catastrophes. Buckland's theory claimed that the last catastrophe was Noah's Flood. He believed that the surficial deposits were from the Flood. Sedgwick became an advocate of Buckland's view and the main apologist for Noah's Flood in the 1820s. He wrote a book Reliquiae Diluvianae in which he laid out his views of the earth. His fame and influence won him the presidency of the Geological Society of London.

As Buckland learned more and more about geology, his doubts grew. By 1831, Sedgewick was having severe doubts. The geologic data was not supporting Buckland's view. Everywhere Sedgwick looked, geology screamed that there was no evidence for the global flood. Stephen J. Gould writes,

> "As Buckland's chief supporter, he had led the fight for flood theory; but he knew that he had been wrong. He also recognized that he had argued poorly at a critical point: he had correlated the caves and gravels not by empirical evidence, but by prior scriptural belief in the Flood's reality. As empirical evidence disproved his theory, he realized this logical weakness and submitted himself to rigorous self-criticism.[3]

When Sedgwick stepped down from the presidency of the Geological Society of London in 1831, he made this statement,

> "Having been myself a believer, and, to the best of my power, a propagator of what I now regard as a philosophic heresy, and having more than once been quoted for opinions I do not now maintain, I think it right, as one of my last acts before I quit this Chair, thus publicly to read my recantation. . .
>
> "There is, I think, one great negative conclusion now incontestably established - that the vast masses of diluvial gravel, scattered almost over the surface of the earth, do not belong to one violent and transitory period. . .
>
> "We ought, indeed, to have paused before we first adopted the diluvian theory, and referred all our old superficial gravel to the action of the Mosaic Flood. . . . In classing together distant unknown formations under one name; in giving them a simultaneous origin, and in determining their date, not by the organic remains we had discovered, but by those we expected hypothetically hereafter to discover, in them; we have given one more example of the passion with which the mind fastens upon general conclusions and of the readiness with which it leaves the consideration of unconnected truths.'"[4]

The effects on Sedgwick were that he had lost faith in the historical truth of the Bible. He continued to believe in divine creation, but viewed religion as good for morality rather than as objective truth. And years later, when evolution became an issue, he did not object to it based upon what the Bible said, he objected to it on moral and

ethical grounds.

This chapter was the hardest one to write. I spent 15 years trying to prove a global flood. I published more than 20 articles attempting to achieve that goal. My views failed to explain the problems discussed below. Indeed, all global flood views can not explain these problems. Like Sedgwick I, too, was forced to conclude that the global flood was not a reality. This was a painful period of my life.

What follows is just a selection of the problems. It is not my purpose to say that the Noachian Flood didn't occur. It did. My purpose is to argue that the Flood could not have happened as the young-earth creationists say. I believe the Bible. The Bible is true; but the interpretation might not be true. I have rejected the current widespread interpretation. I used to believe in a worldwide flood and a young earth. After years of examining the evidence, the Flood must have been local. Eventually, I had to be honest with my self about the difficulties.

There are many difficulties that are not mentioned in young-earth creationist books. Earlier editions of this work have had an impact on young-earth creationism. It made them respond to issue that had never been responded to before. When the first version of this book came out, John Woodmorappe was finishing Noah's Ark: A Feasibility Study. He incorporated this work into his book, making it the second most cited source. This edition will incorporate some of Woodmorappe's responses.

The issues this chapter in particular raise must be dealt with. Secular society is rejecting the divine inspiration for the Bible, Creation and the Flood. This is because Christians propose observationally false and illogical viewpoints, and then claim God Himself proposed these viewpoints. By making God responsible for their own failings, they demean God. We must not place our proposals in God's mouth.

Theological Problems with a Global Flood

Whitcomb and Morris present several arguments for a universal deluge in their book The Genesis Flood. The first comes from Genesis 7:18-20:

> "The waters rose and increased greatly on the earth, and the ark floated on the surface of the water. They rose greatly on the earth, and all the high mountains under the entire heavens were covered. The waters rose and covered the mountains to a depth of more than twenty feet." (NIV)

Whitcomb and Morris argue that this verse proves that the flood had to be global. They state,

> "One need not be a professional scientist to realize the tremendous implications of these Biblical statements. If only one (to say nothing of all) of the high mountains had been covered with water, the Flood would have been absolutely universal; for water must seek its own level - and must do so quickly!"[5]

If one reads the English version of these verses, then Whitcomb and Morris's conclusion may seem correct. There are two features which appear to support their contention: the use of the word 'earth' and the phrase 'under the entire heavens.' A cursory look at these verses, which is what most readers give them, would seem to imply a universal flood. However, an examination of other passages that use the phrase, □under the heavens' clearly shows that it is used in a limited - not global - sense. This phrase or one similar to it can be found in only five other locations. These are:

> Genesis 6:17 "I am going to bring floodwaters on the earth to destroy all life under the heavens, every creature that has the breath of life in it. Everything on earth will perish." (NIV)
>
> Ex. 17:14 "Then the LORD said to Moses, write this on a scroll as something to be remembered and make sure that Joshua hears it, because I will completely blot out the memory of Amalek from under heaven." (NIV)
>
> Deut 2:25 "This very day I will begin to put the terror and fear of you on all the nations under heaven. They will hear reports of you and will tremble and be in anguish because of you." (NIV)
>
> Deut. 30:4 "Even if you have been banished to the most distant land under the heavens, from there

the LORD your God will gather you and bring you back." (NIV)

Job 36:32-37:4 "He fills his hands with lightning and commands it to strike its mark. His thunder announces the coming storm; even the cattle make known its approach. At this my heart pounds and leaps from its place. Listen! Listen to the roar of his voice, to the rumbling that comes from his mouth. He unleashes his lightning beneath the whole heaven and sends it to the ends of the earth. After that comes the sound of his roar; he thunders with his majestic voice. When his voice resounds, he holds nothing back." (NIV)

Genesis 6:17 can not really be used to examine the usage of this phrase since it is the verse at issue. It is in the same context as Genesis 7:19. Whatever we decide Genesis 6:17 means, it will mean the same for Genesis 7:19. To truly understand this phrase, we need to look at the other occurrences.

Exodus 17:14 is either an unfulfilled prophecy or the term "under the heaven" meant something different to the Hebrews than it does to us. The very statement of Amalek's name brings him to our attention. A person whose name is truly unknown under the heavens is the pharaoh who reigned prior to Menes, the first known pharaoh. Amalek's name has not been forgotten, so the term "under the heaven" may have a more limited extent.

Deuteronomy 2:25 gives a truly delimited meaning to the term "all the nations under heavens." Does this verse mean that the Lakota Sioux on the plains of North America in 1600 B. C. were afraid of the Hebrews? Were the British tribesmen of Caledonia and Wales afraid of the Hebrews? How about the Chinese or the Zulus? It is truly difficult to be afraid of someone you have never heard of. The use of the term "under the heavens," at least in this case, can not be a universal usage. It must be interpreted in a limited sense. Without a doubt, the fear of the Hebrews was in the hearts of all the Canaanite tribes and probably the hearts of many Egyptians and Syrians. In that sense, the fear was in all nations under heaven. Thus we find a case where the term can not be used to prove universality of the event it is describing.

Deuteronomy 30:4 clearly indicates that "under the heavens" refers to the whole earth, but this verse also contains the phrase "the most distant lands" and it is referring to the regathering of Israel into the land. But before we get too dogmatic about the use of these two phrases to imply a global conclusion, we need to look at the final example, one in which these two phrases occur together again. While we, with our modern scientific understanding, may interpret this verse in a universal sense after looking at the next passage, it is not clear that the ancient Hebrews understood that term in the same sense as we. This verse may apply to a regional rather than a global area.

The final passage, Job 36:32-37:4, clearly uses the term in a local sense. Elihu, the speaker, is talking about the coming of a storm. Elihu notes that the lightning is unleashed "beneath the whole heaven" and is sent "to the ends of the earth." While this certainly sounds like a universal usage of these two phrases, it can not be meant in a global sense. Notice that Job 37:4 states that after the lightning "comes the sound of his roar; he thunders with his majestic voice." This is the thunder that is heard after the lightning. A person in Oklahoma City can not hear the thunder from a lightning strike in Wichita, Kansas, any more than Elihu could have heard the lightning in Damascus. The lightning is said to strike the ends of the earth, but this can only mean that the ends of the earth are no larger than the horizon and the whole heaven can not be any larger than that either. There is absolutely no way that this passage can be interpreted to mean the entire earth, simply because of the limitation on the hearing of the thunder.

Thus, we may conclude that the use of terms like "under the entire heavens" in Genesis 7:19 and "under the heavens" in Genesis 6:17, may merely refers to the region in which Noah lived. All but one of the internal Biblical passages that also use those seemingly universal phrases are clearly referring to a local region - not the globe. This would fit with the general inverted bowl meaning of the word translated as 'firmament'.

If the internal Biblical evidence does not require the phrase "under the entire heavens to be universal, what about the use of the word "earth?" In the case of the word "earth," there is an assumption which Whitcomb and Morris do not address. It is that the word translated as earth can not be translated in any other way. The Hebrew word is 'eretz' and it can be translated either as "land", "country" or "the planet earth." Unfortunately, the word "earth" has a connotation for modern mankind that probably was not in the Hebrew mind. They did not have the concept of planets circling the sun; those ideas did not become widespread until the 1600's A. D. Because of this, their language would be very unlikely to reflect such an understanding. They used "eretz only occasionally to refer to the planet.

Of the usages of eretz, it is translated "land" 1,458 times and "earth" 677 times. In at least 100 occurrences where it is translated earth, it could just as easily be translated "land."[6] In Ex. 10:15 the Authorized Version

translated "eretz" as "earth," giving the impression that the plague covered the whole earth, rather than just the land of Egypt. 1 Samuel 30:16 has the Amalekites spread across "all the Earth." Surely, the Amalekites were not in the New World. In Genesis 12:1, Abraham is told to get out of his "eretz." Surely, God was not telling him to get off the planet earth. In Genesis 41:57, the famine was said to have been severe in all the lands and all countries came to buy grain from Joseph. The American Indians certainly didn't. In Genesis 48:4 Jacob tells Joseph that God "will give this 'eretz' as an everlasting possession to your descendants." Are we to interpret this as meaning that the entire planet was given to Israel? If so, then the title to my home, as well as yours, is flawed.

A look at the cases where 'eretz' (translated "land," "earth" and "country") in Genesis in the New International Version shows some interesting statistics. There are 137 occurrences of "land", 85 occurrences of "earth" and 23 occurrences of "country." All of the occurrences of "country" could equally be translated as land without altering the meaning. At least 51 of the 85 occurrences of "earth" could legitimately be changed to "land". Occasionally it would change the meaning, such as from a flood that swallowed the earth, to one that only swallowed a land, but there appears to be nothing in the language to disallow such a translation. Out of the 245 occurrences of these three words, 211 of them could be translated "land." Only 34 cases can be unequivocally said to refer to the entire earth. When the entire Bible is considered, the numbers are similar.[6]

Unfortunately, what happens too often in this issue is that those who want to believe in a global flood refuse to even consider the alternative interpretation. Whitcomb and Morris do not even address the applicability of their interpretation of the language of Genesis. This is a significant failing in the theological foundation of their viewpoint. Rehwinkel[7] and Dillow,[8] likewise, assume a universal deluge without any theological defense of their position. Only the local flood advocates, like Custance, discuss these issues.

With these alternative possibilities for understanding the viewpoint of the writer, the correct understanding of "under the entire heavens" and the alternative translation of "eretz," the above verse could have been translated:

> The waters rose and increased greatly on the land, and the ark floated on the surface of the water. They rose greatly on the land, and all the high mountains in the region were covered. The waters rose and covered the mountains to a depth of more than twenty feet.

This alternative does not necessarily carry with it the feel of a universal deluge, although a universal deluge would still be a possibility. It is unfortunate that so little attention is paid to the worldview of the Hebrews and how their language was used when attempting to advocate a universal deluge.

Physical Problems with a Global Flood

On the surface of the earth today there are 1,418,271,000 cubic kilometers of water. This water fills the ocean basins to a level which we call sea level. Unless more water is added to the earth's surface, the seas will go no higher. Proverbs 8:29 makes note of this fact when it says, "when he gave the sea its boundary so the waters would not overstep his command." (NIV)

It is very simple to calculate how much water would be necessary to cover the earth to a depth of 12,782 feet, the height of Mount Ararat. The volume of water is merely the surface area of the earth (510,926,783 km^2) times the height of Ararat (5.122 km) which equals 2,616,966,982 km^3 of water. This is nearly twice the water presently on the surface of the earth. So if the earth was ever covered with water to that depth, then where did the water go? Why do we still not see the earth covered to that depth?

Sources for the Water

There have only been three suggestions for the source of the waters: the vapor canopy, underground waters in caves, and the sinking and rising of the continents. None of these sources are sufficient to fill the earth to the level of Mt. Ararat. Physically, all the suggestions have major difficulties.

The vapor canopy is believed to be a former region of the atmosphere which had no oxygen or nitrogen but was 100% water vapor. The canopy is derived from the description of the rainfall at the start of the flood. Genesis 7:11 describes the rain as the opening of the windows of heaven. This description, according to "canopy advocates," can only be explained by the existence of a canopy of water vapor. It is often suggested as a major source of the water for the flood; the water vapor condensing to liquid water and falling as rain. Only a canopy can explain the 40 days of constant rainfall, according to the canopy advocates. (See Chapter 10 for an alternate explanation for the 40 days of rain.) If all of the water, to a depth of 5.122 kilometers, was placed high in the

atmosphere in the form of water vapor, then there are several issues which need to be addressed.

The atmospheric pressure at the base of a vapor canopy that contains 5.122 kilometers of precipitable water would be nearly 500 times the atmospheric pressure we have today. With this much pressure, no terrestrial animal would survive. Oxygen is a poison when the partial pressure (the pressure of the atmosphere times the fraction that the gas occupies in the atmosphere) reaches one half atmosphere. According to Dillow,

> "So assuming that the oxygen level of the pre-Flood atmosphere was the same as today, 20%, no toxicity would occur under a surface atmospheric pressure of 2.18 atm. In fact, up to 51 feet of water could be placed in the water heaven before this would become a problem."[9]

For a 5,000 meter canopy with a pressure of 500 atmospheres the oxygen in the pre-flood atmosphere could only be 0.1%. When compared with the 20% oxygen today, an atmosphere with only 0.1% oxygen would solve the oxygen toxicity problem but everyone would die from lack of oxygen. The maximum amount of water that can be placed in a vapor canopy is fifty-one feet.

But if we can only place fifty-one feet of precipitable water in the vapor canopy, how can the canopyist ever explain how the mountains were covered? Fifty-one feet of rainfall would be quite destructive, no doubt, but it would not cover the mountains. Not only is the vapor canopy unscriptural, it also fails on the physics in that it can not explain how the mountains were covered.

Furthermore, even with fifty-one feet of water there is a major physics problem for the canopy. It has been shown that even this small amount of water in a canopy would cause a catastrophic rise in the surface temperature. In 1979 this author published an article which calculated the temperature of the earth's surface under various thicknesses of canopy.[10] The surface temperature of the earth would be over 1000 degrees Fahrenheit for any reasonable canopy. This is because water vapor is an extremely efficient greenhouse gas. It is a better greenhouse gas than even carbon dioxide. An extremely small increase in carbon dioxide over the past few hundred years has frightened many scientists for fear of what global warming will do to the earth's ecology and economy. But that increase is minuscule compared to what fifty-one feet of water would do.

The publication of that 1979 article elicited much criticism both of the mathematics and the motives of the author. The story of how long it took to convince young-earth creationists that the canopy won't work is interesting. The article had been a critique of Jody Dillow's doctoral dissertation for which Henry Morris was the sole signatory. During 1978-1979 Jody and I carried on an extended exchange of letters discussing a mathematical error I had found in his dissertation. It was crucial to Jody's thesis that this mistake not be there. Jody denied it. After publication, people sent me tracts on how to become a Christian for merely criticizing the idea of a water vapor canopy. In 1980 I had a meeting with Henry Morris in his office at ICR. There I told him that Dillow had a mathematical error in his calculations. Henry replied, "The math is there for every one to examine". I told him that I had examined it and it was wrong. Henry repeated his mantra. We did this three times and finally in frustration, I ask Dr. Morris, "How many idiots like me do you think there are who will actually plow through the math?" To the best of my recollection, Henry didn't respond to that.

But to Jody's credit, in 1983 he finally rejected his original calculation of the canopy temperature and admitted that I had been correct. He graciously wrote,

> "In an earlier publication a crude approximation for calculating the canopy temperature was employed. It has since come to my attention that I made a mathematical error which would yield canopy temperatures that were several times larger than what had been previously reported.(36)"[11]

Reference 36 in that work says,

> "36 Reference 1, 1st edition, p. 227. A conversion from CGS to SI should have given for the optical path of 12,190 kg m-2. I am indebted to Mr. Glenn Morton, of Texas, for pointing this out to me, July, 1981."[12]

In 1990 two scientists at the Institute for Creation Research finally repeated and improved upon those calculations. Rush and Vardiman concluded,

> "Morton (1979) was apparently the first to conclude that the canopy would have made the earth's

> surface too hot for human habitation (Kofahl did not calculate surface temperatures). Morton made a number of assumptions that greatly simplified the problem, and his surface temperatures are much higher than ours, but the general conclusion is the same: Life as we know it would not have been possible under a canopy of 1013 mb (1 atm) [present mass of our atmosphere-GRM], nor even with a canopy of only 50 mb."[13]

Vardiman has continued work on the canopy problem. Vardiman and Bousselot published another attempt to solve the surface temperature issue in 1998. In this study they varied five parameters in the equations trying to find a solution that allows for a cool earth. They wrote,

> "Attempts have been made by Kofahl (1977), Morton (1979), Dillow (1982), and Rush and Vardiman (1990) to model the amount of water which can be held in a water vapor canopy surrounding the earth and associated temperature profiles. It has become increasingly obvious through radiation modeling that the strong greenhouse effect produced by water vapor severely limits the amount of water that can be maintained in a canopy which is in contact with the atmosphere."[14]

When they varied all five parameters in a favorable way, they still could only place 3 feet of water in the canopy before the surface temperature became too high. Vardiman and Bousselot write,

> "If all five parameters were introduced into the model simultaneously such that the surface temperature was minimized, it is estimated that the water content of the canopy could possibly be raised to as much as 1.0 meter. This is less than 10% of the water content suggested by Dillow (1982). Unfortunately, this amount of water in a canopy would not contribute significantly to the waters of the Genesis Flood or produce significant pressure and density effects."[15]

They call the results "disappointing for advocates of a vapor canopy." It is a similar result to what I had calculated in 19 years earlier. My simplified calculations showed that a canopy of five feet precipitable water would make the earth uninhabitable. It only took 19 years for ICR's meteorologist to agree with what I did in 1979. Unfortunately, many ICR staff members still teach the vapor canopy. Why?

Finally, the vapor canopy can not be the source of the floodwaters because of the heat given off by the vapor when it condenses to liquid form. Jody Dillow, a canopy advocate, calculated that the heat given off by his fifty foot canopy ". . .would be sufficient to raise the atmospheric temperature 2,100^{o} C."[16] This much heat would scald the earth.

Although he claims to solve the problem, he presents no calculations to confirm that fact. He suggests that the canopy condenses to clouds over the year prior to the flood, but this ignores the physics of clouds. A cloud is a collection of water droplets which must be supported by upward moving currents of air.[17] Thus, in order for Dillow's mechanism to work, the air must be rising all over the earth at the same time. If any air is going down, it would rain at that point. It is quite impossible for the air everywhere to be rising. If such an event were to occur it would mean that air is leaving the earth. Goody and Walker show a typical updraft which supports the droplets in a cumulus cloud.[18] Such currents travel upward at 300 centimeters per second. In a year's time, the air either turned around and headed back to earth, causing rain in areas of down-draft, or the air traveled upwards by 9,460 kilometers. This is impossible because it would mean that all the air in the world had gone to outer space.

In sum, then, the vapor canopy would create an atmosphere with too much pressure, too little oxygen and too little water for the flood. The temperature under the canopy would also be too high for life, over 1,000 degrees Fahrenheit and the heat from the condensing canopy too great for life to survive. To solve the heat problem requires that the atmosphere actually leave the earth. For all these reasons, the vapor canopy is an untenable hypothesis and must be rejected by anyone wishing to have a scientifically sound, Biblical explanation of the flood.

Another explanation for the source of floodwaters concerns the "fountains of the deep," also mentioned in Genesis 7:11. The most popular suggestion for what the fountains are referring to is a suggestion I first heard from Walter Brown in the early 1980s. Brown[19] proposed that the preflood earth had a 10 kilometer-thick outer crust of granite which surrounded a huge cavern filled with water. This water-filled cavern, in turn, surrounded a solid basalt layer that, in turn, surrounded the mantle. The size of the water-filled cavern was postulated to be 1 kilometer thick. Occasionally this theory is referred to as "the hydroplate theory."

Brown has the mantle begin as a cool object, no greater than 100^{o} C. It gradually heats up, warming the

water in the cavern as well. The thermal expansion of the mantle and the water, eventually lead to cracks forming in the outer granitic crust. Brown describes them,

> "As the crack raced around the earth, the six-mile-thick 'roof' of overlying rock opened up like a surgeon's incision into tightly stretched skin. The pressure in the subterranean chamber immediately beneath the rupture suddenly dropped to almost atmospheric pressure. The surface of this 250° F liquid was now almost 40° F above its boiling point (212° F). Steam exploded with great violence out of the six-mile-deep 'slit' --a slit that wrapped around the earth like the seam of a baseball. The steam expanded supersonically up through the crack, rising about seventy miles above the earth. This expanding steam added huge quantities of water to the atmosphere, primed the hydrodynamic cycle, and produced torrential rains such as the earth has never experienced -- before or after. All along this globe-circling rupture, a fountain of liquid water jetted ten miles into the atmosphere. Much of this liquid, as it entered the violent wind system caused by the expanding steam, fragmented into 'an ocean' of droplets and fell to the earth great distances away. Some of this water reached elevations where the temperature was about -150° F. The huge masses of extremely cold ice particles that formed could not stay suspended (or 'float') in the atmosphere as could the water vapor (steam). Consequently, massive ice dumps occurred--burying, suffocating, and freezing many animals, including some mammoths."[20]

There are many problems with the physics of such a system. First, the granite outer layer postulated by Brown would have to be an absolutely perfect seal for the water below. Even the smallest crack would be enough to cause the collapse of this cavern. The first meteor which struck the earth would cause the collapse. Nor could there be any earthquakes.

Granite is a poor material to attempt to form a seal. It is a coarse-grained igneous rock formed of various mineral crystals with various values for thermal expansion and elasticity. These small differences between the various grains forming the granite would be the cause of the collapse of the fountains of the deep, regardless of whether man sinned or not. It can be shown that if there were a moon prior to the flood, the tidal distortion of the earth by the moon would raise and lower the earth's surface by 3.5 meters twice a day. The adjustment to this tidal stress must be made by the various elastic parameters of the different crystals forming the granite. If two neighboring grains are a little different in their elastic properties, then microfractures will form along the grain face.

If there had been a layer of water under the continents and oceans it would be extremely unlikely that all of the water escaped at the time of the flood. No process of nature works with 100% efficiency. There should be both remnant water and evidence of the collapse of the continental and oceanic crust. Over the course of a 26-year career examining literally thousands of miles of seismic data both on the continent and off the continent, never once have I seen any evidence of such remnants of subterranean caverns. Much seismic data is available to the public for its own inspection.[21] If there were any liquid water left under the continents, then we would not be able to record a certain type of earthquake wave, called a shear wave, anywhere above the cavern. Nowhere on the worldwide seismic network have such shear-wave shadow zones ever been observed. Since the granite crust above the cavern would crack, crumble and collapse as the water escaped, we should expect to see a rubble zone in which some water still filled the spaces between the boulders. The water would slow the speed of sound in this region and we should see a low velocity zone in earthquake seismograms. We should also see a region of rubblized crust with a low velocity of sound. We do not see that either.

This model is not true to the Biblical record in that it does not allow for mountains on a preflood earth. The equations are complicated but, basically, if you pile the weight of a mountain on the granite, it will begin to sink. This is due to the fact that the forces are unbalanced.[22] After the granite crust sinks a bit, equilibrium will be achieved and there will be no further downwarping. However, once again, the downwarping of the crust will cause fractures to develop, collapsing this precariously balanced situation. The same problem arises even if the hill is quite small, say, less than 3,000 feet in height. If there were no mountains then why does the Bible say that there were?

Another theological problem for both the vapor canopy and the hydroplate theory is that the flood would have occurred regardless of the behavior of mankind. The Scripture clearly indicates that the bad behavior of mankind was responsible for the flood. Genesis 6:6 states that God was sorry He had ever made man! To have created a world with either a vapor canopy or this layer of water underneath it, the flood would have had to occur at some time. Thus, man's behavior would have had nothing to do with the flood. Men would die in such a world whether or not they had ever sinned.

One final source of the floodwaters would certainly supply enough water, but it has its own problems.

Rehwinkel states,

> "The average depth of the ocean is twelve thousand feet. That is equal to twelve times the average height of the land surface. The volume of all the ocean water is therefore greater than the mass of land protruding above sea level. If all the deeper parts of the ocean were filled up by materials to a mean depth, and all of the highest elevations on land would be planed down to an average level, a universal ocean covering the entire earth to the depth of one and a half miles would result. Surely the objection that there was not enough water on the earth to produce the Flood, therefore, can not stand, nor would anyone seriously contend that the omnipotent God and Creator of the universe lacked the physical means by which such a deluge could have been brought upon the earth.
>
> "This chapter might therefore quite fittingly be concluded with a quotation from an article by Lt. Col. Davies which appeared in the Journal of Transactions of the Victoria Institute of London in 1930: 'The question as to where the water came from and where it went to will only trouble those who hold extreme views as to the fixity of oceanic and continental levels. If the sea beds can rise and the continents sink, there is no difficulty whatever in finding enough water, even for a universal flood.'"[23]

While it is perfectly true that, if the continents can sink, there is enough water to cover the continents, it begs the question as to whether the continents can sink or not. Continents are made of granite whose density is around 2.65 grams per cubic centimeter.[24] They float on top of the mantle, which has a density of about 3.1 grams per cubic centimeter. Like less dense ice, which floats in a glass of more dense water, the continents can not sink without a change in the density of the earth's interior. And if they were pushed down, there would be evidence at the continental margins of large cracks in the sediments. I manage a group of men and women engaged in the study of seismic data covering the continental edges. I have personally examined hundreds of thousands of miles of seismic data and no such cracks exist. Once again, there is no evidence to support this theory.

Thus, as we see, there is no global flood theory that can successfully explain where the water came from. All suggestions run smack into major difficulties which are insoluble. Without a credible source for the water, there are only two possibilities: the flood must be local in extent or a miracle.

Where the Water Went

There is an even greater problem for all global flood models than "where the water came from." It is the problem of where the water went after the flood was over. There must be a drain somewhere or water once covering Mount Ararat would still cover it. Rehwinkel, cited above, has the simplest explanation within the young-earth creationist viewpoint. His source and end of the flood involve the vertical movement of continent blocks. Vapor canopy advocates, like Whitcomb and Morris, include the uplifting of continents to account for the subsiding of the floodwaters. With a vapor canopy, there is no other way to drain the water. All of these theories rely on rapidly moving vertical motions on a continental scale.

Unfortunately, continents can not move that rapidly. If they could, then we should not see any continental uplift occurring today. If the continents can rapidly adjust to new positions of balance in a year's time, then all such motions from the ice age should be finished. The truth is that we still find uplift occurring in Scandinavia from the melting of the glacial ice millennia ago. Phillips writes,

> "Over the Scandinavian peninsula there is a persistent negative isostatic anomaly (a mass deficiency) and at the same time the sea level records of long duration show that the average height of the land is gradually rising relative to the surface of the sea. Relieved of its ice load, the crust is recovering its equilibrium by moving upwards. If a load is lifted from a model boat floating in water, it bobs up very rapidly. If, however, the boat is floating in honey, the recovery is much slower; the more viscous the honey, the longer it takes to regain equilibrium. In Scandinavia, the recovery has taken many thousands of years and is still incomplete, so that the viscosity of the underlying mantle must be very large indeed."[25]

Thus the concept that the continents could sink and then rise up after the flood, all within a one-year period, does not fit the observational data. If the flood had been global, it should still be covering large parts of the earth, or it

would have had to occur much earlier than 5,000 years. This is the only way to explain why the continents are now uncovered. The only other alternatives are that the flood was a local occurrence or everything was accomplished miraculously.

Geological Difficulties with a Global Flood

Too often, anyone suggesting that there might be geological difficulties with a global flood is attacked almost as if he was traitorous to the Gospel. Davis Young, a Bible-believing geologist, has been attacked for raising such questions. Morris and Morris state,

> "Regardless of the scientific aspects of this question, however, no unresolved scientific questions should be allowed to call into question the clear teaching of the Word of God - not at least by professedly Bible-believing Christians such as Davis Young and his colleagues. These men recognize and acknowledge that the plainly intended revelation of Scripture is that of a literal six-day creation and a later world-destroying deluge. It should be their duty and goal, as well as ours, to resolve the scientific data in the context of Biblical revelation, not to seek means of distorting Scripture to fit evolutionary theories."[26]

Since the first edition of this book, attacks on me have paralleled those on Davis Young above and may have been worse.[27] Largely the change in my viewpoint was due to geological difficulties I found. Below are the geological difficulties for a global flood.

Young-earth creationists believe that the majority of the sedimentary column was deposited during a one-year global flood. This is required within their theological interpretation because the alternative, that the fossils record vast ages in the past, is ruled out. Thus, the only explanation for fossils is the Noachian Deluge. Henry Morris states as much when he says,

> "Still further, the creationist suspects that the fossil record and the sedimentary rocks, instead of speaking of a long succession of geologic ages, may tell rather of just one former age, destroyed in a single great worldwide aqueous cataclysm."[28]

And further,

> "The real answer to the meaning of the great terrestrial graveyard - the fossil contents of the great beds of hardened sediments all over the world - will be found neither in the slow operation of uniform natural processes over vast ages of time nor in an imaginary cataclysm that took place before the six days of God's perfect creation. Rather, it will be found in a careful study of the very real worldwide cataclysm described in Genesis 6 through 9 and confirmed in many other parts of the Bible and in the early records of nations and tribes all over the world; namely, the great Flood of the days of Noah."[29]

This explanation for the fossil record has certain predictable consequences. The consequences will lead one who takes them seriously and who still wants to believe in a global flood to throw up his hands and search for an alternative explanation.

A varve is a particular type of deposit that occurs in certain lakes. During the winter, when the waters are cold and sometimes frozen, the major material, which is deposited, is silt, or shale. During the summer, when algae grow, the silt and shale are mixed with the remains of dead algae. When the algal remains are buried they are converted to a material known as kerogen. During a year there are two types of sediment deposited on the lake bottom, kerogen-rich and kerogen-poor sediments. This couplet of layers is known as a varve, a yearly deposit.

The Green River Formation is believed to be an old lake. There are an estimated 13 million individual layers, 6.5 million varves. Geologists believe that the Green River Formation took about 6.5 million years to be deposited. Young-earth creationists believe it was deposited in a single year. Morris and Morris say,

> "It is obvious from these experiments and other hydraulic considerations that periodic laminations having the appearance of what have been called varves can and do form very rapidly in sediments. To claim a year for each minute lamination is absurd. The Green River Formation was probably

formed catastrophically, with the laminations developing during and/or after rapid deposition."[30]

Which view is correct? A closer examination will reveal the truth. The Green River Formation is about 2,600 feet thick. Beneath the Green River are about 25,000 feet of additional fossiliferous strata. Remembering that these sediments also must have been deposited during the year of the flood, we can calculate that 75 feet of sediment must have been deposited each day! Using this, we find that the Green River would take 34 days to be deposited. The deposition of 13 million layers in a 30-day period means that each layer took 4 seconds to be deposited. If the Green River was deposited in a single year, then we can expect that no footprints should be found on the various layers. There should be absolutely no evidence that it took any time to deposit the Green River Formation: no footprints, mudcracks or raindrop impressions.

Not only do we find footprints, mudcracks and raindrops on the Green River sediments, we find them at various layers throughout the deposit. Mounir Moussa writing about the footprints of insects and birds writes,

> "Stratigraphically, the Soldier Summit fossil-track horizon is about 900 feet above the base of the Green River Formation, and it lies in the lowermost part of the delta facies. In the Soldier Summit Quadrangle, the track-bearing horizon has been traced from the eastern boundary of the quadrangle westward over an outcrop distance of more than 25 miles. The Timber Creek track horizon, according to Curry(1957), is 4,150 feet above the base of the Green River Formation, and it lies in the upper part of the Parachute Creek Member or in the lower part of the Evacuation Creek Member."[31]

and further,

> "Mud cracks and probable rain-drop impressions are common features in the track-bearing horizon, and very rarely the rocks are ripple marked. The ripple marks are of the oscillation type.
>
> "The area was probably a part of a near-shore shelf area of the Eocene Uinta Lake, and at that time the lake was apparently characterized by a rapidly vacillating water level. Whether the fluctuation of the water level in Uinta Lake was periodic, for example, seasonal, can not be inferred. It is certain, however, that from time to time during the period of deposition of the sediments of the track-bearing beds, the area became a mudflat. The beds carrying the fossil tracks are thinly laminated, and most of the laminae bear fossil tracks."[32]

What these tracks prove is that the Green River Formation could not possibly have been deposited within a one-year duration. After all, if each layer was formed in two seconds as the mathematics requires, there is no time for the birds or the insects to take leisurely strolls across the layer surface. Some of the insect tracks are long enough to have taken much more than two seconds to be made. Besides, the Green River Formation is at the top of the local geologic column, which, in the view of young-earthers, is at the end of the flood year. The earth is still covered with water; so how are the birds and insects still alive after a year of swimming? The only reasonable explanation is that the Green River Formation was not deposited in the fashion described by Morris.

Paul McGrew and Alan Feduccia[33] discovered a nesting colony of Eocene Flamingoes at still another level in the formation. Aquatic turtle shells, crocodile and fish bones and algal encrusted twigs are found together with thousands of fossilized flamingo droppings and egg shell fragments, all of which speak of a tranquil lake edge. It is not reasonable for the droppings of the birds to be concentrated by a flood. Nor is it likely that, during a particular two-second time, thousands of birds defecated on the forming sediments. Usually, floods disperse small objects rather than gathering them together.

A final objection to the concept of catastrophic deposition forming the Green River Formation is the preservation of signals from the solar cycle and variations in the earth's orbital parameters in the thickness of the varves. Maurizio Ripepe, Lillian T. Roberts and Alfred G. Fischer[34] investigated the variations in thickness of the varves and found that they varied systematically with several periods. The first variation has a period of around 5 years, which is the period of the El Niño weather system. The second has a period of around 12 years, which is the periodicity of the solar cycle. Longer cyclicities include a 20,000 varve cycle, which is the period of the precession of the earth's axis, and a 100,000 year cycle which is the number of years it takes for the earth's orbital eccentricity to begin repeating. How could sediments supposedly laid down in a single year preserve periodicities of the orbital variables and the sunspot cycle? The most evident answer is that they couldn't. The only reasonable explanation is that the Green River formation was deposited over a period of several million years. This analysis did not assume

the layers were varves from the outset. We merely examined the scientific evidence and draw the logical conclusion that these layers are indeed varves.

The final blow to Morris's view that the Green River Formation was deposited catastrophically is that their view was considered and then rejected as an explanation. W. H. Bradley states,

> "For storms to have produced a regular series of uniformly perfect pairs of laminae such as that illustrated in Plate 11 it is necessary to postulate one or the other of two conditions - (1) that each successive storm stirred up only the ooze that had accumulated since the completion of the preceding couplet of laminae, or that it stirred up the fresh supply and in addition one or more complete couplets of laminae, but never only part of a couplet; or (2) that between the formation of each couplet of laminae and the next storm the stratified material became so much indurated that it was unaffected by subsequent storm waves. Either of these necessary postulates seems to the writer adequate to rule out periodic storms as agents competent to produce the regular, uniform series of paired laminae observed in the rocks of the Green River formation. Moreover, there is a small but significant difference between pure density stratification and that observed in most beds in the Green River formation. In pure density stratification [read this as catastrophic sedimentation-RDC] the grain size should diminish regularly upward from the base of each pair of laminae, but the grains in most laminae in the Green River beds are practically unsorted, even though the distinction between the layers rich in organic matter and those poor in organic matter is very sharp. If the material had been thrown into suspension in saline water coagulation would have prevented a clean separation of the various sizes of mineral grains, but at the same time it would just as surely have prevented a distinct separation of organic and mineral constituents."[35]

The thing to notice in the above quotation is that positing a cataclysmic deposition will not explain the details of the particle distribution. A storm or cataclysm should deposit the largest particles on the bottom and the finest ones on the top. Stokes Law describes the settling velocity of particles. Larger or denser particles should be deposited first. This is not seen in the Green River. The sharpness and abruptness of the change from carbonate to organic sedimentation also disproves the idea of catastrophic deposition. Stokes' Law describes the settling velocity of particles in water. The larger the particle, the faster the settling rate. The denser the particle, the greater the settling rate. These rates determine the change from rapidly settling carbonate particles to slowly settling organic particles. Without this difference, the organic matter of the Green River would be dispersed throughout the formation rather than collected in bands. Bradley reports,

> "The greater part of the organic matter presumably came down as a rain of minute planktonic organisms which might have ranged from 1 or 2 microns to several millimeters in maximum dimension, though if an analogy with Lake Mendota in Wisconsin is significant it might be inferred that most of the organisms were less than 60 microns in diameter. . ."
>
> "It is reasonable to believe that the precipitation of carbonates accompanied the sedimentation of the remains of plankton organisms. And if the assumptions are made that organisms and carbonate grains began to settle from the same water stratum, that the particles of both sorts of material settled as spheres, that the carbonate grains averaged about 5 microns in diameter (their present size), and that the organisms averaged about 50 microns in diameter and had an average specific gravity of 1.05, then the variables of Stokes' law show that the carbonate grains, despite their small size, must have settled many times more rapidly than the lighter organic matter. Consequently there would have been complete separation of the constituents into two layers even in shallow water."[36]

The implications of Stokes' Law do not become obvious until it is realized that a dead plankton, 50 microns in diameter, falling from the surface of the Green River Lake to the lake bottom 33 meters deep, (100 feet) would require almost a week to get to the bottom. This rate of fall is too slow to allow the Green River to be deposited catastrophically. If each layer required 5 days to form, then that is 178 thousand years. If it was deposited in a turbulent catastrophic event, as Morris suggests, the turbulence itself would seriously extend the time of fall and thus the time required to permit sedimentation. If the water were deeper than 100 feet, then, too, it would take much longer than five days for the plankton to fall to the ocean bottom. Stokes Law forms the very basis of sedimentation that any hydraulic engineer, like Morris, knows.

Thus the 6.5 million varves of the Green River Formation must be yearly deposits. No theory of rapid deposition will explain all of the facts. It is not right for young-earth creationists to blithely state that the Green River can be deposited rapidly and not explain how the laws of physics were different or how the detailed observations can be explained. The Green River formation is proof that the earth is old and that the fossils were not deposited in a one-year flood.

Too Many Animals

Advocates of the global flood claim that all the fossils are the remains of animals that died in the flood. Morris states,

> "Still further, the creationist suspects that the fossil record and the sedimentary rocks, instead of speaking of a long succession of geologic ages, may tell rather of just one former age, destroyed in a single great worldwide aqueous cataclysm."[37]

If this claim is true, that the fossil record represents the remains of a single prediluvial world, then there should not be enough fossils to overcrowd the world. Most animals would be destroyed in the Flood, not preserved. Thus if the geologic column consists of one single biosphere which was destroyed in one year, there should be very few fossils and certainly not enough of them to fill up today's earth. But this isn't what we see. What we see are too many animals, which means that we have buried in the geologic column more than one biosphere.

Whitcomb and Morris cite with approval a paleontologist who estimates that the Karroo Formation of southern Africa is believed to contain 800 billion fossil vertebrates with an average size of the fox.[38] There are 126 billion acres on the surface of the earth. Only 30 percent of this area is land, giving a land area of 38 billion acres. If 800 billion animals were spread over the 38 billion available acres, there would be 21 animals with an average size of a fox, per acre, from this deposit alone. This does not include all the vertebrate fossil deposits throughout the rest of the world. Assuming that the Karroo beds are only 1% of the fossil vertebrates in the world (the Karroo beds occupy much less than 1% of the sedimentary column) means that 2100 animals per acre occupied the preflood world. Since an acre is 4840 square yards, each animal would have only 2 square yards, or 18 square feet, of territory. That is an area only 4.2 wide by 4.2 feet long. This can be put in a setting that most Americans can understand. The average house lot is about a quarter acre. Can you imagine every house in your neighborhood surrounded by 525 hungry animals the size of a fox? I, for one, would not venture out of doors. Obviously this is far too many animals.

Too Many Plants

If we further consider the quantity of plant matter which must have occupied the single preflood world envisioned by young-earth creationists, these results pale in comparison. There are an estimated 15×10^{18} grams of carbon contained in the coal reserves of the world.[39] An acre of tropical forest contains 525 kilograms of plant matter per square meter.[40] Assuming an 18% carbon content of plant matter[41] we have 94.5 kilograms of carbon per square meter. Multiplying this by the number of square meters on land, we have approximately the quantity of carbon contained in coal, 15×10^{18} grams. One can account for all the carbon in coal only by postulating a tropical rain forest over the entire world.

But this is impossible, because many of the animals in the fossil record require low productivity regions to survive. Grazing animals that live on grass can not live in tropical rain forests, because carpeting grasses do not live there. Now we have too many animals on each acre and almost too much plant matter. But we are not through.

Whitcomb and Morris believe that oil and natural gas are the result of the decay of plants and animals that lived before the flood. These authors state,

> "The exact nature of the organic material has been as yet quite unsettled, but there seems little doubt that the vast reservoirs of organic remains, both plant and animal, in the sedimentary rocks constitute a more than adequate source."
>
> "Although the details are not clear, the Deluge once again appears to offer a satisfactory explanation for the origin of oil, as well as the other stratigraphic phenomena. The great sedimentary basins being filled rapidly and more or less continuously during the Flood would provide a prolific source of organic material, together with whatever heat and pressure might have

> been needed to initiate the chemical reactions necessary to begin the transformation into petroleum hydrocarbons. Of course, not all organic debris deposited during the Flood was converted into oil; apparently certain catalysts or other chemicals were also necessary, and where these were present, it was possible for oil to form."[42]

If all the oil were the result of the decay of organic matter, then there is far too much oil and natural gas in the world. There are 201 x 10^{18} grams of carbon in the hydrocarbons of the earth. In all of the world's living things, there are only 0.3 x 10^{18} grams of carbon. There is 670 times more carbon in petroleum than there is in every living plant and animal on earth. Surely the world was not 670 times more crowded at the time of the Flood than it is today!

Too Many Plankton

There are also too many microscopic animals. Most limestone is deposited by bacteria and invertebrate animals. The Austin Chalk, which underlies Dallas, is a 400-foot thick limestone bed made of the remains of microscopic animals, called coccolithophores or coccoliths. It is about 70% coccoliths. The coccolithophore is a small spherical animal, between 5 and 60 micrometers in diameter, each having about 16 coccoliths that separate upon the death. According to Stokes Law these animals would fall through the water at a rate of .1 millimeter per second. To fall through a 100 foot (33 meter) depth of water would take 4 days.

The time required to form the Austin Chalk is far longer than one year. The coccolith skeleton, when pressed flat, is about 1 micron or one millionth of a meter thick. A deposit of coccoliths 400 feet thick must represent many thousands of years of deposits. One hundred twenty-one million coccoliths could be stacked up like coins across the four hundred feet. The length of time necessary to deposit these 121 million coccoliths can be calculated by assuming the maximum density of living coccolithophores in the waters above. Such measurements can be made during an event known as a red tide.

Occasionally, growth conditions become so favorable that they grow beyond all reason. As many as 60 million creatures per liter of water grow and quickly use up all of the oxygen and nutrients in the water and then die. Their decay continues to use any oxygen entering the water and also gives off poisons. Fish who swim into one of these areas often die from lack of oxygen and the absorption of toxins emitted by the dead microorganism. These water blooms last only a few weeks as the microorganisms deplete the water's nutrients rapidly and die. However, even at their most dense, 60 million microorganisms per liter, only 39 layers of organisms are stacked in a single cubic centimeter. Thus, to stack 121 million coccoliths would require the death of nearly 8 million organisms. A 100 foot water depth, filled to the maximum with coccospheres, would only generate a thickness of six feet of chalk! The four hundred feet of chalk of the Austin formation would require 66 such blooms. If it required two weeks between each bloom to recharge the nutrients and one week for the bloom to occur, it would take 4 years to deposit the chalk. And these values are wildly optimistic for the deposition of chalk. This size bloom is not possible.

The coccolithophores remove calcium carbonate from the water to make their skeletons. In water depth of 100 feet there is not nearly enough calcium to deposit such a volume of chalk. One hundred feet of seawater contains only enough carbonate to deposit a little over 1-millimeter of carbonate. Thus, no bloom of the size mentioned above can even occur. Using the two-week recharge and one-week bloom mentioned above, it would take 7,000 years to deposit the chalk. Obviously, the chalk under Dallas would require much more time to deposit than merely one year. In southern Louisiana, the chalk is 2100 feet (640 meters) thick. I have drilled it. This would take considerably more time than seven thousand years.

Additionally, the quantity of chalk seen in the world is far too great to have been contained in the preflood world hypothesized by young-earth creationists. The Austin Chalk is a chalk deposit that stretches from Mexico along the coast of the Gulf of Mexico into Louisiana, a distance in excess of 800 km. In Mexico, the Austin Chalk is named the San Felipe Formation. A glance at the geologic data shows that the band is about 160 km wide and appears to average 120 meters in thickness.[43] In the chalk in Texas alone there are enough dead coccolithophores to cover the earth to a depth of 3 centimeters. But Texas is not the only place on earth that has deposits of chalk. In Alabama and Mississippi, the chalk is known as the Selma. The Niobrara chalk - 5,000 km long, 1,400 km. wide and 6 meters thick - runs through much of the western part of the Great Plains of the United States.[44] The Niobrara would add another 7 centimeters of cover to the earth. Throughout Europe Upper Cretaceous chalks cover large areas. The White Cliffs of Dover are made of chalk that is as much as 215 meters thick in parts of England. This chalk sweeps across southern Scandinavia, Poland and into south Russia where it attains an amazing thickness of up to 1000 meters. It is stopped by the Ural Mountains. The chalks of western Europe are enough to cover the entire earth to a depth of 83 centimeters.[45] West of the Urals, in the Central Asian Tuar-Kyr mountain range, a

deposit of chalk 20 meters thick is found. In Israel, Jordan, Egypt, Syria and Saudi Arabia, an Upper Cretaceous chalk is around 180 meters thick. If all the fossil record was the record of the destruction of one preflood biosphere, as Morris suggests, it must have been a crowded place. The worldwide quantity of dead coccoliths would cover the earth to a depth of one meter.

Too Many Diatoms

A deposit that is similar to chalk is diatomaceous chert. These siliceous deposits are made of little more than dead diatoms. A diatom is a small single-celled animal that lives in the sea. As diatoms collect on the ocean floor and are buried deeper and deeper, they are compressed and changed from a form known as diatomite, which is used in swimming pool filters, to opal. Upon further burial, with increased temperature and pressure, the opal is changed into chert. The Monterey formation of California is such a deposit. It is the light-colored rock that forms much of the landscape of southern California. The deposit is 1,200 kilometers long, 250 kilometers wide and averages half a kilometer in thickness. This single deposit of dead diatoms is large enough to cover the earth to a depth of nearly 1 foot, or 0.28 meters.

But this is not all. There are over 300 such siliceous deposits around the world. If each one of them is only one-fourth the size of the Monterey, then there are enough dead diatoms to cover the earth uniformly to a depth of 21 meters, or 70 feet! So we now have a preflood world which contains 2,100 terrestrial animals per acre (none of which are human), a tropical rain forest everywhere, 20 meters of dead diatoms over the entire globe and 1 meter of dead coccoliths. Where is everyone going to live? And we are not through.

Too Many Crinoids

The Mission Canyon formation in the northwestern United States is part of a truly remarkable deposit. It is largely made of the remains of dead crinoids, which are deep-sea creatures called sea lilies. Clark and Stearn report,

> "Much of the massive limestone formation is composed of sand-sized particles of calcium carbonate, fragments of crinoid plates, and shells broken by the waves. Such a sedimentary rock qualifies for the name sandstone because it is composed of particles of sand size cemented together; because the term sandstone is commonly understood to refer to a quartz-rich rock, however, these limestone sandstones are better called calcarenites. The Madison sea must have been shallow, and the waves and currents strong, to break the shells and plates of the animals when they died. The sorting of the calcite grains and the cross-bedding that is common in this formation are additional evidence of waves and currents at work. Even in Mississippian rocks, where whole crinoids are rare fossils, and as a result, it is easy to underestimate the population of these animals during the Paleozoic era. Crinoidal limestones, such as the Mission Canyon-Livingstone unit, provide an estimate, even though it be of necessity a rough one, of their abundance in the clear shallow seas they loved. In the Canadian Rockies the Livingstone limestone was deposited to a thickness of 2,000 feet on the margin of the Cordilleran geosyncline, but it thins rapidly eastward to a thickness of about 1,000 feet in the Front Ranges and to about 500 feet in the Williston Basin. Even though its crinoidal content decreases eastward, it may be calculated to represent at least 10,000 cubic miles of broken crinoid plates. How many millions, billions, trillions of crinoids would be required to provide such a deposit? The number staggers the imagination."[46]

In just this one deposit, there are enough crinoids to cover every square inch of the earth to a depth of 1/4 inch. Where would the vertebrate animals (in the Karroo Beds mentioned earlier) live if the whole world were covered with crinoids? But this deposit is not the only crinoidal deposit. Rocks of the lower Mississippian age are largely composed of crinoidal calcarenites - translation: dead crinoids. Further north in Canada, the deposit of crinoidal limestones is called the Rundle, and it is called the Lisburne limestone in Alaska. Both of these beds contain vast quantities of dead crinoids. Farther south, the crinoidal limestone is called the Leadville Limestone in Colorado, the Redwall in Arizona, and the Chappell in Texas, the Burlington and Keokuk limestones in the Mid-Continent region. The Burlington alone contains another 719 cubic miles of dead crinoids.[47] It is called the Edwardsville Formation in Indiana. This Mississippian crinoidal rock unit is called the Ft. Payne in Tennessee,

Kentucky and Georgia. But this is not the extent of this crinoidal limestone.

In Australia there is a deposit of crinoidal limestones called the Namoi and Bingleburra Formations.[48] In Libya near the Timenocaline Wells, there is a 6 foot bed of crinoidal limestone.[49] White crinoidal limestones are found along the banks of the Zilim River in the south part of the Ural Mountains.[50] Belgium boasts a crinoidal limestone that reaches 2,100 feet thick.[51] Without further documentation, which could have been provided, these crinoidal limestones are found in Egypt, Central Asia, and China. A Mississippian crinoidal limestone even tops Mt. Everest! With crinoids all over the Northern Hemisphere, where did land animals live? Where did the tropical rain forest live? Where did the diatoms come from? Where did the coal come from?

When it is realized that almost all of the limestone deposits in the world are biologic in origin, a problem quickly arises. There are 6.42×10^{22} grams of carbon in the limestones of the earth and only 3×10^{17} grams of carbon in the biosphere of the earth. The flood must have buried 214,000 times more living matter in limestone alone than is currently on the earth.

There are far too many dead animals to have fit on the preflood earth as envisioned by the global flood advocates. The fossil record can not even begin to be considered the remains of one preflood biosphere. It would have been too crowded!

The Order of the Fossils

Whitcomb and Morris suggest hydrodynamic sorting and ecological zonation as the reason for the order we see in the fossil record.[52] The fossils are sorted in accordance with Stokes' Law to where the animals lived and their specific gravity. This is called hydrodynamic sorting. Thus a trilobite is on the bottom of the geologic column because it lived on the ocean bottom and was heavily armored. Presumably, mollusks first appear early because they too lived on the bottom and were immobile. Fish were more mobile and able to avoid burial for a while but eventually they too succumbed to the rain of sediment and were buried. Amphibians were next, living near the water's edge. Reptiles lived in coastal swamps and lowlands and were the next to be buried. Mammals, being smarter, were able to flee to the safety of mountains and thus avoid burial until the very last. Man, being the smartest, was able to avoid burial the longest. In a nutshell, this is the explanation for the fossil record that global flood advocates generally adhere to.

Unfortunately, they give no credit to John Woodward, who first suggested this explanation in 1695.[53] But even that long ago, critics were aware of major difficulties with this suggestion. Martin Rudwick writes,

> "Woodward criticized his predecessors for the 'shortness of their Observations'; but, as Ray commented with unusual asperity, this was just the test which Woodward's own theory was unable to meet. It was clear to anyone who studied the order of strata and their contained fossils that they were not arranged in order of specific gravity. For all its use of the latest scientific jargon of corpuscles and gravitation, Woodward's theory failed the simplest empirical test."[54]

What are the difficulties?

Observationally, the fossil record is not what hydrodynamic sorting would predict. It is true that trilobites and mollusks appear on the bottom of the geologic record, but they don't stay on the bottom. They also appear in rocks above those with dinosaur footprints and bones. For instance, the Morrison Formation of the Rocky Mountain region is famous for its dinosaur bones. The first Apatosaurus was found there, as well as many other dinosaurs. According to the hydrodynamic-ecological sorting model propounded by Morris, the Morrison should represent an area where preflood dinosaurs lived. Yet, vertically below the Morrison are marine Mississippian Crinoidal limestones.[55] Vertically above the Morrison are numerous beds also containing marine fossils, such as mollusks, oysters, and oyster-like invertebrates. One such marine bed above the Morrison is the Frontier Formation.[56] It contains Inoceramus, Cardium Ostrea, Scaphites, Baculites and other marine shellfish as well as sharks' teeth.

If the fossils are where they are because they died due to the flood water, we should only see one layer with marine fossils. Yet innumerable cases can be cited of layer after layer of sediments with marine fossils interspersed with terrestrial animals.

In a global flood as Morris envisioned it, the massive destruction should not allow for more than one layer of terrestrial animals; yet we find layer after layer of them. For instance, in the Newark Basin of New Jersey the vertical stratigraphic record shows dinosaur footprints scattered over ten different intervals. Interspersed with the footprints, but on different layers, are fish bones, clamshrimp and fossilized roots.

Another serious problem for the hydrodynamic-ecological sorting hypothesis of Whitcomb and Morris is the fact that no whales or dolphins are found in rocks where the first fish appear. Remember, their suggestion is that animals were deposited in the fossil record according to their ecological habitat and within that order they should be sorted according to size. Large fish should be deposited first according to the laws of sedimentation but no whales are found with the earliest fish. Some fossil fish found in the earliest period of abundant fish, the Devonian, were as large as some whales. The Dinichthys was a primitive fish which grew to lengths of up to thirty feet.[58] This animal was deposited with smaller fish, why are there absolutely no porpoises buried with them?

A related problem comes when considering the escape of land animals to higher ground. Global flood advocates suggest that man was able to escape from the floodwaters until the last because they were smarter and knew where to flee. A close examination of this argument reveals how weak it is.

Let us assume that the tallest preflood mountain was 14,000 feet tall. If the rain is going to cover the entire earth to a depth of 14,000 feet in only 40 days, then the remains of mankind should have appeared much earlier in the fossil record. Consider a man living by the seashore. The rain fell at a rate of 350 feet per day (14,000/40). This is an astounding 15 feet per hour. The man could begin running when the first drop falls, but since a marathoner can only run about 13 miles in an hour, he will not get very far before he must begin swimming. Within four minutes over a foot of rain had fallen. Even a track and field man who was in good shape could not have traveled more than a mile by this time. After eight minutes, two feet of water would make running impossible. With rates of rainfall this high, no one, neither man nor beast, was going to flee very far. Once again the hydrodynamic-ecological sorting hypothesis fails the test of reason.

With rainfall rates this high, why do dinosaurs, especially the large ones, not appear in the fossil record later than man? After all, the taller ones could have remained with their feet on the ground and still had their heads above the water much longer than could a man. An Apatosaurus had an extremely long neck that could still extend out of the water from a depth of 6-8 meters. While the animal could no longer breathe from this depth, even an ability to breathe from a depth of 4 meters would give this animal the ability to outlast mankind.

Dinosaurs like the Tyrannosaurus are now thought to have been able to attain speeds in excess of those attainable by man. The Tyrannosaurs should have been able to flee faster and farther than men and should therefore appear after mankind if the ecological zonation views of Morris are correct. Once again a prediction of the global flood fails the test of logic.

Why is it that no pteranodon, a flying reptile, was able to make it safely to the higher ground and not be buried until late in the flood? After all, the pteranodon can fly above the drowning waters. Under these conditions, mankind should be found lower than the pteranodons. They aren't. Since no fossil blade of grass or grass pollen grain is found in the fossil record until nearly the stratigraphic level at which man is found,[59] must we believe that grass was also able to flee the rising waters and escape burial until the end?

The existence of roots in the Newark sediments discussed above obviously raises the question of whether or not the roots grew in place or were washed in from elsewhere. The finding of fossil roots is an exceptionally common occurrence in geology. If it took time for the plants to grow in place then it obviously would require more time than a single year.

But one does not need to worry about burrows being washed into the sediments since one can not move and deposit a hole. Burrows are quite common in the fossil record. Southwest of Austin, Texas, along the San Gabriel River, the author has personally seen fifteen feet of limestone, exposed at a river's edge, which had five different layers, each containing burrows of small creatures, called pholads, which only burrow into a hardened layer. Each burrowed surface had hundreds of burrows per square meter. Since these burrows are holes, they could not have been washed into place. They represent a certain amount of time for the animals to populate the area; and form their burrows. If all the sediments were deposited in a one-year-long flood, there is a problem as to how these burrowing animals could reproduce so quickly and make their burrows when more than 100 feet of sediment must have been deposited on average each day of the flood. This does not make sense.

Similarly, burrows of lungfish have been found in the fossil record. The significance of lungfish burrows lies in the fact that they only burrow when the waters are drying out. So why would lungfish burrow during the very wet Flood? Voorhies writes,

> "The African (Protopterus) and South American (Lepidosiren) lungfish both live in swamps on floodplains of tropical rivers subject to seasonal drought. During the dry season they estivate [hibernate-GRM] in flask-shaped burrows, which they excavate themselves and sometimes line with mucus to retard drying out. Specimens of Protopterus aethiopicus have been known to survive for 18 months or more before being released from their sun-baked burrows by the return of

the rainy season."

"The burrowing technique of Protopterus annectens in Gambia was studied comprehensively by Johnels and Svensson. As water levels fall at the end of the rainy season, the fish literally begin chewing into the compact red clay bottom. The mud is forced into the mouth, where it is diluted with water and expelled through the gills. At the proper depth (as much as 1 m, depending on the size of the fish) the end of the burrow is widened, and the fish reverses its position and assumes a tail-down orientation. The animal periodically rises to the surface to breathe, until the water level drops below the estivating chamber, at which time the mucus cocoon is secreted and the remarkable physiological modifications accompanying 'summer sleep' begin."[60]

Boonton Fm (80 m thick)	fish, leaves, pollen
	clamshrimp
	Dinosaur footprints
	roots
	footprints, roots
	plants, pollen
	plants, pollen
	footprints, roots
Hook Mountain Basalt	
Towaco Fm (120 m thick)	Dinosaur footprints
	fish, plants, pollen
	roots
	Dinosaur footprints, roots
	fish plants pollen
	pollen
	roots
	roots
	Dinosaur footprints, plants, pollen
	fish, plants, pollen, stromatolites
	plants, pollen, roots
	roots
Preakness Basalt	
Feltville Fm (20 m thick)	roots
	Pollen
	plants
	pollen
	fish, plants
	footprints, pollen, roots
Orange Mountain Basalt	
Passaic Fm (15 m thick)	roots
	roots
	roots
	roots
	plants, pollen
	footprints, Dinosaur bones
	roots
	roots
Lockatong Fm (4 m thick)	Dinosaur footprints
	fish, clamshrimps
	fish scales
	fish, clamshrimps
	reptile bones, articulated reptiles
	clam shrimp
	fish scales, clamshrimps
	fish, clamshrimps
	articulated reptiles, plants, clamshrimps
	Dinosaur footprints
Stockton Fm	insects, arthropod burrows

Table 10. Vertical succession of fossils in the Newark Group[57]

This description of living lungfish burrows is remarkably similar to what Voorhies reports for Permian burrows found in Texas and Oklahoma. The Permian is halfway up the geologic column and presumably halfway through the Flood. He continues,

"Romer and Olson were the first to describe dipnoan burrows in the rock record. The

authors recognized the peculiar cylinders weathering out of Lower Permian shales at several localities in Texas as being natural casts of burrows remarkably similar to those made by modern lungfish. The presence of skeletal remains of the dipnoan genus Gnathorhiza within some of the burrows confirmed this identification. In more recent years, similar burrows have been reported from Lower Permian beds on Prince Edward Island, the Sangre de Cristo Formation (also Lower Permian) in northern New Mexico, Middle Pennsylvanian strata in Michigan, and the Wellington Formation (Lower Permian) in north-central Oklahoma. The last occurrence is particularly noteworthy in that well-preserved, articulated skulls and skeletons of Gnathorhiza were found in typical tail-down estivating position."[61]

I have in my own collection an

ovoid, helical burrow, six inches in length. The burrow itself is a quarter-inch in diameter, collected from the Tertiary rocks just east of Saltillo, Nuevo Leon, Mexico. How are burrows to be deposited in a universal flood? Holes simply can't be transported and buried. These features, omnipresent in the geologic record require that the majority of the earth's sedimentary layers be the result of slow deposition to be the rule rather than rapid deposition.

Migration Difficulties

The Bible relates that God told Noah to

> "Take with you seven of every kind of clean animal, a male and its mate, and two of every kind of unclean animal, a male and its mate, and also seven of every kind of bird, male and female, to keep their various kinds alive throughout the earth.
>
> "Seven days from now I will send rain on the earth for forty days and forty nights, and I will wipe from the face of the earth every living creature I have made. And Noah did all that the LORD commanded him. Noah was six hundred years old when the flood waters came on the earth. And Noah and his sons and his wife and his sons' wives entered the ark to escape the waters of the flood. Pairs of clean and unclean animals, of birds and of all creatures that move along the ground, male and female, came to Noah and entered the ark, as God had commanded Noah."[62]

This passage describes the animals that were to enter the ark. There is some disagreement as to exactly how many animals this refers to. The disagreement concerns how many individuals of each clean animal were taken into the ark. Most people believe that it means two pairs of the unclean and seven pairs of the clean animals. Whitcomb and Morris suggest that this passage merely means that Noah took two of the unclean and seven individuals of the clean animals.[63] We will look at both cases.

The 1982 Encyclopaedia Britannica says that there are 4,000 species of mammals, 6,000 species of reptiles, 2,400 species of amphibians and 8,700 species of birds. Using these figures and assuming that Noah took seven pairs of the clean animals onto the ark, about 170,000 individual animals must be loaded onto the ark. Assuming he only took seven of each unclean animal, then he had to load 93,700 individuals. But this is not all. There are 22,000 species of terrestrial snails and 5,000 species of fresh water snails. Even a slight amount of salt or saltwater is enough to kill terrestrial snails and slugs, so they could not have survived the flood off the ark. This adds an additional 54,000 animals. There are 750,000 known species of insects, 30,000 species of spiders, 2,800 species of centipedes, 1,800 species of terrestrial earthworms, 8,000 species of millipedes and 20,000 species of mites. The vast majority of these species would not be able to survive in the ocean waters. Thus we would have to add an additional 1.6 million individuals. The grand total of animals needing to be on the ark is somewhere around 1.7 million individuals, which is quite a load.

Whitcomb and Morris never really deal with the survival of the invertebrates. They merely state,

> "In addition, some mammals are aquatic (whales, seals, porpoises, etc.); the amphibians need not all have been included; a large number of the arthropods (815,000 'species'), such as lobsters, shrimps, crabs, water fleas, and barnacles, are marine creatures, and the insect 'species' among Arthropoda are usually very small; and many of the 25,000 'species' of worms, as well as many of the insects, could have survived outside of the Ark. . . ."
>
> "For all practical purposes, one could say that, at the outside, there was need for no more than 35,000 individual vertebrate animals on the Ark. The total number of so-called species of mammals, birds, reptiles and amphibians listed by Mayr is 17,600, but undoubtedly the number of original 'kinds' was less than this."[64]

Notice in the above quotation that they do not quantify how many species could live outside the ark; they merely mention that some could. They do not even address the issue of the spiders, earthworms, etc. Have you ever walked along a sidewalk after a rain and seen what happens to hapless worms who get too wet? They swell and die. If the flood ripped up the Old World topsoil, how could the worms have survived outside the ark? Delicate butterflies exposed to the horrendous rainfall envisioned for the first part of the flood would be washed away. They would be unable to fly to escape the flood because most wet insects are completely earthbound until they dry out. No, the only logical way to handle the insects and worms is to include them aboard the ark.

The obvious way out of this problem is to assume that the number of species carried on the ark is much

less than the number of species accounted for by taxonomists. But as we saw in the first chapter, this requires that the young-earth creationist believe in rates of evolutionary change that are more rapid than the evolutionists. If the Christian opts for this solution to the ark problem, he needs to consider whether he can logically reject evolution as incompatible with Christianity when they believe it happens faster than the evolutionist does..

But this many animals on the ark creates a huge problem. They could not be loaded in the time frame allotted. Genesis 7:1-4 states that God came to Noah and told him to enter the ark because seven days from then the flood would occur. Only then did the animals begin to enter the ark. So, 1.7 million animals must enter the ark during a one-week period. This is a rate of three animals per second continuing around the clock for a seven-day period. There is absolutely no way that eight people could move rapidly enough to store each of the animals in its proper place.

Even if we agree with Whitcomb and Morris's value of only 35,000 individuals on the ark, that means that each of the eight humans on the ark must load, store and lock away 4,375 animals during the week. There are 168 hours in a week so 26 animals must be taken care of each hour or approximately two minutes per animal. One third of the time Noah would be able to put the animal on the first floor of the ark; one third of the time he must climb stairs or a ramp up to the second floor; one third he must climb up to the third floor. The second floor is a climb of 15 feet, the height of a story and a half. The third floor is a climb of 30 feet, equal to three stories. This means that each hour for an entire week Noah must climb up and down the equivalent of a sixty-two-story building. Could you do that? A miraculous solution to this would be to have God tell the animals which stall was theirs and they went there on their own.

Animal Migration

The migration of the animals to the ark is another area of severe difficulty. If the young-earth creationists are correct and there are only 1636 years between the creation and the flood, then all the animals must be able to migrate to the ark in that time frame. Thirty percent of terrestrial snails scrape algae off of tree trunks. The snails could not do it. The average speed that a snail travels is 8 centimeters per minute.[65] Assuming that the snail must use 2/3 of its time for feeding (not an unreasonable assumption) then while it is migrating to the ark, it must spend two-thirds of its time traveling up and down trees. Assuming that the migrating snail must travel two meters up, then two meters down the tree and then find the next tree within two meters, a snail making a straight-line trip from the opposite side of the earth to the middle east, a distance of 20,000 kilometers, would have to travel a true distance of 60,000 kilometers. At eight centimeters per minute, the snail would take 1426 years to make the trek. Thus the snail must start his trek almost the day of creation in order to make its way to the ark. But a terrestrial snail can not take the most direct route because it can not cross rivers without drowning. It must make numerous detours around creeks, lakes and rivers. A snail, which lived on the opposite side of the earth, could not reach the ark in the available time. Other snails, living a little closer to the ark, must have begun their migration immediately upon their creation. And since snails do not live as long as 1,400 years the descendant of the snail that started the trek would have to finish it.

I do not know how rapidly earthworms can move, but it is unlikely that they are as fast as snails. Yet if they are to make it to the ark, they too must make the migration. But neither snails nor earthworms are likely to be able to cross the oceans to get to the ark. And if the flood was only 5,000 years ago, then how in the world did these animals make it back to the Western Hemisphere from Ararat in so short a time? After all, most creationists think that the continents were divided at least by Peleg's time, only 344 years after the flood. Assuming that worms and snails were both able to travel at 8 centimeters per minute, but needed 2/3 of their time to eat as before, then in 344 years they could only have traveled 600 kilometers from Ararat. There should be no snails or earthworms on the two American continents.

Woodmorappe's explanation of the problem of worms is inconsistent. He explicitly states that earthworms are not on the ark.[66] Then he has them on the ark for manure control.[67] Obviously the worms can't be on and off the ark at the same time.

The plight of the tree sloth in this great migration to the ark is truly pitiful. The tree sloth, which moves slowly enough when in the trees, is almost helpless when on the ground. The Encyclopedia Britannica states,

> "Sloths seldom voluntarily descend to the ground. Because they cannot walk but must pull themselves along the ground with their claws, they are easy prey for jaguars and other predators."[68]

It is quite difficult to envision this slow-crawling, defenseless animal traveling from South America to the Ark or from Ararat back to South America. Sloth's limbs are not even strong enough to support their own weight. The odds of making such a journey, in the face of predators, is vanishingly small. Rationally, in order for two to have successfully made the journey, hundreds of thousands must have started and died along the way. But there are other problems with the migration of the sloth. The sloth could not travel through any land whose temperature was too cool. Terry Vaughan notes,

> "Tree sloths are probably heterothermic, with body temperatures varying from 28^{o} to 35^{o} C; when they are inactive, they have difficulty maintaining a constant body temperature. Tree sloths have been observed to shiver at ambient temperatures as high as 27^{o} C (80^{o} F)!"[69]

Since the sloth can't come to Noah, Woodmorappe has Noah go and get the sloth and other animals. If he is gone on safaris when would he preach?

Other mammals present equally challenging problems to the idea that they migrated from great distances to the ark. The horse is one of the fastest animals on earth and yet it is quite unlikely to have been able to travel to the ark in a relatively rapid time. Arthur C. Custance observes,

> "There are so many problems in such a view which have been overlooked. One reads of the speed achieved by certain animals such as deer and antelope, etc., and imagines accordingly that they could easily make the trip. But this disregards one important fact, namely, that such creatures are herbivorous. The importance of this observation is that those animals must spend an enormous amount of time browsing in order to gain enough energy for ordinary living. In some cases this may even amount to 80% of their waking hours. Such a circumstance leaves them little time for making long journeys through unfamiliar territory, and it accounts for the fact that a man can outrun a horse - given time - as has been demonstrated on many occasions. In spite of its strength the horse must stop to eat far more frequently than the man who eats meat."[70]

Thus herbivorous animals would take far longer to travel than is normally thought, simply due to their need to eat.

Other animals, which would have difficulty making the trip to the ark, include mice and amphibians. Mice are unable to cross rivers. Different species of mice often inhabit opposite sides of a river because the mice are unable to swim across.[71] Most amphibians are killed by even a small amount of salt water and thus could not easily make a trip across an ocean. E. O. Dodson wrote, "Even a very small amount of salt water is a nearly absolute barrier to amphibians."[71]

Many animals live on a specialized diet and for them to leave the region where their food is, would mean certain death. The giant panda from China eats only bamboo shoots. During his journey he would need to take with him a supply of bamboo, and Noah would need a year-plus supply on the ark. The restriction of the bamboo thickets in China during this century has caused a decline in their population.[72]

Polar bears get their food out of the Arctic Sea and would require a change of behavior in order to survive the trip to Noah's location.

The red tree mouse survives only by eating fir needles and it nests only in fir trees.[73] Prairies and non-fir forests present an insuperable barrier to this mouse. A red tree mouse setting off for the ark would have to carry with him not only his own supply of food, but also enough food for his descendants, a year on the ark and the return trip.

Koala bears in Australia live only on eucalyptus leaves, and eucalyptus lives naturally only in Australasia.[74] The koala must get about 1.3 kilograms of these leaves each day. Even Woodmorappe acknowledges that they will die from indigestion if they eat other things.[75] Eucalyptus oil can keep them alive. Woodmorappe claims "...It would have been easy for Noah to have had Eucalyptus oil (liquid or solid) on the Ark."[76] But how Noah would get these leaves or oil (a trip to Australia?) is another question. The koala too must bring his food with him - an impossible task.

Kangaroos present one unique migration problem. The only place on earth that fossil kangaroos are found is in Australia. If, as most global flood advocates believe, this represents the location in which preflood kangaroos lived, then the kangaroo must have traveled from Australia to the ark. Then, when the flood was over and Noah released the animals from Ararat, the kangaroos must have traveled back to Australia again. With a global flood, this is the only way to explain the distribution of fossil and present day kangaroos. But this is an extremely unlikely occurrence.

In assessing these difficulties, Rehwinkel opts for the most reasonable solution, within the global flood framework; he believes that the entire migration effort was miraculous.[77] This is certainly a reasonable solution, for God can do whatever he wishes. But it does remove the ability to discuss the events in a rational fashion because we can never know how God accomplished the miracle. How did Jesus turn water into wine? Exactly what laws of chemistry did He override? We do not know! Because of this the postulation of a miracle removes the issue from the area of apologetics or science. All we can do is remain silent and marvel at the result.

Theological Difficulties

If the generally accepted model of the flood is true, that Noah took on the ark representatives of all important groups, then there is a theological problem. God told Noah in Genesis 6:19, "You are to bring into the ark two of all living creatures, male and female, to keep them alive with you." God knew that some of those animals were going to become extinct. Knowing this, why did Noah have to take them on the ark for absolutely no reason? Why did God tell Noah to take all the animals to "keep them alive with you", if some were going to become extinct? The purpose of the ark was to save animals from extinction and yet many animals are found in the fossil record, which requires that they lived before the flood and went extinct afterwards. This would seem to charge God with poor planning.

Ark Problems

There are further problems, which seem to defy solution for the global flood advocates, which occur on the ark itself. Consider the plight of carnivorous animals. They make their living by eating their neighbors. Obviously, this would not do on the ark since many of the animals that entered the ark would never leave it. Whitcomb and Morris suggest that the carnivores, and indeed many of the animals, hibernated on the ark.[78] While this is certainly possible if it was miraculous, there is little evidence that most carnivores except bears are able to hibernate. Besides, the Biblical record clearly states that Noah was to take on board enough food for the animals. If they were hibernating, why would they need food?

Secondly, if the animals are eating, then there is the problem concerning the removal of waste matter, both liquid and solid, from the ark. A human, on average, passes 1.5 liters of urine a day.[79] We will use this value to calculate how much urine must be removed from the ark. Whitcomb and Morris assume that the average animal on the ark was the size of a sheep and then go on to demonstrate that 35,000 of these animals could live in the ark. A sheep has about 1.5 times the body weight of a human[80] and so could reasonably be expected to produce 1.5 times the urine, 2.25 liters per day. Multiplying this by 35,000 yields 78,750 liters of urine per day; this is 21,000 gallons. The manure would be positively overwhelming.

The loss of 78,750 liters of urine per day presents a unique problem. That much water must be drunk every day. The water in the sea surrounding Noah would be salty, full of sediments and unfit for drinking. Thus Noah must have taken a year's supply of fresh water with him. That water would occupy 70 percent of the ark's volume leaving little room for food and animals.

Woodmorappe makes the suggestion that urine could be drained by gravity and fall overboard. [81] But this is unworkable especially for the animals on the lower two floors. The ark was a thirty cubit tall three-story boat. According to Woodmorappe, the draft of the ark was 15 cubits.[82] The draft is the distance from the water line to the bottom of the boat. Thus the floor of the second deck level was 5 cubits below the water. If you opened a porthole to drain the urine off the floor of the first and second decks you would let sea water in and sink the ark.

For the solid waste, Woodmorappe suggests trained defecation. So no one will think I am making this up, he writes,

> " Some of the aforementioned arrangements would have been even more workable if the animals had previously been captive before the Flood, and had been trained to control their body functions. For instance, it is possible to train animals to urinate, either spontaneously or on command, into buckets. This has been done, for example, in the case of horses and various large captive wild animals."[83]

What a fun job that would have been. Even as a young-earth creationist, I would not have found this to be a particularly effective argument.

What about the cooling system needed for the ark? Everybody has had the experience of being in a very

crowded room and feeling the temperature in the room rise. This same effect would occur on a crowded ark. Even in Whitcomb and Morris' view, with only 35,000 bodies, the heat would quickly overwhelm the occupants of the ark. Very light motion produces 288 calories/hour in man.[84] Scaling this value for the 35,000 sheep-sized animals, means that 10,080,000 calories per hour are generated by the animals aboard the ark; one third of these calories are deposited on each floor of the ark. To transport this energy out of the ark requires that the temperature of the top surface of the ark must be 90^{o} C higher than the outside temperature of the air.[85] In order for this to happen, especially due to the thermal insulating effects of wood, the temperature inside the ark must be even greater than 90^{o} C (194^{o} F). Water boils at 100^{o} C (212^{o} F). With this much temperature difference everyone inside the ark would roast alive.[85]

One friend, who had been in the Navy objected that the problem on a ship is cold, not heat. He stated unequivocally that anyone who had slept next to a bulkhead would know how cold it could get in a ship's hold. It is true that ocean water is cold and that the cold is transmitted into the modern naval ships. But modern naval ships are made of steel, not wood. Steel is an excellent conductor of heat. Wood is one of the best insulators being about 2,000 times less conductive of heat than steel. Wood would not allow the heat to escape.

Several other problems remain. How is the food to be kept fresh for a year? Herbage goes sour if not kept dry and the ark would be anything but a dry environment. Woodmorappe says that watertight containers could be made to keep the feed dry. He cites Indian structures on land but gives no explanation for how the moisture on the ark would be kept from the vast quantity of food. The problem the Indians faced was different from that faced on the ark.

Parasites that only live on one type of animal and yet kill that animal would either have to be excluded from the ark or their hosts would die. Occasionally, parasites, such as sleeping sickness in the wildebeest or gnu, do not affect the host but are lethal to others. If the tsetse fly in the ark were to bite a gnu infected with trypanosomes and then bite cattle, Noah or even dogs, the victims would die. But If Noah did not take an infected animal on board, the trypanosomes would not be here today, supposedly 5,000 years after the flood.[86] Five thousand years is too short to evolved all the numerous diseases. With 35,000 animals in the ark all of the oxygen would be used up in seven hours. The seven hours are reduced to two hours when accounting for the space that the fresh water supply must occupy. The only way to avoid this problem is to have a modern and extremely efficient ventilation system, but on the ark they would not have had such an amenity and no power with which to run it.[87] Mayflies on the ark would die within a few days and their larvae would not survive. They require fresh running water, none of which would likely be available on the ark.

Post-ark Problems

Various inbreeding problems become evident when natural populations of animals drop below fifty individuals. In fact, it is quite unlikely that such populations will even survive.[88] Since most of the animals on the ark were populations of two, genetic drift, founders effect, and the expression of deleterious genes would destroy most of the incipient populations. As we saw in the last chapter, today's genetic variability is too large for the world's populations to have been recently constricted to such small numbers.

Woodmorappe suggests that the rates of mutation were greater after the flood.[89] There are two main problems with this. Random chance is now supposed to create the modern genetic diversity in Woodmorappe's scheme. This young-earth creationist is appealing to random mutation yet he won't allow evolutionists to use random chance. This seems hypocritical. And he cites no evidence to support this hypothetical faster mutation rate. It is merely an ad hoc suggestion to solve his problem. And to solve his problem he must have evolution occurring faster than evolutionist believe, yet we Christians, according to him, are not supposed to believe in evolution. This is very confusing.

Many trees, which were left off the ark, would not have survived. Anecdotal evidence from the 1993 Mississippi River floods supports this concern. Ken Cox wrote,

> "I can provide some anecdotal evidence (. . .). As you may have heard, we had some mild flooding in the Midwest this year, and some areas were under water for several months. Some of the observable effects on vegetation:
> Most of the smaller plants died, and ditto for the smaller saplings.
> Some of the grasses and herbs have begun a comeback, but the fields are still mostly bare and the forest understory is pretty much gone. Some large deciduous trees lived, some died. It seems to depend on both species and whether their crowns were submerged. The survivors are showing

stress and many won't make it through the winter.
And the interesting data point: Evergreens of all sorts -- yews, spruce, cedar, PINE -- died, almost without exception. Even trees near the edge of the flooding, which just had a few inches of water over their roots for a couple of weeks, died. Apparently evergreens don't take well to even a short dip."[90]

When the animals left the ark at the end of the yearlong global flood, they would enter a devastated world. All of the trees in the world would have been ripped up. There would be no forests. Grass would not have had time to re-establish itself; there would be no food for the herbivores. Animals that require forests or mature fruit for their food would fall ill and become easy prey for the hungry carnivores that were also leaving the ark. They could not survive their migration to other parts of the world.

Woodmorappe solves this problem by having the animals eat seaweed and carrion. There are so many problems with this idea that one hardly knows where to begin. Woodmorappe admits that bodies decay within 2 months, yet here we have carcasses still edible 13 months after the onset of the flood. He tries to explain how the bodies could float for 13 months. These bodies have been through the turbulence of the flood which could erode solid rock but not destroy the soft bodies. This is not consistent. He gives not a word about how koalas and red mice are supposed to survive off the carrion and seaweed when they require special diets. Did the koala carry his eucalyptus oil with him?

The story of the dove returning with the olive leaf does not void this present objection. The olive leaf proves that either God re-created the world miraculously after the flood or that the flood was a local event which did not destroy the entire earth. The miraculous case removes the flood from the reach of scientific discussion; a local flood is not affected by this issue because the ark merely landed in a locale which was not totally destroyed by the flood.

Conclusions

All of the problems, which have been discussed above, are solvable if one postulates the miraculous. God can do whatever he wants to. But if we say that God took care of all these problems miraculously, then we can not say anything about how it was accomplished. Under this circumstance, the flood would be removed from any observational support. We could either believe that God caused the flood or not, but we would be unable to use supporting evidence.

But what then are we to say to the non-Christian who is trying to determine whether or not the Bible is true? Can we realistically ask people to believe something for which there is absolutely no evidence? Is that not doing what Francis Schaeffer warned us about: divorcing the Bible from reality?[91]

All of these problems can be solved if we simply assume that the flood was local in nature. We retain a basis in reality for the flood. The Bible can then be supported by reality. In the next chapter we will look at the evidence concerning evolution and what the implications are to Christianity.

References

1. Writing this chapter was one of the most difficult tasks in the book. This chapter will examine the difficulties of a worldwide flood and intends to prove that, barring the frequent and continual miraculous intervention by God, the worldwide flood advocated by many young-earth creationists is impossible. The data discussed is that which finally forced this author to conclude that the global flood was not a realistic possibility. This chapter includes just a selection of the many, many problems that surround a global flood. It is not the purpose to argue that a Noachian flood did not occur, but only to argue that it could not have occurred in the fashion envisioned by the young-earth creationists. Nothing in this chapter should be construed to imply that the author does not believe either the Bible or the Noachian flood. On the contrary, only the particular interpretation of Genesis is being disputed. The Bible is true; our interpretation of it may not be. This author once believed in a worldwide flood and a young earth but after years of examining the evidence, it has become obvious that the Noachian Flood must have been local in nature.

The many difficulties discussed here are generally not mentioned in young-earth creationist literature, but they ought to be. To be intellectually honest, these issues must be answered with specific solutions to each problem. As difficult as this chapter will be for the Biblical literalist, it is very important to understand why secular society is rejecting our claim for divine inspiration of the Bible, the creation and the flood. If Christians propose viewpoints that are both illogical and contrary to observation and then claim that God, Himself, proposed these viewpoints, is it any wonder that people do not want anything to do with that God? We must not be guilty of putting our proposals in God's mouth.

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Scotland-Germany 1100 km x 600 km x .5 km thick
Poland - Carpathian front 800 km x 400 km x .5 km thick
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Using the area of ellipse
pi x 350000 x 150000 x 250 = 4.1233×10^{13} m^3
pi x 550000 x 300000 x 500 = 2.5918×10^{14} m^3
pi x 400000 x 200000 x 500 = 1.2566×10^{14} m^3

The sum total is 4.2607×10^{14} m^3
American chalks 90% coccoliths 10% shale
European chalks are 99 percent coccoliths; 1% is shale see (Peter A. Scholle, Michael A. Arthur and Allan A. Ekdale, "Pelagic Environment," in Peter A. Scholle, Don G. Bebout, Clyde H. Moore, Carbonate Depositional Environments, (Tulsa: American Association of Petroleum

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This is 3.8346 x 10^{14} m^3. Divided by the surface area of the earth 5.11 x 10^{14} m^2, yields enough to cover the earth to .75 meters thick.
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85. Each animal in the ark produces 288 calories/ hour which equals 42,174,720 joules for 35,000 individuals. This is 11715.2 joules/sec. The area of the surface of the ark according to the Bible is 137.2 x 22.8 meter = 3137 meters of surface area. Thus 3.73 joules/meter squared must escape to the atmosphere. Dividing this by the Stefan-Boltzmann constant (5.67 x 10^{-8} Joules /m^2/K^{-4}/s^{-1}) we find that the temperature difference between the top of the ark and the atmosphere must be 90^o C. However the difference can be expressed as T(ark)-T(air)=90. If the atmosphere is at freezing, then the temperature of the top surface of the ark must be 90^o C (194^o F). This calculation assumes that the major escape of heat is through the top of the ark. This is because the wood must be thicker on the bottom and sides of the ark in order to sustain the stresses encountered in a sea voyage. The only place on the ark that thin wood could be placed, structurally, is on the top.
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ADAM AND EVE-OLUTION

The sun had just come over the horizon. The men pulled on the oars to propel the dingy from the ship to the beach. After the brief ceremony on the beach, claiming the land, a dark-sinned group of men emerged from the trees. The two groups of men stared at each other. One group was fair-skinned and dressed in the garb of 15th century Spaniards. The other group was dark-skinned and nearly naked. the Arawak Indians presented a dilemma to the theologians of Columbus' day. This dilemma created a battle between two men of passion.

The problem was that Christians did not want to believe that physical morphology could change. This was long before Darwinism came on the scene-- three hundred and fifty years before. This implicit denial of evolution and morphological change has had tremendous implications for the subsequent history of the world.

Father Juan Gines de Sepulveda was an influential priest in Spain. He led the school of thought that said that the American Indians were not descended from the European Adam. He advanced several arguments in his favor. Adam's children wore clothing. These people seemed comfortable without clothing.[1] Adam's children had ethics. Indians didn't. According to Sepulveda, they were barbarous and committed crimes against natural law. They oppressed and killed innocent people, which meant that they had no conscience. He claimed that Indians were inferior to Spaniards as children are to adults or even as apes were to true men.[2]

Sepulveda seriously questioned whether Christian ethics applied to them. He argued that Christians had no need to treat American Indians well. The pope and king, he said, had the right to subdue the Indians by war.[3] Slavery was justified in order to teach the Indians about civilization.

Sepulveda also believed that it was useless to give the Gospel to these savages. These people had no knowledge of Jehovah or Jesus. Cosmas had clearly pointed out that the Gospel had gone into the whole world and the Gospel had clearly not gone to America. Because of this, it implied that the Indians were not subject to the Gospel. He also advanced an argument often heard today about fossil men only he applied it to the Indians. He said that they were not 'inventive' and thus were not like Europeans but were like children.

The point about separate Adams was particularly vexing. Sepulveda was advocating the polygenist (multiple origins of man) view. Stephen J. Gould writes,

> "The harder argument abandoned scripture as allegorical and held that human races were separate biological species, the descendants of different Adams. As another form of life, blacks need not participate in the equality of man. Proponents of this argument were called polygenists."[4]

These arguments applied to black men as well as to Indians. And it raised the question of how the Indians got to America. Everyone knew that the Atlantic was wide and no one thought that primitive peoples would be able to cross it. [As an aside it was an opponent of this view who first proposed the Bering Land Bridge idea of how Indians walked to America.] If the Indians were cut off from Adam's race, then who were they?

Father Bartolome de Las Casas argued strenuously against the view advocated by Sepulveda. He viewed all men as children of Adam. Since all men were degenerate, he believed that the racial differences were due to degeneracy with various races having degenerated different amounts. The question, in Las Casas view, was 'Had they degenerated to the animal level?' Las Casas said no. Gould writes,

> The softer argument again using some inappropriate definitions from modern perspectives upheld the scriptural unity of all peoples in the single creation of Adam and Eve. This view was called monogenism or origin from a single source. Human races are a product of degeneration from Eden's perfection. Races have declined to different degrees, whites least and blacks most.[5]

The monogenists needed an explanation of how Indians arrived in America. Jose de Acosta proposed it in 1589.[6] He simply said that Indians had walked from Asia to America. This suggestion was made 136 years before the discovery of the Bering Strait. And in a real sense it was a successful Biblical prediction based upon the presupposition that humanity was of one origin.

However, even those who believed that Indians were descended from Adam often believed that they were children of Satan. The spiritism and magic of the Indians led many to believe this.[7] Jonas Michaelius in 1628 wrote,

> "As to the natives of this country, I find them entirely savage and wild, strangers to all decency, yea, uncivil and stupid as garden stakes, proficient in all wickedness and ungodliness, devilish men who serve nobody but the devil, that is, the spirit which in their language they call Menetto [Manitou],

> under which title they comprehend everything that is subtle and crafty and beyond human skill and power. They have so much witchcraft, divination, sorcery, and wicked arts that they can hardly be held in by any bands or locks. They are as thievish and treacherous as they are tall, and in cruelty they are altogether inhuman, more than barbarous, far exceeding the Africans..."[8]

Unfortunately, it was Sepulveda's views, while not the official vies of the authorities, which were the operatives views of the Europeans entering the New World. At least three different Popes declared the Indians as human but they were ignored. The consequences of that continue until today.

What were the consequences? Indians and others, like Africans, could be taken into slavery. Their women could be raped. They could be killed. And most importantly, their gold could be stolen. Taking gold from Indians was no more unethical than taking gold from chickens.

The continuing historical consequences include Christians who do not want to believe that those who are different could be human with all the rights we enjoy. Las Casas, while trying to stop slavery among the Indians, suggested that Africans could be imported as slaves instead. This led directly to the slavery of African in the Americas. It eventually led to the U.S. civil war, and to the present racial tensions in the U. S. This encouraged the idea that racial mixing should not occur because Africans were somehow different from Europeans.

This aversion to racial mixing affected Christian missions. In the 1800s mission societies did not allow European missionaries to marry native women. This denied these people a most human and God-given right.[9] Some missionaries were even forced to divorce their native wives by the very mission boards which supported them. Such beliefs arose from the denial of morphological change among human beings. There is a tremendous evidence for the morphological change among humans that we will now examine. I never thought I would write a chapter like this. My young-earth creationist background didn't allow me to believe that man was able to change morphology drastically. Observational data forced me to change my view.

With the 1859 publication of Darwin's book, The Origin of Species, a chasm developed between the religious view of the world and the scientific view. Since then both camps have spoken from two widely divergent fields of understanding, with little common ground for discussion. Scientists have spoken from the world of observation, citing things visible--and only things visible--as evidence of their position. Young-earth creationists have spoken from the world of faith, citing the Scriptures as the final authority and arbiter for understanding man's place in the universe. Standing on these two pedestals, the two camps have shouted and thrown rocks at each other for over a century with the result that science has seemingly asked the believer to relinquish his belief in the historicity of the events in the Bible and the faithful have seemingly asked the scientist to ignore what he has seen with his own eyes. Each side "knows" it is correct and can't understand why the other won't bow before its superior wisdom.

In this chapter we will take one more look at the suggestions of the creationists before laying out a new historical interpretation of Genesis that also accounts for the scientific facts gathered over the past 400 years. Once again, I never thought that I would write a chapter like this, having once been a young-earth creationist myself. The arguments, which were the most convincing to me, will be presented with enough observational support to back them up. But first, we must look at the theological issues.

The Theological Issues

The basic problem that conservative Christians have with the theory of evolution is that it seems to have negative implications for the validity of the Bible as the Word of God, the doctrine of original sin and, finally, the atonement by Christ. H. G. Wells outlined the threat when he wrote,

> "If all the animals and man have been evolved in this ascendant manner, then there would have been no first parents, no Eden, and no Fall. And if there had been no Fall, the entire historical fabric of Christianity, the story of the first sin and the reason for an atonement, upon which current teaching bases Christian emotion and morality, collapses like a house of cards."[10]

At one time, this author thought Wells was correct and that if his concept of evolution and the events surrounding the origin of man is true, then evolution would destroy Christianity. But Wells' view and the young earth creationist view is in error. The young-earth creationists don't seem to realize that it is the historicity of Genesis which is important, not the reality or lack there of, of evolution. Wells believed that life arose without any intervention by God. As I intend to show in the next few chapters, this view is wrong.

What are the basic beliefs that must be held by a Christian? This is no simple question, but obviously the sine qua non is that Jesus died for our sins and rose on the third day. Without this belief it is difficult to see how one could consider oneself a Christian. But a correlated concept to the payment for sins is that there are sins in the first place. The Bible gives an account of the origin of sin in the first three chapters of Genesis. If these chapters are not historical, meaning no Adam and Eve, no Fall and no effect on future humanity, then there was no need for Christ to die for our nonexistent sins. A historical Adam and Eve further requires that all of humanity be descended from this primeval pair. Without this descent, sin could not be spread throughout humanity. There is also the clear indication that all humanity is descended from Noah and his wife.

There is the secondary issue of whether the Bible is or is not the Word of God. We will not address the modernist view that Bible is God's communication via allegory. If it is the Word of God, then it should be error-free in the original manuscripts. This would require that the story of the creation of Eve must also be true. For if this is false, then the Bible is unhistorical. Thus if the Bible teaches an origin for the human race which is different from that which did indeed occur, the only two conclusions are that either the Bible is not the Word of God or that the current manuscripts had been re-written sometime in the past. Neither possibility is satisfactory for the conservative Christian. From this analysis, we have the important issues, relating to creation, which need to be held to for a consistent theology which does not damage the claim of the Bible to be the Word of God. These are: an actual Adam and Eve, the surgical creation of Eve, and an actual Fall. Without these as the basis, Christianity has a very weak foundation. The Flood is important only for the historical accuracy of the Bible

Other issues, unfortunately, get added on to this short list. Whitcomb and Morris write,

> "The Bible teaches a perfect Creation followed by a Fall and subsequent deterioration, requiring the intervention of God Himself, in Christ, to bring about redemption and salvation. Evolution postulates a gradual progress from crude beginnings through innate forces, to higher and higher levels of achievement and complexity. "[11]

In this quotation a new doctrine which is unnecessary to salvation is added to the Genesis account. The doctrine is the perfection of creation. What does that mean? Throughout Genesis 1, 2 and 3, God says that the creation is good but none of the translations consulted used the word "perfect." According to Morris, this term evidently means a world without decay of any sort. He argues,

> "And it will be new again (Rev. 21:5) much like the cosmos He had made in the beginning. 'There shall be no more curse' (Rev. 22:3). The Second Law of Thermodynamics will have been 'repealed', and perhaps the First Law also, as God's creative power will undoubtedly be freely manifest wherever needed thenceforth."[12]

This implies that the lack of the second law in the beginning is a Biblical doctrine. But this is not found in the Bible.

The First Law of Thermodynamics merely states that energy is neither created nor destroyed. The Second Law of Thermodynamics is the physical law which basically states that all natural systems go to the most likely state of affairs. The second law can be illustrated by the following analogy. A neat and ordered child's room is an extremely unusual state of affairs. The natural and most likely state is for toys to be strewn around and clothes to be dropped at random places. When entering a child's room it is more likely to be in the latter state than in the former. The Second Law of Thermodynamics is the law that ultimately causes friction, decay and the wearing out of every man-made object on earth.

With this in mind, to assume that the curse is equivalent to the Second Law of Thermodynamics is presumptive to the highest degree. Although Whitcomb and Morris state matter-of-factly that the Second Law will be repealed, nowhere does the Bible say that the curse of sin is the Second Law. Does this mean that prior to the Fall, when the world, according to Whitcomb and Morris, was perfect, that there was no friction nor decay? If there were no friction, then Adam, Eve and the animals would not be able to walk. The friction of our feet against the ground is what allows us to start walking, stop walking and turn. No, the Bible does not teach that the Second Law was instituted after the Fall. It is an interesting speculation by Whitcomb and Morris but it has no Biblical basis and should not be taught as such. When dealing with Biblical interpretation, we need to be very clear what the Bible actually says and what our speculation from that data is.

Another theological issue, which must be dealt with in any discussion of evolution and the Bible, is the issue of death. Romans 5:12 clearly states, "Therefore, just as sin entered the world through one man, and death through sin, and in this way death came to all men, because all sinned--"(NIV)

This verse does not teach that there was no death before Adam sinned. What it does teach is that there was no death for men before he sinned. The verse leaves unaddressed the issue of whether animals died. This verse also does not address whether the death Paul spoke of was spiritual or physical. It is most likely referring to spiritual death because of the use of the word 'death' in Romans 5:17. There, death is contrasted with our reigning in life through Jesus. We do not exactly reign in this life; we suffer. If the life in this verse is spiritual life, then the death must be spiritual death. In Romans 5:18, condemnation and justification are substituted for death and life, further confirming the spiritual dimension of Romans 5:12.

The only other place that could be construed as implying that animals did not die prior to the fall is in Romans 8:20-23 which says.

> "For the creation was subjected to frustration, not by its own choice, but by the will of the one who subjected it, in hope that the creation itself will be liberated from its bondage to decay and brought into the glorious freedom of the children of God. We know that the whole creation has been groaning as in the pains of childbirth right up to the present time. Not only so, but we ourselves, who have the first fruits of the Spirit, groan inwardly as we wait eagerly for our adoption as sons, the redemption of our bodies."

This passage does not say anything about death in the prefall world either. The last verse, which compares our groaning for adoption with, the creation's groaning, is speaking of our sinful state. Death is not the only evil that the creation could conceivably be subjected to. Man's mismanagement of his environment is a result of sin. The creation certainly groans under that. Species go extinct; lands are polluted for thousands of years with radioactive waste. The passage above could easily be referring to this type of subjugation.

From the two passages cited above we can draw the conclusion that spiritual death affected mankind through Adam's sin and the rest of creation was affected only through the actions of mankind. There is no Biblical prohibition on animal death prior to Adam's sin!

Another theological objection to the concept of evolution concerns the morality of the process. Whitcomb and Morris say,

> "Similarly, the morality of evolution, which assumes that progress and achievement and 'good' come about through such action as benefits the individual himself or the group of which he is a part, to the detriment of others, is most obviously anti-Christian. The very essence of Christianity is unselfish sacrifice on behalf of others, motivated by the great sacrifice of Christ Himself, dying in atonement for the sins of the whole world!"[13]

While the premise of the above argument is correct, i.e., that Christianity is based on unselfish sacrifice, the conclusion, that evolution is therefore unchristian, is wrong. The very essence of Christianity is Christ's sacrifice. Whitcomb and Morris totally ignore verses such as Isaiah 45:7 where God says, "I form the light and create darkness, I bring prosperity and create disaster; I, the LORD, do all these things.□(NIV). To be eaten as food by another species is certainly a disaster for the victim. As Christians we are to have honorable dealings with our fellow humans but not with other species necessarily. Is it dishonorable to eat a chicken? For the chicken, maybe. Yet the Bible clearly teaches that we are allowed to eat any food we want, even as Christians. We must be very careful to avoid reading into the Scriptures what is not there and then claiming what we interpret is inviolable.

There is also the ostrich's lack of motherly sacrifice described in Job 39:13-16. It says, "The wings of the ostrich flap joyfully, but they can not compare with the pinions and feathers of the stork. She lays her eggs on the ground and lets them warm in the sand, unmindful that a foot may crush them, that some wild animal may trample them. She treats her young harshly, as if they were not hers; she cares not that her labor was in vain, for God did not endow her with wisdom or give her a share of good sense." Once again, God takes credit for creating an animal who treats her children harshly, not in the self-sacrificing fashion that Whitcomb and Morris expect. Their limitation upon God, to only create self-sacrificing animals, is contrary to Scripture.

It has also been shown that Whitcomb and Morris are wrong when they say that evolution would not produce altruistic behavior. While it is true that Darwin thought it was not possible for altruism to be created by evolution, subsequent work by sociobiologists like Edward O. Wilson has shown that an organism which helps its near relatives is more likely to pass its own genes on to the next generation than is one who acts selfishly.[14] Whitcomb and Morris are presenting a view of evolution that is outdated.

Creationist Criticisms of Change

One of the dictionary meanings of evolution is, simply, change. In the case of biology today, evolution often means a change in gene frequency. The young-earth creationists allow for gene frequency change as long as the change is not too great. But they never define how much change is too much. As noted several times, young earth creationists want change to occur more rapidly than evolutionists desire. This is like having our cake and eating it too.

Furthermore, they discount all evidence of macroevolution based upon several criticisms. The first objection to evolution is that non-living matter can not give rise to living matter. A variety of arguments are advanced to support this view. The most compelling argument is that of probability.[15] The argument, presented by the young-earth creationists, goes something like this: proteins are made up of a serial string of amino acids joined together and then folded into a characteristic pattern. There are around 20 amino acids that can be arranged in any order. Let us assume that we want to construct a protein molecule that is made up of 20 amino acids. For the first position we have 20 possible amino acids to choose from; this means we can construct 20 different single amino acid proteins. For the second position, we also have 20 amino acids to choose from; but when added to the possibilities of the first position, instead of 40 (20+20) different amino acids we actually have 20 x 20 = 400 different possible two-protein amino acids. For a three amino acid protein, we have 20 x 20 x 20 = 8000 different combinations. For our 20 amino acid protein, we can construct 10,000,000,000,000 or ten trillion different possible proteins.

Now, what this means for the origin of life is that for a very small protein formed from only 100 amino acids, the different possible combinations are 1 followed by 130 zeros. In scientific notation, this is written as 10^{130} where 130 is the number of zeros following the 1. Considering that there are only 10^{17} (1 followed by 17 zeros) seconds in 4.5 billion years, the young-earth creationist argues that there has not been enough time for life to emerge. There are only 10^{80} (1 followed by 80 zeros) particles in the entire universe. If you formed 10^{80} different combinations each and every second that the universe has existed by now you still would not have formed each and every possible combination. Today you would only have 10^{97} different combinations. This falls 1,000,000,000,000,000,000,000,000,000,000,000,000 times short. Thus with an impossible production rate for an impossibly long time, the odds are that you have not created the correct order of the protein needed for life! Thus God had to have created the protein.

While I believe that God created everything, there are several things wrong with this argument. First, unlikely events occur each and every day. Get a deck of cards and shuffle it. When you shuffle a deck of cards, each shuffle produces an order that is very unlikely to be repeated in the history of the universe. The number of different combinations for a deck of cards is 10^{67}. If 10 billion card players shuffled their decks every second for the entire history of the earth, it would be extremely unlikely that any of them would repeat the order in the deck of cards that you have in your hand. Does that mean that the order of your deck of cards does not and never could exist? Of course not, it exists in your hand.

There is a very large fallacy in calculating the odds of an event occurring after that event has occurred. We know that in the past, couples had large numbers of children and very few of them lived to adulthood. Some families had 20 children with only two on average living beyond childhood. From this fact we can calculate the probability that you would exist. Assume that the earth has only existed for 6,000 years with a generation time of 20 years. Further assume that on average each child had a fifty-percent chance of surviving to adulthood and having its own children. If any of your ancestors had died before reproduction, you would not be here. Calculating that in 6,000 years there are 300 generations of human beings, so with a fifty percent chance of survival there is only 1 chance out of 10^{91} that you should exist. If you add to this the chance that only one of the estimated 300 million sperm ejaculated by your father was able to fertilize your mother's ova, the odds against your existence drop even further to 1 chance out of 10^{99}. If you only consider this same 1 out of 300 million odds for the correct sperm to fertilize the egg at each step back through your ancestry, the odds against your existence are truly infinitesimal, being approximately 1 chance out of 10^{2400}. With odds like these against your birth, I feel confident that you do not exist.

The young-earth creationist will argue that this does not solve the problem because, in the case of certain proteins, a change in the order of the amino acids harms the working of the protein. Thus he would say that chance could not produce such a rare occurrence which benefits function. Davis and Kenyon write,

> "A mutation in a coding gene, then, can be looked at as a random change in functional information. As a unit of functional information in the cell, a coding gene is much like a word (a unit of meaningful information) in a book. What do you think would happen if we randomly changed the letters in some of the words in this book? Would the book be improved? On the contrary, it is

probable that random changes in the words of this book would decrease rather than increase the meaningful information they carry."[16]

But this is not true. The young-earth creationist, Walter Lammerts, used radiation to improve a rose species for commercial sales. He published this in the Creation Research Society Quarterly, in the 1960s. Rose seeds were irradiated with radioactivity. One of them produced a rose that was more complex in that it had more petals than a normal rose. This mutation arose by chance, proving that chance can improve a species. Young-earth creationists have ignored the implications of this for over 30 years. Lammerts wrote,

> "Among the 20 plants, several were indistinguishable from normal and one was particularly intriguing from the commercial viewpoint. It had 29-36 large petals instead of the usual 14-18 of T55059/6. The buds were long pointed and had a lovely regularly imbricate high centered form when one-quarter to one-half open. Comparison of the typical H55059/6 flower and this neutron radiation induced "high double" sport is shown in Figure 5."
>
> "Hot house testing shows that it buds true and also breaks fully as rapidly as the normal type. H55059/6 is more vigorous than the average hot house rose, so the slight reduction in vigor of this sport is not a handicap. Whether it will meet all of the other exacting requirements for a good hot house rose remains to be seen.
>
> "The significant fact is that we have demonstrated that a semi-double variety can be converted into a commercially desirable one as regards petal number and bud form. Incidentally, the color is very similar to H55059/6."[17]

Creationists never seem to cite this article from their own journal.

The real issue is the origin of the information of functional proteins, according to Gange. He says,

> "The argument that a near-impossible arrangement can easily appear (some sequence of the fifty-two cards) is erroneous because it presumes that each of the many trillions upon trillions of ways that the cards can be arranged organizationally functions to satisfy life's requirements. But this is hardly the case. For example, to explain the origin of life we must explain the origin of a particular sequence of nucleotide bases in the DNA blueprint that instructs cells to manufacture protein, including the production of three thousand vastly complex enzymes that supply the 'workmen' responsible for doing the actual assembly."[18]

Gish says essentially the same thing when he writes,

> "The highly specific biological activity of each protein is due to the precise way the amino acids are arranged, just as the information conveyed by this sentence is determined by the precise sequence of the 190 letters found in it."[19]

Work by Dr. Gerald Joyce, at the Scripps Research Institute in La Jolla, California, has proven that a particular sequence of nucleotide bases may not be necessary for a given functionality. Dr. Joyce put natural selection to work to create just such unlikely sequences.[20] RNA is similar in form to DNA and also carries the genetic information. Like DNA it is formed from four nucleotides. Thus for the first position in any RNA molecule there are four choices; for the second, four, etc. Thus a chain of nucleotides 393 units long is $4^{393} = 10^{236}$ different combinations. As you can see, there are more possibilities for this length RNA than there were for our 100 amino acid protein mentioned above. There is no way that Joyce in a laboratory could ever produce every possible combination of a 393 unit long RNA molecule; there are simply too many combinations. However, he has found a method of finding and producing RNA molecules that do something no natural RNA molecule can do - cut DNA molecules.

An RNA molecule able to slice DNA could be programmed to cut viral DNA and thus fight a viral infection but no known RNA is able to do that. He manufactured millions of RNA molecules based on a naturally occurring one, which cuts RNA but is unable to cut DNA. His replication effort was not perfect so a few of the RNA's would have small mutations. He put these in a vat, added some DNA and waited. Most of the RNA did nothing to the DNA but one molecule in a million was able to cut a DNA molecule in about an hour's time. He took these slow-cutting molecules and replicated them, but once again he replicated them in a sloppy fashion, allowing mutations.

Once again he threw the RNA into the vat, added DNA and waited. Cycle after cycle went like this. After two years, Joyce had gone through 27 cycles and his RNA was now able to cut the DNA in five minutes. This two-year-old RNA is almost as efficient at cutting DNA as the naturally-occurring RNA is at cutting RNA! This is the power of selection. To attempt to create this 393-nucleotide-unit-long molecule by chance would never happen. If only one sequence was able to accomplish this task, then Joyce would never have been able to find it. What Joyce's work shows is that there are 10^{221} different sequences which would accomplish this task. Joyce didn't have to find just the one sequence that would work for him, he simply had to find one out of the multitude! But selection was able to direct the formation of this molecule in a very short time.

Joyce related an experiment run by Andrew Ellington and Jack W. Szostak. They were trying to find an RNA that would bind tightly to a specific dye. They started by making a batch of 10^{13} RNAs with a random code. They found a set of RNAs that bound tightly to each dye that they tested. A young-earth creationist, like Gish, might ask how this specific order of nucleotides was arrived at and assume that Ellington and Szostak would have had to design them. After all, it takes a lot of information to pick out the correct sequence. But in fact, pure chance chose the order of both the successful sequences and the unsuccessful sequences. Ellington and Szostak repeated the experiment a few years later and found an entirely new set of RNA sequences that would bind to the dyes. This means that perfectly designed sequences are not what biological systems are made of. Trillions upon trillions of sequences out of all the possibilities are able to perform the same function. Joyce concludes,

> "That observation reveals an important truth about directed evolution (and indeed, about evolution in general): the forms selected are not necessarily the best answers to a problem in some ideal sense, only the best answers to arise in the evolutionary history of a particular macromolecule."[21]

Joyce's work proved biologically what we have always known linguistically. Gish said, "The highly specific biological activity of each protein is due to the precise way the amino acids are arranged, just as the information conveyed by this sentence is determined by the precise sequence of the 190 letters found in it."[19] But he could have said, "The biological activity of each protein is due to the arrangement of the amino acids, just as the meaning imparted by this sentence is determined by the sequence of the 152 letters in it." or "The enzymatic activity of a protein is caused by the order of the amino acids, just as the meaning of this sentence is given by the order of the 125 letters." or "Amino acid order is necessary for protein function like word order is necessary for sentence meaning." He could have expressed the same thought in any of thousands of other ways. Each of these four sentences serves the same function to convey a particular thought. Some do it better than others do but the meaning is the same. So it is with the proteins. There is not one and only one order that will perform a given task. Many will do it but only some of the letter orders will do it efficiently.

The common complaint of creationists of all stripes, that life's chemicals are too specific for it to have occurred by chance, is destroyed by these experiments. There is so much overlapping functionality contained in the polymers of life - DNA, RNA and protein - that random sequences of them after undergoing selection are able to find functional proteins. It must also be concluded that the argument so often advanced by young-earth creationists, that there has not been enough time to create the various proteins, is wrong. Experimental evidence from a mere deck of cards as well as the biochemical experiments of Joyce disproves their argument. The work in this area has the most profound implications for the creation/evolution debate. This leads to a very disturbing conclusion (at least to this author) that life probably is capable of arising by chance, pure chance, and nothing but chance. One must certainly consider from this that function tied to reproduction could quickly shape the origin of life. Christians must be theologically prepared to face the eventual origin of life, from scratch, in the test tube. Failure to be prepared will lead to massive defections from our faith.

If, as Joyce, Ellington and Szostak have discovered, one in a million permutations of the molecules are able to perform the function that they are looking for, then the time necessary for the formation of life is much reduced. If one has to look through only a million permutations, then by making and testing only one molecule per day on average, one suitable molecule can be found in only 2,800 years - not even the period of human history. By starting with a million random copies and adding natural selection to the procedure, a suitable chemical can be found in only a few days. Thus the argument that there has not been enough time for evolution to occur collapses in no time at all.

A related argument concerns the applicability of the Second Law of Thermodynamics as applied to the origin of life. Here the young-earth creationists may have a point. To form long chains of DNA, RNA or proteins requires an incredible lowering of the entropy in a local region of the earth.

There are two types of entropy that are important when the origin of life is discussed. First there is the change of entropy due merely to the formation of a long polymer. This entropy decrease is quite large. The second type of entropy decrease is due to the informational content of the molecule. Thaxton, Bradley, and Olsen calculated the informational entropy decrease necessary to form a unique 4-million-nucleotide-long DNA molecule.[22] This is the amount of DNA in an E. coli, a common bacteria that inhabits the human gut. They assumed that only one nucleotide combination out of all those possible would have the proper function. This is false. There are many millions of strains of E. coli, some of which will kill you. Because Thaxton, Bradley and Olson think that only one DNA sequence will produce a bacterium, their calculation of entropy is erroneous. When considering the origin of life, the most important function is reproduction. Thus if any combination could reproduce, then as far as reproduction is concerned, the informational entropy decrease is actually zero.[23]

Young-earth creationists should not be too positive about their objection, though. The problem can be somewhat alleviated by allowing short DNA, RNA, and protein polymers to begin the process of replication and reproduction. With relatively short chains, the decrease in entropy is not too great. And with a living system, which is what a reproducing system is, the Second Law of Thermodynamics does not apply. This is the reason that Ilya Prigogine won the 1977 Nobel Prize in Chemistry. The reason the second law does not apply to life is because living systems are not closed systems. Energy flows through them. The Second Law is applicable to closed systems - systems which do not exchange energy with the outside. Thus, we can say that the Second Law applies to living system plus its environment (i.e., the rest of the universe which is closed) but not to the living system alone. As we will see later, with polyploidy, once you have a reproducing system it is quite easy to make the DNA chains longer. In a chemical system that naturally mimics Joyce's test tube discussed above, the polymers could very rapidly improve their efficiency as the chemicals there did. This would be especially true if small mutations were allowed in each reproductive cycle.

Obviously, since no one has actually accomplished the inorganic origin of life in the test tube, there is every possibility that God alone is capable of creating the original life. Evolutionists have not proven their case here. But if Christians base the truth or falsity of their Bible, their faith, and ultimately, their Messiah on whether or not man can create life, they are making a grave mistake. Once you base your faith on the absence of some event, no matter how improbable that event is, you have created a religion which may fall if that event takes place. Those creationists of all stripes, who firmly deny man the ability to create life, should ponder the meaning of Genesis 11:6. The passage is talking about the building of the Tower of Babel. It says,

> The LORD said, "If as one people speaking the same language they have begun to do this, then nothing they plan to do will be impossible for them."(NIV)

This verse is quite clear that nothing is impossible for man to accomplish. The speaker is not some liberal theologian from New England, but it is God Himself! It is quite likely, in this author's opinion, that mankind will eventually create life from scratch. The only two questions are: when it will occur, and what new disease will it cause? But what will be the consequences for the theologian who has staked his case on the inability of man to create life? And what of his followers? Will the theologians' lack of preparedness lead to the collapse of their faith and the defection of his followers?

Mechanism of Evolution

Many young-earth creationists criticize a view of evolution that is outdated. Morris states,

> "Mutations are rare and almost always harmful, and yet great numbers of favorable mutations must accumulate to produce a new kind."[24]

This view assumes that each gene codes for an independent trait: One gene for arm length; another for head size. But this is not how genes work. They are hierarchical. Some mutations have more effect than others. Homeobox genes are the ones which control the development of the embryo and largely determine the morphology of the developing organism.[25] A mutation in a homeobox gene is likely to cause vast alteration in form unlike a mutation in the gene for eye color which will only affect that trait.

An example of such a case is the horse. Most horses possess only one toe, the hoof. According to the fossil record, in times past all horses had three toes. Evolutionists claim that the three-toed horses evolved into one-toed horses by the loss of the two outside toes. Creationists strongly imply that these two types of animals are

unrelated and not in an ancestor-descendant relationship. Gish states,

> "Thus, there are horses with browsing teeth and some with grazing teeth, but no intermediates showing a transition from one to another. There are three-toed horses and one-toed horses, but no intermediates showing a transition of one to the other. In fact, in the Rattlesnake Formation of the John Day Country in the Blue Mountain region of northeastern Oregon, Neohipparion, a three-toed grazer, is found with Pliohippus, a one-toed grazer with a hoof and no side toes."[26]

That Gish seems amazed (that fossil three-toed forms are found with fossil one-toed forms) shows a basic lack of understanding concerning what the evolutionists are saying about evolution. Evolution is merely the change in frequencies of various traits in a population. The horse used to be almost entirely a three-toed species with a few mutant forms with one toe. As time progressed, one-toed forms became more numerous and three-toed forms less numerous. The two forms would be expected to live together. Now, the three-toed variety is the mutant form. There is evidence that this is what happens because even today, occasionally a horse is born with three toes. This event is caused by a single mutation, not numerous ones. Gish speaks as if he expects that one night all three-toed forms disappeared from the earth to be replaced with one-toed varieties. Stephen J. Gould writes,

> "The historian Suetonius writes that Caesar used to ride a remarkable horse, which had feet that were almost human, the hoofs being cleft like toes. It was born in his own stables, and as the soothsayers declared that it showed its owner would be lord of the world, he reared it with great care, and was the first to mount it; it would allow no other rider."[27]

Even today horses are born with three toes. They are not a different species, but neither is there any "transitional form" between these modern three-toed varieties and the single-toed ones as Gish expects. Indeed, how could there be? The genetic mechanism either expresses both outer toes or it doesn't. The mutation that causes this deformity is an "on/off switch." The switch is either on or it is off, but there is no intermediate position. The horse has not lost the ability to produce a three-toed form; the switch is simply turned off. Gish's view of genetics would imply that the horse should gradually grow longer and longer toes but that is not the way genes work. That is the view that Darwin espoused; he did not know anything about genes and DNA, and that was also over one hundred years ago. For the young-earth creationists to be using the genetic theories of a hundred years ago to fight evolution is certainly a poor tactic.

The young-earth creationists' view of evolution is also quite limited. They believe that God created numerous kinds (as opposed to species) and these kinds, split into two, three or more different species. Snelling, et al. note,

> "The Bible teaches that there were a number of separately reproducing populations created initially ('kinds'). These were to 'multiply and fill the earth', both after creation, and after the Flood. Thus they had to carry sufficient genetic information to fill a large number of empty ecological niches, and to cope with general environmental stresses."[28]

They define a kind as follows:

> "Today, a 'kind' may be represented by more than one population - e.g., horses, donkeys and zebras may have split from an original population - which had more genetic information and thus more variation potential than each group has today. A kind can include more than one species."[28]

It is interesting that they chose this kind as their representative. Whitcomb and Morris also use the horse "kind" in their discussion.[29] They assume that all these species arose since the time of the flood, about 5,000 years ago. What they ignore are the large chromosomal differences between the members of the horse kind and the amount of time necessary to produce these changes. The horse 'kind' illustrates just how evolution occurs in animals and shows that the amount of change within the horse 'kind' could not have taken place in so short a time.

Przewalski's horse was discovered in Central Asia in 1879 by Nikolai Przhevalsky. Unknown to Przhevalsky, half a continent away and also in 1879, Don Marcelino de Sautuola discovered a painting of this

animal in a cave in Altamira, Spain. Because the animal was unknown to people in western Europe, the paintings were dismissed as frauds. Eventually other paintings were found in caves that had been sealed since the Pleistocene epoch. They proved that the paintings were authentic. The animal that Przhevalsky discovered had changed very little from the picture on the cave wall in Spain. These pictures were painted on the wall more than 12,000 years ago.

Przewalski's horse has 33 pairs of chromosomes.[30] The modern horse, Equus equus, has only 32 pair. Normally, one would think that two such animals would not be able to interbreed and produce fertile offspring. When the chromosome pairs from each of these animals split to form the egg and sperm and then unite to form the fertilized embryo, the expectation would be that there would be 32 paired chromosomes with one chromosome left unpaired. Usually, such an egg would not survive since all chromosomes must be paired. However, the cross (between Przewalski's horse and the modern horse) is fertile. The reason lies in the simple fact that one of the horse chromosomes had broken in two in Przewalski's horse, giving two chromosomes where the modern horse has only one. When the egg and sperm join the two broken chromosomes of Przewalski's horse line up with the unbroken horse chromosome and it produces an animal with only 32 paired chromosomes. The DNA in the two broken pieces is so similar to that of the modern horse that the pairing can be accomplished. The racial differences between Przewalski's horse and modern Equus equus are due in part to the breakage of a chromosome and reproductive isolation.

But what if the reproductive isolation lasted longer than 12,000 years? Would the differences grow even greater? The answer seems to be yes. Not only do genetic differences grow, but also the chromosomes of the horse 'kind' are prone both to breakage and fusion as was evidenced in Przewalski's horse. Almost all crosses between horses and other equines produce infertile offspring or no offspring at all. Zebras have 22 pairs of chromosomes; donkeys have 31. Onagers have 28 chromosome pairs. Kulans have 27. The equines, like other animals, are subject to various forms of chromosomal rearrangements that aid in reproductively isolating the various subspecies.

If in 12,000 years Przewalski's horse has not quite formed a separate species, then it stands to reason that the reproductive isolation of the Onagers, Kulans, and Donkeys has been much longer than 12,000 years. Young-earth creationists would have this genetic change occurring within the past 5,000 years. But as we saw in chapter 4 (page 30)) carbon-14 dating works and it says that the cave paintings are of the order of 10-20 thousand years old. These animals have had chromosomal breakage and fusion and are related, but there is no way it all could have occurred within that short a period of time. Whitcomb, Morris, and Snelling claim that the horse "kind" gave rise to all the equines within the past 4,000 years and they do not provide any further discussion of the issues raised here. This leaves the informed reader unsatisfied.

On to Greater Complexity

With plants there is another mechanism in which one or two plants give birth to an entirely new species and occasionally a new genus. As mentioned above, polyploidy is a process that creates more complex plants. What happens in polyploidy is a "mistake" in the fertilization and formation of a seed. The parent plant normally has, say seven pairs of chromosomes, and produces a plant that has 14 pairs of chromosomes. The daughter plant has twice as much chromosomal material as the parent had. The daughter plant is much more complex, putting to rest the erroneous young-earth creationist argument that the Second Law of Thermodynamics forbids precisely this type of event. As we mentioned earlier, the Second Law does not apply to a living system and so this increase in complexity does not violate any law of physics.[31]

Since the polyploid plant originally has only extra copies of the normal genetic information, this might not seem as anything worthy of notice as far as developing new genetic information. But when contemplating the extremely important results of Gerald Joyce's experiments, we see that new information can be developed through mutation and selection. After all, in a polyploid plant that had two or even three copies of every gene, a mutation in one of the copies will not necessarily cause great harm to the plant. It has an unmutated form of the gene. The new copy can be used to search for new functional proteins. Random mutation and selection of a single copy would then be able to create new information without violating the Second Law. Christians who are hanging their hat on the Second Law to avoid evolution had better be very cautious. Joyce's experiments have far reaching consequences.

Obviously, some will ask if we ever really have seen such polyploidy events take place in nature. The answer is most definitely yes. In 1912, Digby crossed two species of primrose, Primula verticillata and Primula floribunda, which normally produced sterile hybrids. But in a few cases the offspring were fertile. It is not clear why

some are fertile but they are. This polyploidy has been observed in natural settings in 1905, 1923 and 1926.[32] In 1950, Owenby showed that two species of Trapopogonan were created by this means. T. miscellus was formed by a cross between T. dubius and T. pratensis. Another species, T. mirus, found near Pullman, Washington, was created as a cross between T. dubius and T. porrifolius.[33] Occasionally a species will produce an offspring with twice the number of chromosomes as the parent. A species of fireweed was formed in this manner.[34] Polyploid species of the maidenhair fern have been found.[35] Wheat, corn, and potatoes are also believed to have arisen by polyploidy. This is a widespread and beneficial process in nature.

Many other examples of polyploidy could be cited but they need not be. The point of the process of polyploidy is that greater complexity can be produced by a genetic error. The young-earth creationist, Gish, argues very strongly against the ability of natural processes to create greater complexity. He says,

> "The evolutionist assumes that the accumulation of many such minor changes eventually could result in a new basic type and in increasing complexity, but this is purely an assumption. What is required is experimental evidence, or, lacking that, hard fossil evidence, or historical evidence, that basic changes of this type actually did take place."[36]

Polyploidy provides precisely the historical and experimental evidence of new and increasing complexity and information. Why do Christian apologists want to ignore what can clearly be seen with their eyes?

One final aspect of the polyploidy phenomenon is that creationists often claim that there is a limit to variability. But at least in the case of plants, polyploidy can yield an almost endless supply of variability. Unfortunately, using such claims of limited variability to support the Bible may, in the long run, cause more harm than good to the creationists cause if the claim proves erroneous.

Transitional Forms

Creationists have long demanded transitional forms between various groups. The lack of these transitional forms is said to be evidence that evolution is false. Before we can know if this is true, we must define what we mean by a transitional form. To define such a thing, Gish says,

> "We would predict that new basic types would not appear suddenly in the fossil record possessing all of the characteristics that are used to define its kind." [37]

This is as close as Gish gets to defining his term. Anderson and Coffin[38] and Huse,[39] making similar claims, also do not define the term. Parker merely states that,

> "...the boundaries between kinds should blur as we look back at their fossil history."[40]

Of everything surveyed, Wise gives the best definition. He said,

> "They have a structure that stands between the structure of their ancestors and that of their descendants. However, they are also found in the fossil record as younger than the oldest fossils of the ancestral group and older than the oldest fossils of the descendent group."[41]

Thus we should expect a transitional animal to both be between the two groups morphologically and be found in rock strata between the ancestor and daughter species. What he fails to specify in the above is, "What is the nature of the morphological gradation expected?" Later he seems to suggest that there ought to be smoother transitional series if evolution is to be true. He says,

> "It is merely the combination of structures that is intermediate, not the structures themselves. Stephen Jay Gould calls the resultant organisms 'mosaic forms' or 'chimeras.' As such they are really no more intermediate than any other member of their group."[42]

If by transitional series one means that there should be an infinite gradation of morphology from one form to another, like the "morphing" done to pictures of politicians in political TV ads, then he is using a bad concept of the nature of genealogical traits. This is the view that Wise and most non-evolutionary creationists suggest. This view of

heredity is almost that of Pythagoras who believed that life began with a blending of male and female fluids.[43] When the term "morphing" is used below, it means a smooth gradation between one form and another like the face of Clinton turning into the face of Jimmy Carter or Hillary in a political ad. Those types of sequences consist of hundreds of intermediates. But this is not how transitions occur in the fossil record.

Traits are not analog in nature. They are at least partially quantized. I have blue eyes; my three sons have brown eyes. They do not have bluish-brown or brownish blue eyes. In the fossil record, horses have one toe or three toes. Even today, about 1 in 10,000 horses is born with three toes.[44] They don't have 2.75 toes, or 1.82345 toes. Thus for creationists to insist upon an infinitude of forms is using the hereditary knowledge of 500 B. C. Surely we can do better than that.

So what is a transitional form? It should be defined as an animal which has some features of each group; not an infinite morphing sequence. In a recent issue of Nature, there is a picture of a malformed toad. This toad had eyes on the inside of his mouth on the roof of the mouth. It was named the Goldschmidt toad after a biologist who believed that evolution occurred by just such deformities.[45] The toad was found living in the wilds of a Canadian garden. Regardless of the cause of his deformity, it was not a gradual thing that produced this feature. Its parents did not have the eyes on the lips, its grandparents did not have the eyes where the nostrils are and its great-grandparents did not have eyes just below where normal toads have their eyes. There was no gradual transition to the eyes-in-the-mouth state. I believe that this is how most mutational change occurs. A minor mutation of the control genes produces a major change in the morphology of one or a set of traits. (See the fish to amphibian transition below).

Phillip Johnson advocates this morphing view of genetics as evidenced by his statement recently. He says,

> "There is no evidence from the fossils of a pattern of common ancestors and intermediates connecting them. If neo-Darwinism were true, somewhere there should be a universe of transitional intermediates, as Darwin said there had to be. Where is it?"[46]

Darwin, it is true, believed that gradualism, in the morphing sense, was the way evolution worked. But Darwin did not have modern genetic and developmental knowledge. To always quote Darwin as the authority on how change must occur is to hold evolution to its most primitive form. It does not even attack the view held by most scientists today. Secondly, just because Darwin believed it does not make it standard dogma today. So the constant demand for a series of morphing forms is trying to attack a view held more than 100 years ago and is not what our children are taught in college. Our use of these views makes us look outdated and risks our children's trust.

Anti-evolution Christians often criticize the idea that small changes could lead to large morphological change. Phillip Johnson stated,

> "These scientists understand that a theory which is valid only at the small scale has been recklessly extrapolated into a general theory of creation, in order to fill the explanatory gap that would otherwise exist. The theory has to be extrapolated. Otherwise we wouldn't have a theory at all."[47]

This criticism if applied to other sciences would be equally valid. Johnson should criticize astronomy, which is extrapolated from small observed changes. No one has ever seen a star form, the sun orbit the galaxy or even Pluto make a complete orbit. Continental drift falls under the same gun, as does much of geology. No one saw the continents connected. Observed trends and fossil evidence are extrapolated. No one was around to see that it takes a long time to deposit the world's sedimentary beds. That idea is just an extrapolation of presently observed trends. If extrapolation were not allowable in science then much would have to be erased from our textbooks. Is this what anti-evolution Christians want to accomplish - the destruction of all science?

Fish to Amphibian

Johnson[48] talks about the fish to amphibian transition. He cites Stahl who says that none of the known fish is believed to be on the direct line of amphibians. That can probably be said of any transition since these animal bones are not found with signs that say, "Here lies your Great-Grandfish." Johnson then proceeds to talk about the Coelacanth, a living representative of the Crossopterygians. He points out that a study of the internal organs of this creature does not show pre-adaptation for land. With this he dismisses the coelacanth as a suitable example of an evolutionary transition.

But one must ask, "Why should it?" It lives in the deepest part of the ocean and is in a distinct order of the subclass Crossopterygia from which the amphibians arose.[49] This doesn't sound like a big deal to most people, but look at what an order is. Bats are in a different order from primates. Thus the fact that the Coelacanth is a different order than the Crossopterygian should have been brought out for the reader to understand its significance. If I say, I found a bat and a study of its internal organs shows no pre-adaptation to doing mathematics, or walking upright or having an opposable thumb and therefore mankind did not evolve, it is a meaningless conclusion. The bat has nothing to do with our proposed ancestry! Likewise to suggest that the Coelacanth shows no pre-adaptation for life on land is equally meaningless. Thus Johnson is not giving the reader, who is very likely to be a nonscientist untrained in the field, enough data to be able to decide for himself.

What evidence is there that the fish/amphibian transition is real? The Encyclopaedia Britannica,[50] notes that the crossopterygians had nasal passages which enabled them to breathe air with their mouth closed. This is a fish with a feature that is "characteristic of all terrestrial vertebrates." That is a transitional feature. They also had working lungs. The teeth of the fish had infolding of the enamel surface almost identical with the teeth of the earliest amphibians. A look at the earliest amphibian, called Acanthostega, reveals that they had gills as well as lungs, a trait in common with the precursor fish. Coates and Clack state,

> "Acanthostega seems to have retained fish-like internal gills and an open opercular chamber for use in aquatic respiration, implying that the earliest tetrapods were not fully terrestrial. The discovery provides information on the sequence of acquisition of tetrapod characters, and supports previous suggestions that such characters as legs with digits evolved first for use in water."[51]

What is interesting is that reports of the second oldest known amphibian, found in Pennsylvania, state that it had lost the gills and only had lungs. This was 5-10 million years after the earliest known amphibian.[52] Its legs were also more muscular.

The best recent overview of the fish-amphibian transition is found in Ahlberg and Milner, 1994. The skulls of the Panderichthyidae a type of crossopterygian, are so much like those of the earliest amphibians they were first included in that group until more complete skeletal material was found which showed that these were still lobe-finned fish. Ahlberg and Milner state,

> "Indeed one panderichthyid fragment, the holotype skull roof of Elpistostege, was initially described as a tetrapod, while two other supposed panderichthyids have recently proved to be Devonian tetrapods."[53]

These kinds of mis-identifications should be expected in a truly gradualistic transition. Creationists don't recognize this. Gradualism makes it difficult to draw a line. Remember Parker's definition above? But the transitional features are so mixed up together in these animals that "Both Ichthyostega and Acanthostega retain true tail fins with fin rays."[54] This sounds like a tetrapod with a fish tail and sounds very transitional.

Now, none of the creationist books that were consulted mentioned any of these transitional traits. Anderson and Coffin state,

> "The first amphibian to appear in the fossil record is Ichthyostega. Its appearance in the Devonian period in Greenland is abrupt and without transitional forms."[55]

Gish states,

> "There is a tremendous gap, however, between the crossopterygians and the ichthyostegids, a gap that would have spanned many millions of years during which innumerable transitional forms should reveal a slow gradual change of the pectoral and pelvic fins of the crossopterygian fish into the feet and legs of the amphibian, along with the loss of other fins, and the accomplishment of other transformations required for adaptation to a terrestrial habitat."[56]

Compare Gish's desire for transitional loss of fins with the following from Ahlberg and Milner,

> "The fundamental importance of panderichthyids lies in the combination of characters they possess. Unlike osteolepiforms [another type of fish-GRM], panderichthyids actually look like early

> tetrapods with paired fins: They have the same superficially crocodile-like skulls with dorsally placed orbits [eye sockets on the top of the head--GRM], straight tails and slightly flattened bodies without dorsal or anal fins. Like tetrapods, but unlike all other fishes, they also have frontal bones in the skull roof."[57]

Here we have a fish that HAS lost two of its fins and looks much like a tetrapod! Gish is wrong.

There is a new discovery, found in Pennsylvania, of a fish with fingers. The fin had eight fingers.[58] Interesting that the earliest amphibians had eight fingers also. If a fish with fingers isn't transitional, what is?

The fish-amphibian transition has fish with tetrapod skulls, lungs and gills, fin loss, nasal passages and teeth similar to the earliest tetrapods. The earliest tetrapods had lungs and gills, teeth and skulls like the fish, they had a retained tail fin and the body morphology was similar.

I would respectfully contend that the creationist books are not preparing our college bound youth for what they will face. All it takes for students to find these things out is a little work and curiosity. When they learn of all this they will begin to question what we taught them. It is only a short step to questioning the Gospel itself.

Modern Speciation

It is necessary to include here a few cases of modern documented speciation. Even though most young-earth creationists allow for minor changes, even changes to new species, some still believe that there is absolutely no observed speciation. David Paul Licata stated (in a table and not in complete sentences) that,

> "No change between species ever seen. If different species mate the offspring, if any are sterile. .... None changed to other species. ... Not one genus observed to change in history."[59]

Hugh Ross is on record as stating,

> "Since the coming of humans, however, the rate of speciation has dropped to a virtual zero."[60]

And Henry Morris wrote,

> "An average of at least one species has become extinct every day since records have been kept, but no new species have evolved during that time."[61]

All of these statements are simply wrong! One definition of a species is a mutually reproductive group of animals. Two different species can not breed and produce fertile offspring. So, by that standard, are there any new species? Yes. In 1964 a few polychaete worms from the species Nereis acuminata, were captured near Long Beach, California and bred in captivity. After the captive population had grown to several thousand, four individuals were sent to Woods Hole Oceanographic Institute in Massachusetts. These worms were grown and used as guinea pigs in experiments for 20 years. Between 1986 and 1991, Weinberg's team collected worms from the Long Beach area and discovered two populations of worms. These were named P1 and P2. The team then crossbred the two natural populations with each other and with the Woods Hole population. What they found was amazing. In twenty years, the Woods Hole population (WH) had become a new species. Table 11 shows the percentages of successful offspring created by cross mating the various populations. The fact that crosses raised no successful offspring with the Woods Hole population proves that in the 20 years of separation, they had become a distinct species. Speciation does not have to take long although most speciation events in nature take much longer as was documented in chapter 5.[62]

WH x WH 75%
P1 x P1 95%
P2 x P2 80%
P1 x P2 77%
WH x P1 0%
WH x P2 0%

Table 11 Successful Offspring from Crosses in N. acuminata

The beginnings of this process can be seen in an incipient speciation occurring today. In the Americas, prior to the European colonization, a particular type of fly, Rhagoletis, laid its eggs in the hawthorn fruit. Europeans brought apples and planted them throughout North America. About 150 years ago some of the flies began to lay eggs in apples. Due to the different times of maturation of the fruit, the two breeds became reproductively isolated. The timing of the adult emergence from the pupa stage is now inherited in the new breed. In fact, studies have shown that significant genetic differences now exist

between the two breeds. Even though, at this moment, these two are still the same species, eventually this process seems likely to lead to a new species that does not mate with its parent species. The new breed has been assigned a species name, Rhagoletis pomonella, because, in nature, it does not interbreed.[63]

Dodson and Dodson describe the snail species inhabiting Tahiti and Moorea in the South Pacific. He says,

> "A celebrated example of genetic drift is that of the snails of the genus partula on the island of Tahiti and Moorea, neighbors in the Society Islands, about 2,400 miles south of Hawaii. These are typical volcanic islands characterized by a central volcano from which deep valleys and narrow separating ridges radiate to the sea. The snails feed on the plants of the valleys and the intervening ridges are almost impassible barriers to them. Several species of Partula are represented on the islands, some species being found in many of the valleys, others in few or a single valley. In each case, the inhabitants of every valley comprise a distinct race, distinct in characters such as size, direction of coiling, details of shape and color. Only those species which are represented in only one valley, such as P. tohiveana, are monotypic. The variation of the several races of a species definitely is not clinal. Races of neighboring valleys may be strongly divergent, while races at opposite ends of the valley may have identical ecological requirements and may live on the same food plants, and yet show no tendency toward parallel variation. All attempts to interpret this situation in terms of different selective forces in the different valleys have failed. Probably, then, all of the races of Partula are subject to substantially identical selective forces, and the differences between them result from genetic drift. But genetic drift on so grand a scale is possible only because the geographic features of the islands enforce almost complete isolation upon all of the local breeding populations. These snails have been studied intensively three times, at wide intervals in the past century, and it appears that significant changes in many of the races have occurred even in that short time."[64]

These species are rapidly changing even today and illustrate effectively how mutation and genetic rearrangement via genetic drift can rapidly change a species.

In Hawaii, there are several species of moths in the genus Hedylepta. Some species feed on bananas while others feed on various other plants including the palm. Similarities in form show that the palm-feeding variety is the parent species to the banana-feeding moth. The reason it can be so categorically stated that the banana-feeders are the descendants of the palm-feeders is that, until a thousand years ago, when the original Hawaiians settled the island, there were no banana plants on Hawaii.[65] And the humans could not have brought both species to Hawaii because the entire genus is found only on Hawaii. The moths are found nowhere else in the world. Thus, within the past 1,000 years the moth has changed into two separate species, probably in a manner similar to that being taken by the fruit fly, Rhagoletis pomonella.

Lake Victoria in Africa illustrates evolution in action across species limits on a huge scale. The lake is no older than 750,000 years and contains over 170 species of cichlid fishes. When the rivers are examined in an attempt to find where these fish came from, it is discovered that all but three of the species are unknown anywhere else. Furthermore, there is a small lake at the edge of Lake Victoria, called Lake Nabugabo, that is only 15 square miles in area. It is separated from Lake Victoria by a small spit of land that had been deposited by a stream entering Victoria. Radiocarbon dating of the plant remains in the spit proved that Lake Nabugabo became isolated only 4,000 years ago. Lake Nabugabo contains five cichlid species unknown anywhere else on earth. Thus, we have a case where five species of fish are known to have arisen within the last 4,000 years. If a young-earth creationist wants to believe that carbon-14 yields ages that are far too old, then this requires that speciation occur even more rapidly.[66]

Faster rates still are suggested by a study of the southern end of Lake Malawi, which was a dry lake bed only two centuries ago. Today the region is filled with many new local species and incipient species, generated within the past two hundred years! [67]

Modern molecular studies of the Lake Victoria cichlids show that they have an average alteration of 0.006 substitutions per location on the DNA molecule.[68] This does not sound like much; but for the cichlid, with one trillion DNA locations, 6 billion mutations had to have occurred which were not harmful and deleterious. This puts a dent in the young-earth creationist argument that all mutations are harmful.[69]

Many young-earth creationists, like Licata above (page 86), state absolutely that no new genus has been observed to arise. This simply is not true. There are several cases in which new genera have been observed to arise this century. Boraas told of his work with Chlorella pyrenoidosa in which a new family arose. A family is the

biological unit above the genus. He was raising these single celled animals for food for another protozoan, Ochromonas. A colonial form of this animal appeared in his apparatus that had never before been seen. It quickly took over the culture and has persisted for several years. At first, the colony sizes ranged from 4 to 32 cells, but eventually the colonies settled at 8 cells. Using the taxonomic criteria applied to asexual microscopic life this new colonial form not only is a new genus, Coelosphaerium, it is in a new family - one taxonomic step higher than a genus. Thus, in one step, the single-celled animal gave rise to a new family.[70] Notice that there were no intermediate or transitional forms! Such an event seen in the fossil record would appear as a gap which young-earth creationists would claim needs to be filled in. But how could there be a transitional form? The animal is either colonial or it is not. There is no middle ground!

A further refutation of Licata's claim that no new genus has ever arisen comes from Triticale. Scientists intentionally crossed wheat (genus Triticum) and rye (genus Secale) to produce a plant in a new genus Triticale. Corn (Zea mays) arose from a wild grass teosinte (Euchlaena mexicana). While some authorities have named teosinte Zea mexicana, the plant is sufficiently different from modern corn that many authorities have placed it in a different genus. Licata is in error to claim that no new genus has ever arisen.

Apparently, new phyla can arise even today. In 1995 Funch and Kristensen discovered a new species in a new phylum. This phylum was living on the mouth of lobsters. They write,

> "We believe that all the above features of this previously undescribed species warrant the recognition of a new phylum with affinities to Ectoprocta and Entoprocta."[71]

So creationists who deny the observational fact that new species, genera and phyla arise today, are burying their heads in the sand.

Fossil Genes link Adam to Apes

The rejection of morphological change pushed Christianity into racism. If morphological change can't occur, then Adam's descendants must look like him, that is, must look like whatever race the true Adam came from. Under this view, if Adam was a Caucasian, then one must question whether Adam gave rise to the American Indians. There would be no link between Indians and Europeans. Today we have evidence of a linkage not only with Native Americans, but also with the apes. If these men of 1500 had known this data, they would have been less likely to reject the Americans as human.

If evolutionists are correct, then there should be genetic evidence of relatedness contained within the genome of any individual animal. These evidences should be of sufficient force to prove this to even the most skeptical observer. The evidence for relatedness comes in two forms: similarity in working genes and similarity in useless genes. Cytochrome c is a respiratory enzyme that is distributed throughout much of life on this planet. It is made of between 103 and 112 amino acids. One might think that an enzyme that is as important as this one would be the same throughout nature, but it is not. The differences have been used to create evolutionary lineages. Closely related species like man and chimpanzee are expected to cytochrome c. Indeed, this is what is found. There are no differences between chimpanzee and human cytochrome c. Between man and rhesus monkey there is only one difference; position 66 in man contains isoleucine but rhesus cytochrome c position 66 contains threonine. Horse cytochrome c has eleven differences and kangaroos have ten differences from man. The have few differences in the arrangements of proteins in snapping turtle cytochrome c differs from man's at sixteen positions with one missing. The dogfish, a shark, has twenty-four differences.[72] Red bread mold differs from man in 44 locations out of the 104.[73]

> The number of differences appears to mimic the evolutionary "ladder." Evolutionists seeing this evidence assert that it proves evolutionary relationship. Creationists seeing this evidence state as Davis and Kenyon do, "Proponents of intelligent design read similarity in structure as a reflection of similarity in function."[4]

With the similarities from working proteins and genes, either argument is a valid way of looking at the issue. Both young-earth creationists and evolutionists have a valid interpretation of the data. But when it comes to the similarities between useless sections of the DNA, the young-earth creationist argument collapses.

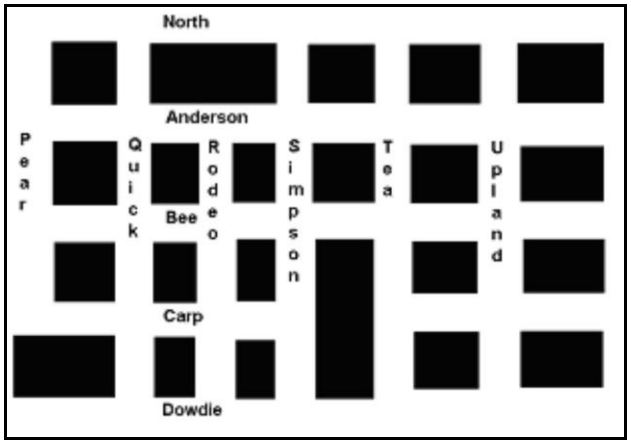

Figure 16 True Map

This can be illustrated by an examination of three maps. If I decide to go into the map-making business, I need to gather the information for the city map from the city manager's office. His map is shown in Figure 16. I copy the information as best as I can but even so, I make a few errors. My map can be seen in Figure 17. As you can see, I misspelled Bee, Tea and Pear streets. I also closed Bee Street off and opened Rodeo from Anderson to North. Let's assume that you wish to go into the map making business in competition with me. You think that you can produce a cheaper map and put me out of business. One of your strategies for producing a cheaper map is to copy the information I gathered at the city manager's office. In this way you can get the information more cheaply. Your map (Figure 18) has all of my errors plus another error. You misspell Simpson Street as Simpsen Street. Since all but one of your mistakes are identical to mistakes I made, I can take you to court and successfully sue you for plagiarism. If we had both collected our data from the City Manager's office the odds of us making identical mistakes would be vanishingly small. The only reasonable explanation is that you stole your information from me and made further errors. Other similarities might be due to design, but not to error. This useless and erroneous information is precisely the sort of data, which proves that your map is derived from mine. If both our maps were identical to Figure 16, I could not sue you for plagiarism, because you could always claim that you also had gotten your information from the City Manager. In that case our maps should look alike. Even useless information at the City Manager's office should appear on both of our maps. But errors in my map which do not occur in the City Manager's data but also appear on your map will put you in jail.

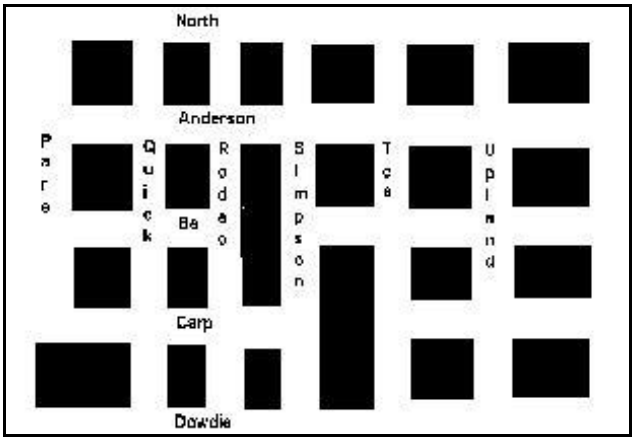

Figure 17 My Map

Within the past 20 years, useless genetic material has been found in the genome of humans. These worthless, impotent genes are called pseudogenes. These errors contained in the genetic information of various species can be used to prove which species copied their genetic information from another. There are two forms of genetic error. The first can be defined as any gene that can not be expressed in the developed animal because the gene for some other protein is missing or turned off. Even though the information is coded correctly, it is useless because it is only part of the instructions for a trait. This situation represents information that once was useful but is now retained despite being useless. There is an interesting example in horses.

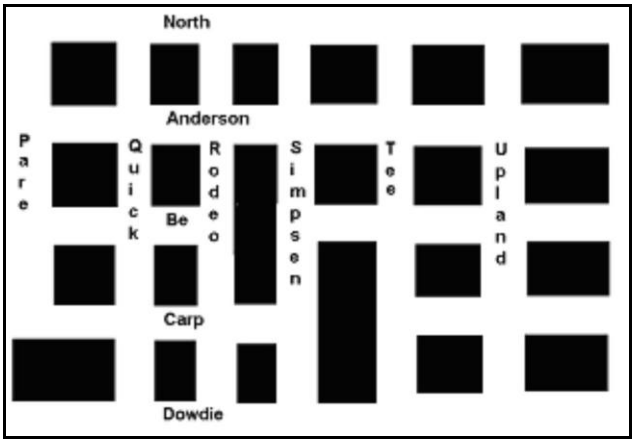

Figure 18 Your Map

As we noted above, the first equines found in the fossil record have three toes on their feet. Paleontologists suggest that the three-toed form lost the outer toes, producing the single-toed variety that we ride. Creationists have ridiculed this idea. The creationist magazine Ex Nihilo, now known as Creation magazine, wrote,

"Most evolutionists believe that millions of years ago three-toed horses evolved into one-toed horses. Pictures (*similar to the above) appeared in the 'National Geographic' of January 1981, p. 74. The article associated with the pictures describes an excavation in Nebraska. The remains of thousands of animals buried in a single volcanic eruption were dug up - a 'prehistoric Pompeii' the title proclaimed. The photos show a fossilized hoof of a one-toed horse and that of a three-toed horse. Both were trapped in the same eruption. The convincing caption in 'National Geographic' reads: 'An evolutionary moment is frozen in time. Complete skeletons of the horse Pliohippus verify the transition of primitive three-toed variety to the one-toed type ten million years ago.'

"Millions of readers of 'National Geographic' would no doubt have been impressed by this 'proof' of evolution and not given the matter any further thought. But what does this evidence really show? Clearly, the one fact that is 'verified' is that three-toed and one-toed horses both existed AT THE SAME TIME. Both specimens were trapped in the same volcanic eruption, in the same locality, 'frozen in time'. This hardly supports the idea that one type was the ancestor of the other! Creationists have long pointed out that the arrangement of the fossils in 'horse evolution' exhibits has been a contrived sequence, and that there was every reason to believe that the various types of horses lived at the same time. Had these two fossils been found in separate localities, they would no doubt have been displayed showing the three-toed one as 'older' than the one-toed.

"Finding them together like this is in reality an embarrassment to the idea of evolution. It most certainly does not verify any sort of 'transition'."[75]

The fact that the two types are found together does not at all mean that one did not evolve from the other. Evolution simply means that one morphological majority is replaced by another morphological majority. Thus, in the past, the vast majority of horses were three-toed. They were replaced by single-toed varieties. There would logically be a time when both types lived together. In fact, we still are in that period, for 1 out of 10,000 horses today is born with three fully formed toes on each foot. There is no intermediate or transitional form.

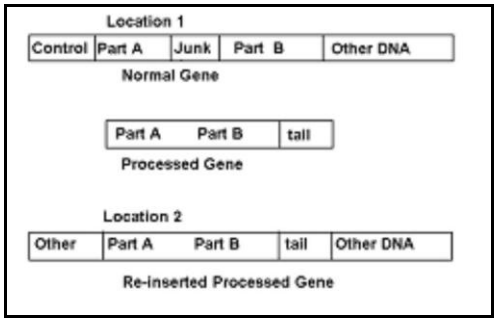

Figure 19 Gene Structure

The question young-earth creationists must ask themselves is, if horse's were created in the fashion that they claim, why do they have relict abilities to form extra toes? In their scenario, God must be responsible for creating this ability which deceives us into believing that they were related in an evolutionary manner to the earlier three toed varieties.. Does God deceive us? Absolutely not. If God doesn't deceive, then three-toed horses must have given rise to one-toed horses.

Other examples of preserved DNA from ancestral forms are fairly numerous. Marshall, Raff and Raff write,

"Reversals of long-lost structures do occur but evidently result from the co-option of genes that continue to survive in other roles. Among living cats, Lynx possesses primitive field features in its dentition. The carnassial teeth of the lower jaw (M1) in Lynx exhibit a third cusp at the hind edge of the tooth. Fossil evidence indicates that this structure was lost and then regained in this lineage. Lynx also exhibits the reappearance of the second molar, M2. This tooth has been absent in felids since the Miocene, about 20 Myr. Kurten has suggested that the regain of a cusp on the rear edge of the carnassial and the reappearance of M2 are correlated and result from a 'reactivation of the molarization field,' which brings M2 above the threshold of realization. Suppression of M2 probably did not involve the loss of any structural genes, since the same genes are presumably required for the morphogenesis of all teeth. In this case, regain of a lost structure after a long period of eclipse may not represent activation of any silenced gene but stem from changes in the level of gene activity controlling the size or strength of the molarization field.

"Other reversals have been noted in complex structures, including the reappearance of 'lost' muscles in the limbs of some birds and limbs in usually limbless tetrapods. It has also been possible to experimentally reverse toe number in guinea pigs by selective breeding from three toes to a more primitive four toes. This reversal appears to be the consequence of the continued

maintenance of an ancestral developmental pathway that can produce more toes in guinea pigs and can be elicited in the appropriate genetic background. As is the Lynx molar, toe number is a meristic trait: once the anlage is provided, the 'toe program' is played out automatically." [76]

Lande notes,

"The experiments of Wright on the hind digit V of the guinea pig, Cavia cobaya, have been described above. All living members of the family Caviidae and the capybara (sole living member of the closely related Hydrochoeridae) have the digital formula, I, II, III, IV on the manus [front foot--GRM] and II, III, IV on the pes [the back foot--GRM]. The same digital formula almost certainly occurred in the latest members of the extinct ancestral family Eocardiidae, i. e. Eocardia of the Lower Miocene. The initial members of the caviomorph radiation in the late Eocene were probably pentadactyl on all limbs, because the earliest known caviomorph, Platypittamys from the Lower Oligocene of South America clearly had five digits on the manus and pes, with the thumb considerably reduced in size. Thus the missing hind digit V of the guinea pig was lost sometime during the Oligocene about 30 million years ago. Wright (1935) also analyzed a semi-dominant gene, Px, in the guinea pig which tended to restore the primitive pentadactyl foot when heterozygous, but was lethal when homozygous, producing a monster with 7 to 12 undifferentiated digits per foot, cranioschisis and other gross abnormalities. Heterozygotes were also anomalous in other respects though the extra digits were usually well developed."[77]

And

"In view of the fact that external hind limbs of cetaceans were lost 40 million years ago, it is rather surprising that there have been reports of rare cases of external pelvic limbs in both mysticetes and odontocetes. Andrews (1921) described a humpback whale, Megaptera nodosa, with poorly developed hind limbs that protruded 127 cm from the body. In humpbacks the pelvic limb is normally represented only by an internal cartilaginous femur. Berzin reported a sperm whale, Physeter catadon, with external pelvic appendages 28 and 34 cm long. A total of six such cases are known in the sperm whale, giving a frequency of about 0.02% in the general population; these have a wide range of expression, including a full leg with some phalanges. Sperm whales normally have only an internal rudimentary femur a few centimeters long, attached or adjacent to the pelvic bone. All other odontocetes usually do not show even internal traces of pelvic limb elements. Nevertheless, rare external hind limb rudiments have also been observed in dolphins. Slijper reported a 16th century etching of a pilot whale, Globicephala malaena, showing vestigial pelvic limbs."[78]

Once again, if there was no evolution, why did God create these animals with genetic mechanisms that imply that they once had these features. The fact that these restored traits are found in the fossil record of animals very similar in morphology is inexplicable except on the assumption that evolution actually occurred.

The second form of useless genetic information concerns genes that have been separated from an important part of their information and inserted into random places in the chromosomes. Genes in the DNA consist of a control region, a coding region and noncoding (or junk region, See Figure 19). The working gene is shown in its normal form at location 1 on a particular chromosome. In order for the gene to be expressed, the DNA is first copied into RNA, a chemical that is similar to DNA. The RNA is then processed to remove the noncoding portions and the control region of the DNA. Then a section of RNA is added which allows the RNA to function properly. The RNA normally is transported from the nucleus to the cytoplasm of a cell where it directs the synthesis of a protein. Occasionally, the processed RNA with the added section is mistakenly copied back into the cell's DNA at a random location (location 2). This may be on the same chromosome or even on another one. This occurs because the RNA is mobile and can float throughout the cell. This re-insertion becomes part of the genetic inheritance of all future generations. The re-inserted gene is useless because it does not have the control section next to it and the junk is removed. If we find the same processed RNA reinserted into the DNA at precisely the same location in two different species, we can be sure that they are related.

An example of the second type is even more destructive to the young-earth creationist position. Edward

Max[79] relates the results of recent research concerning the human immunoglobulin [epsilon] gene. This gene was processed (as shown in location 2 of Figure 19) and then re-inserted into the same spot in both man, gorilla, chimp and gibbons. The identical mistake at the same spot in several separate species seems exceedingly difficult to explain if there is no relationship between all the species. One curious item was that part of the processed gene was not found in the chimpanzee. This seemed to argue against the evolutionary view until it was discovered that part of that region had been completely cut out of the chimpanzee DNA!

Young-earth creationism is quite incapable of explaining these similarities between man and ape. The only possible reply is that someday a function will be found for these useless regions of DNA. While that may be true, it is also an extremely weak reply, which displays a decision to ignore scientific data, hoping for new data. The scientific data comes as close as anything can to proving to the Christian that Adam and Eve-olution must be compatible. The failure to find a means of harmonization between the two viewpoints will ultimately have profound implications for Christianity. Christians must not put their heads into the sand, hoping for future data and giving the appearance of withdrawal from the world. In light of our Lord's command to go into the world making disciples, withdrawal and deliberate disregard of the data put before us seems counter to that command. If the Christian message is true, then there is an answer to these problems and Christians should not have to tuck tail and run every time these difficulties come up.

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POSTSCRIPT TO PART 1

As we have seen in the first part, young-earth creationists leave many facts and honest questions about their views unanswered. They find themselves in this position simply because they paint themselves into a theological corner by refusing to consider that there might be theological interpretations which save the doctrines that they find essential. These doctrines are: an actual seven-day creation, a real Adam and Eve, an historical Fall and a real entrance of death into the cosmos, at least as far as humankind is concerned. Being unable to think of any other alternatives, they remain convinced of a few-thousand-year-old universe and rule out evolution as being incompatible with their view of Scripture. This leads to three distasteful consequences.

First, it promotes a flight from fact. Any fact that indicates an old earth must be explained away, i.e., explained so that the data doesn't appear to mean what it obviously does. When discussing radiometric dating, they explain why the data doesn't really mean that the earth is old rather than explaining why it gives old dates in the first place. The fact that no animal found in Ordovician (or even Cretaceous strata) is identical to living forms is never explained. They merely attempt to explain why the difference couldn't be due to evolution without a single thought for what this change in morphology really means. This flight from fact is even more poignantly illustrated by a very brief correspondence I had with a prominent creationist whom I still count as a friend. After my views had changed, I told him why I felt that the geology was not being handled appropriately by the young-earth creationists and cited several facts to back up my assertions. He wrote back that he did not believe I could support the claims I was making. I sent him articles out of scientific journals with photos proving my point. I got no response. I sent more documentation and once again got no response. This is not the action of a man who is confident that he is correct. Somehow it is difficult to conceive of our Lord behaving in this fashion.

The flight from fact has the effect of making Christians look fearful of knowledge and the modern world in which we live. But, according to the Bible ". . .God did not give us a spirit of timidity, but a spirit of power, of love and of self-discipline." (NIV). If this is true, why do we fear so many facts?

The second problem is that their interpretation of the Bible places the Scripture in a no-win situation. The insistence that their interpretation is the correct and inspired interpretation, combined with their theologically correct position that the Bible must be without error, leads to serious difficulties. If the Bible is either error free or not the Word of God, and, their interpretation is the only true one, then obviously, if we find an error in the interpretation, it implies that the Bible is not the Word of God. Simple logic. In this section we saw the errors in their interpretation, as do many scientists. The problems with the interpretation lead many not only to reject the interpretation but also to reject the Bible. In spite of their protestations that only belief in creation can preserve the moral standards, their stand actually drives people away. The Bible is placed in a lose-lose situation.

Years ago I was talking with another prominent young-earth creationist. He was lamenting the fact that his son had gone off to college as a creationist to major in geology. He came out of college as a committed evolutionist. The father was blaming the geology professors for leading his son astray. Never once did this truly heartbroken father question the role that his own beliefs might have played in his son's "apostasy." He had failed to provide a proper explanation for his son.

I know of a geophysics major who graduated from Christian Heritage College, the college that supported the Institute for Creation Research for many years. After going to work for a major oil company and seeing the geologic problems that his professors had failed to teach him, he underwent a major crisis of faith.

Steven Robertson, a personal friend of mine, studied at the Institute for Creation Research and his master's thesis became ICR Technical Monograph No. 6. After his education, he went to work for a major oil company. Over they years, he examined the geologic data, the seismic data and other sources of information. Like me, he eventually rejected young-earth creationism. While he did not have a crisis of faith like I had, he did leave his former beliefs behind.

The final difficulty with the young earth view is that it is attempting to do what Jesus told the Pharisees not to do - seek a sign (see Matthew 12:38). Young-earth creationism seeks for a proof that God created the world so that they can use that as the cornerstone of their faith. It is as if it is more important for God to have created the world in the fashion they say, than for Jesus to have died for our sins. Proof of creation becomes a point of certainty in their faith. It confirms that the Bible is true and therefore authenticates the truth of the message. This is backwards to what the faith of the Christian ought to be. Our faith should be in Jesus, not in the creation of the world by God.

What is the place of apologetics in the area of creation and evolution? It is simply to provide a plausible synthesis between what science knows and the truth of the Bible. A synthesis is nothing but a plausible scenario. It is not metaphysical truth, nor is it an infallible interpretation of Scripture. The synthesis is simply a way of reading the Scripture which minimizes the tension between observation and the interpretation of the Bible. Christians should not treat their apologetics as equal to the divinely inspired Scripture. And they should not tie the infallible Word of

God to a falsified viewpoint. Young-earth creationism is a falsified viewpoint.

There is a tremendous need for a new apologetic. Genesis 1:1 says, "In the beginning God created the heavens and the earth." This simple statement has caused much controversy. In the prescientfic days few questioned it. As science has developed and mankind learned more, clashes have developed between what the Bible says and what science observes. Actually the clash is between the traditional interpretation and what science observes. From the 1500s on, shock after shock has hit the traditional Scriptural interpretation. David Hume's crisis of faith occurred only half way through this series of shocks.

The first shock was the discovery that the earth did not go around the earth. Until the Copernican revolution, the universe was considered to be Earth-centered both theologically and physically. All Biblical interpretations assumed a Ptolemaic astronomy, which placed the earth at the center of the universe. All astronomical objects were believed to orbit the earth and all orbits were perfect circles. God would not create imperfect ellipses.

With Copernicus, theology had to adjust and it was a difficult adjustment in two areas: observational reality and God's perfection. Copernicus was concerned that people would use their observation of daily solar movement to reject his view. Thus Andreas Osiander wrote a foreword to Copernicus' book which stated that Copernicus' views were not necessarily true. Osiander said that this represented only a new calculational method. This was done to avoid trouble with the Church as well as to avoid appearing absurd. Everyone could see that the sun moved and the Earth didn't. Also everyone knew that the Bible indicated that the Earth was the center of God's creation.

Concerning God's perfection, Kepler discovered that the planets didn't move in circles but they moved in ellipses. Since an ellipse was believed to be less perfect than a circle, some theologians viewed the new Copernican theory as impugning God's perfection. This issue was further highlighted by the discoveries made by telescopes. Galileo discovered craters and mountains on the moon and blemishes (sunspots) on the sun. It seemed that everywhere scientists were calling into question the perfection of God's creation. Because of this Galileo was forced to recant his support of Copernican cosmology. But as we saw in Chapter 2, the Bible only says that God created a 'good' world, not a perfect world.

The second shock came when the science of paleontology discovered that animals had gone extinct. This implied that God had created something that wasn't perfect.[1] Perfection, after all, implied eternality and extinction implied something very wrong with the creation. Extinction also violated the church doctrine of plenitude. This doctrine said that creation was an interconnected whole. The loss of a single part would cause creation to fall apart.

Once again the battle lines were drawn. Churchmen said fossils weren't the remains of living beings. But geologic studies showed that the oldest rocks contained animals unlike those which live today implying that an entire biosphere had gone extinct. Paleontology required, even proved extinction. Once again the church lost.

The third shock came when it was realized that the earth was older than 6000 years. We have seen evidence of this in the previous chapters. This knowledge spread across Christendom in the early 1800s prior to Darwin. This information affected the concept of a universal deluge. The last well-known geologist who supported the global Flood was William Buckland who finally threw in the towel in 1840. He admitted from then on that there had been no universal deluge.

The fourth shock was the rise of evolution. It had the effect of removing man from the center of the biological universe. Some said that man was just another animal. Some believed that this proved that man was no longer the theological center of the universe. How one can determine God's interest level from evolution, one can't say. If God used evolution, man could still be the center of His attention.

We saw earlier that the Scripture does not limit the age of the earth or the age of man. St. Basil in 400 AD noted that the days in Genesis were indicative of a long period of time, especially the first day. This was prior to the advent of modern astronomy, geology and other areas of science. Basil wrote,

> "If then the beginning of time is called "one day" rather than "the first day," it is because Scripture wishes to establish its relationship with eternity. It was, in reality, fit and natural to call "one" the day whose character is to be one wholly separated and isolated from all the others. "[2]

The days were not time but 'distinction between various states and modes of action. Basil continues,

> "If Scripture speaks to us of many ages, saying everywhere, "age of age, and ages of ages," we do not see it enumerate them as first, second, and third. It follows that we are hereby shown not so much limits, ends and succession of ages, as distinctions between various states and modes of action."[2]

Another indication of the ancient age of the earth is the use of the Hebrew word owlam. Genesis 49:26 says,

> "The blessings of thy father have prevailed above the blessings of my progenitors unto the utmost bound of the everlasting (owlam) hills"

The passage is talking about progenitors, that is the past. According to Strong's Dictionary Owlam means "eternity" "past or future". This says that the mountains are old. They are older than merely 2000 years at the time of the writing.

We saw that the genealogies are not complete and we saw that if we treat the genealogies as complete then the Tower of Babel occurred more than 1000 years after many written languages existed around the world. A new discovery places the earliest writing at 3,500 B. C. in Pakistan and the second oldest in Egypt and the third in Harapan, India. These were different languages prior to the classical time for the Tower of Babel.[3]

We also saw that death is not ruled out by the Scripture, that sin spread death to all men not the animals, and that God created the world 'good' (towb) not 'perfect' (Tawmiym). He specifically avoided the word for perfect and used the word for good. This word 'good' was the same word Lot used when he offered his daughters for rape. This analysis of the Hebrew words implies that the created world was not deathless heaven.

We have seen that the Bible has the land and the sea bringing forth life. That is evolution, or at least what evolution says. The Bible teaches evolution. We also saw that there was no statement in Scripture to the effect that animals must give rise to animals after their kind. By this I mean a statement with animals as the subject and animals as the object. The phrase 'after their kind' means of various kinds not 'reproduce after their kind.' The word reproduce does not appear in Genesis 1.

It is clear from the science that we need a new apologetic. It is clear from the statements of Scripture that we need a new apologetic. It is time for Christianity to get on top of the curve. It is time to quit reacting every time a new discovery comes along, but we should anticipate what future scientific developments would bring.

Future apologetical viewpoints must be internally consistent and make predictions. Only in this way can the view be falsifiable. The risk of falsification is the only way to verification. We should cease being afraid of falsification. Successful predictions are the only thing that will ultimately impress hard-nosed scientists and lend credibility to the view. We should hold ourselves to the same standard that we hold evolutionists to. Unfortunately, we expect them to have a higher level of verification than we want for ourselves and for our views. This is hypocritical.

In what follows, such a suggestion is made. It must be held to the standards above. It must fit the data.

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Part 2: The Novel View

DESIGN IN THE YOU-NIVERSE

David was born to a religiously Calvinistic family. They attended the local church where his uncle was the pastor. He had all the advantages a religious upbringing could give. His devoutly religious mother home schooled him and he took religion seriously. Having read the Calvinistic book, The Whole Duty of Man, he tried to live his life by that standard.

David had been taught the correct things. He had been sheltered until an age at which he should have been able to handle the world's ideas. Being zealous to advance philosophical arguments in favor of God's existence and against atheism, he became interested in philosophy. He kept a notebook about these mental wrestlings with ideas.

During David's adolescence, the design argument for God's existence was very popular. Machines must be produced by intelligent agents and the universe resembles a machine. Therefore, the universe was created by an intelligent agent, i.e. God.

David saw a problem with the argument for design and he tried to fix it. In order to determine the cause one must be able to determine causality. He realized that what men called causality was merely the association of two events. When a ball strikes another ball and apparently causes the second ball to move, no one sees the force causing the second motion. Since causality can only be determined from past association of two events, one can't be sure that the association will continue into the future. Thus causality is not actually observed.

If there was no proof of causality then there could be no proof of causality when applied to the design argument. This meant that design could not be confirmed. It meant that God could not be proven to have designed the universe. And most importantly, it meant that God could not be proven to exist.

Of this time years later, David Hume reported, "Tis not long ago that I burn'd an old Manuscript Book, wrote before I was twenty; which contain'd, Page after Page, the gradual Progress of my Thoughts on that head [i.e. religious belief]. It begun with an anxious Search after Arguments, to confirm the common Opinion: Doubts stole in, dissipated, return'd, were again dissipated, return'd again."[1]

Finally at the age of 18, David had what others called a 'nervous breakdown'. [2] There is little documentation of that period. It appears to have been a crisis of faith. It took him several years to overcome his difficulties.

David Hume was destined to become one of the world's most famous and accomplished philosophers. His works are still studied in graduate schools around the world. In 1739 at the age of 27 he published A Treatise of Human Nature, which criticized religion indirectly by attacking the epistemological basis of it. Indeed, he spent the rest of his life attacking religion. His last, and most famous work, Dialogues Concerning Natural Religion was his most ferocious attack upon the ability of man to support religion through observation.

In this book, he argued that design could not be inferred for four reasons. First, causal connection is weak. Secondly, we can't look at universes with alternative designs to see what their designers did. Without this alternative, we can't know how well designed our universe is. Thirdly, Hume said, to claim that God would design in the same fashion as humans design, is to anthropomorphize God and make ourselves the model of the universe. It is to make God the subordinate rather than man. And finally, to complexity is no guarantee of design. He observed,

> "It is vain...to insist upon the uses of the parts in animals or vegetables and their curious adjustments to each other. I would fain to know how an animal could subsist, unless its parts were so adjusted?"[3]

This pretty much does away with Michael Behe's complexity arguments.[4]

So how does the Christian answer Hume? Argument 1 is that causality is weak. It is true that we can not prove, metaphysically, that causality exists. But Hume overlooks the way we learn causality. Hume argued that we learned everything from the external world and that there was no innate (or inborn) knowledge. Thus he believed that we learned causality from within ourselves at an early age. Hume was wrong. We don't learn causality from outside, we learn it from within. We learn at an early age that our will can cause our own hand to move. We don't learn causality by watching balls strike each other.

We also learn causality by action. We have to act as if causality does exist. We have to act as if a car that hits us will hurt us. If we don't act accordingly, we will not be here to add our voice to the philosophical argumentation. We know of few exceptions to the proposition that jumping out of an airplane without a parachute will kill us. Experience watching others teaches us that what is not seen must be inferred.

Hume's second argument, an inability to look at alternative universes has been disproved recently by

studies in physics. Hume was an empiricist. He believed that all knowledge came from experience. Mathematics doesn't come from experience but comes from pure thought. Mathematics has been unreasonably effective in explaining the world as we know it. Because mathematics is capable of making predictions about the real world, we can consider alternative universes mathematically. Hume had never considered this possibility and thus his second argument is voided.

Hume's third argument, that we can't understand the way God would create or design a universe is partially true. But since we are created in the image of God, it seems a stretch to believe that our fashion of design would have nothing in common with the means by which God designed the universe. By mathematics, which is purely a mental phenomenon, we can match the world exactly. In fact, mathematics is our model for the universe.

In 1539 Gerolamo Cardano was preparing a book on algebra. He discovered the square root of a negative number and invented the complex number system. It was purely a mental conception with no connection to reality. Except this mental feat became the very mathematical basis for quantum mechanics, the theory that controls all chemical reactions, the atomic bomb and all of modern electronics. Gerolamo Cardano had no idea of the importance of his mental game.[5]

Hume's last argument that complexity is no guarantee of design is true. But this does not rule out design. The world's economy was not designed by a designer yet is quite complex. It just happened by the actions of everybody trying to get richer. This example proves that design must be determined on other criteria than complexity. Design can be inferred only if it is inferred from something that only God can do. It can't be something like the distance of the planet from the sun. Given the number of stars, chance would allow some planets to be earthlike. But the setting of the values of the physical constants for the universe is clearly something that only the creator can do. What we will look at in this chapter is the design of other possible universes. It is called the anthropic principle. Many physicists have been taken with the uniqueness of conditions that will allow for life. These arguments are only valid for a universe that is old. None of these arguments can be used within a young-earth creationist paradigm.

The Ant-othropic Principle

Why does the ant exist? "He evolved by chance" is the normal evolutionary answer. But more basic to this is the fact that he exists because life exists on our planet. But why does life exist? Living matter consists of complex organic polymers which regulate the processes of life. These exist because there are stable chemicals made up of stable protons and electrons. The ant also exists because there is a planet upon which he lives, in a stable orbit around a stable star. The star is located a long way from the chaotic center of the galaxy. All of these factors add up to allow for the existence of the ant. If any one of these factors was different, the ant's existence would be threatened. These coincidences have often been used to argue for the existence of a grand designer like God.

If God created the universe one would expect some type of evidence, but not proof, supporting this concept. What should this evidence consist of? It should be a set of circumstances that are extremely unlikely or incapable of existing without intelligent thought or design. How can such circumstances be recognized? We saw in the last chapter how ineffectual the argument of design is when applied to biological systems. The probability of a working protein's creation is not evidence of design. The overlapping functionality observed by Joyce proved that the odds against a given function being produced by nature are not as bad as the young-earth creationists contend. A very high number of proteins are able to perform the same biological function, making it almost a certainty that one will be generated. The odds against the existence of a particular set of circumstances is not an argument for design when it was inevitable for a set of circumstances to exist, regardless of which particular set of circumstances it is. The odds against your personal existence were one chance in 10^{2400}, but the odds that somebody would exist (even if it weren't you) are quite high. This is why it is not unusual for the odds against your personal existence to be so great and yet still you exist.

In early 1995 I had a debate on the internet with Michael Behe, the author of Darwin's Black Box, about the definition of design. I had asked him, a design theorist, if there was a quantitative measure of design. He had said that it was not useful to put numbers on these things. But, as noted above with mathematics, the purpose of science is to quantitatively describe the world. If design can't be quantified, then it can't be scientific.

While many observers to that debate thought I was arguing against design, I wasn't. Design can be recognized by estimating the uniqueness of the universe. Only God can set the parameters for the universe. And the uniqueness of the universe can be measured numerically. We know how much of a change in a specified physical constant will destroy life. If we estimate the range of acceptable values and divide by the range of values

that might be chosen at random, we obtain a measure of the universe's uniqueness. It is a measure of how likely our world is to have been selected by chance.

This avoids Hume's objection that there is only one universe and we can't make comparison. Modern physics has given us a means of comparing possibilities. We can look at the conditions in the universe which make life possible and ask how likely they are to have been chosen at random from all the possibilities, given a fixed set of natural laws. In other words, does it appear as if the universe was created so that ants could exist? This principle is the "ant-othropic" principle, otherwise known to more serious scientists as the anthropic principle. This is the concept that the conditions in the universe are so unlikely that it appears that the universe was designed for life.

As physics has advanced it has become apparent that the constants of nature which govern all motion, radiation, galaxy and star formation, and all other material interactions are just the correct value for life to exist. Changes in these values beyond a certain range would preclude the existence of ants and man.

There are twelve fundamental features of the universe that we will examine in detail, and a few we will look at in less detail. Each of these features is fundamental to our existence and a number defines each. We will look at the numerical range within which life can exist and then divide it by the range of possible choices. The quotient is then a measure of the probability that the variable was chosen by chance. For instance, it is often claimed that the position of the Earth, its distance from the sun, is crucial to our existence. It is, but it is not an unlikely occurrence. There is only a small zone around the sun in which a planet can be placed and have that planet support life. This zone extends from .95 astronomical units to 1.37 astronomical units. An astronomical unit is the distance from the Earth to the sun. Now the nine planets range in distance from .38 astronomical units (the earth-sun distance) to 39.4. Assuming that this is the maximum range from which you could place a planet, the odds of putting a planet in this tiny habitable zone are (1.37-.95)/(39.4-.38), which is a 1% chance. However, there are nine planets so the odds that one of the planets will fall within this zone are 9 times 1% which is almost a 10% chance. Out of all the star systems with nine planets around them, 1 in 10 will have a planet within the habitable zone. Considering the number of star systems that are likely to exist, our type of solar system can not be an unlikely occurrence in the galaxy.

The methodology used here is different than that which most authorities use when discussing the anthropic principle; it was suggested by discussion on the internet concerning how design in the universe was to be recognized. Simply stating that something is unlikely is not a very meaningful statement where design is concerned. And noting that a minor change in a physical constant makes our existence impossible does not tell us how unusual such a change would be. The following discussion will assume that the universe was constructed by pure random choice of the parameters discussed. If the 'parameters' of the universe are set by some type of all-encompassing physical law, then the reader needs to be aware that the following discussion does not apply to that situation and the conclusions drawn will be inapplicable. The method won't prove design, but will give evidence of it. This method will seriously underestimate the chances of choosing the various constants. A truly random choice has no upper or lower boundary on the chosen number. I must place some boundary or all the values of fundamental constants have zero chance of being chosen. The method has the advantage that it does produce quantifiable numbers as an estimate of how likely design might be assuming the alternative is pure random chance.

Designing a Universe

Our universe has three spatial dimensions upon which all physical interactions occur. These three dimensions are length, width and depth. These are the only dimensions that we are capable of envisioning. Those who have studied relativity in college will be perfectly aware of the inability to actually visualize in our mind's eye what a fourth dimension looks like. All one can do is simply perform the mathematics and examine the results. Our brains are not constructed for four-dimensional visualization. But if you were to create a universe wouldn't it be fun to have more than three spatial dimensions? Three is so boring. Well, by pure chance, if you were selecting a dimensionality for your universe by lottery, then there could be anywhere from 1 to 10,000,000 or more dimensions. Pick a number, any number. Unfortunately, only one number will allow life. That number is three.

Throw a rock into a pond. A single event, the rock entering the water, creates a seemingly endless series of waves. The water's surface goes up and down multitudinous times. Waves in a two-dimensional universe, which is what the surface of a pond can be considered to be, reverberate. This reverberation makes communication impossible. Say you are at the edge of a large pond and a person across the pond is going to communicate with you by Morse code, by throwing rocks into the pond. The distance across the pond is too great to hear him. The tempo with which he throws the rocks will determine whether it is a dot or a dash. What you observe is a wave

coming across the pond splashing up on the shore. You note the time it arrives. Another wave comes and you dutifully note its time of arrival. But did the second wave come from the first stone, or has your partner thrown in a second one? Another wave approaches the shore. Once again you don't know. In fact you have no idea how to decipher your comrade's message. This is the case in every spatially even-dimensional universe, that is, universes with 2, 4, 6, etc., dimensions. The problem of reverberation in even-dimensional universes is not confined to sound. All forms of communication are affected in the same manner. Thus, nerves in the arm could not communicate pain to the brain or orders from the brain for the legs to move. Life would be impossible.[6]

In spatially odd dimensional universes except three, dispersion is too great for communication to take place. Dispersion is the tendency for different frequencies of wave phenomena to travel at different speeds. This distorts the wave shape and leads to unintelligible communication. If I say "Travel down the paths less sought", severe dispersion will make that sound like "Drabel bown the bash leth thod." Obviously, information is lost in this fashion. In four spatial dimensional universes and higher, dispersion is so great that communication becomes impossible. Thus Barrow and Tipler conclude,

> "Only three-dimensional worlds appear to possess the 'nice' properties necessary for the transmission of high-fidelity signals because of the simultaneous realization of sharp and distortionless propagation."[6]

One final feature of dimensionality is that closed, stable planetary and atomic orbits are possible only in a universe with less than four dimensions. Without these orbits, neither chemicals nor chemists nor habitable planets upon which they live could exist.[7] Assuming that dimensionality could be anything from 1 to 100, then the odds that a three dimensional universe would occur by chance is 10^{-2}.

Lest we fall into the same fallacy that occurs with the discredited biological design argument, we need to examine an important issue. If the universe had an alternate dimensionality, then we would not be here to observe it. Since we are here, there must be an explanation. Either we are incredibly lucky or there are an infinitude of universes and we just happen to be in one of the few which allows life, or this is the only universe which could possibly exist. The infinitude of universes, known as the many-worlds hypothesis, has been advanced by Hugh Everett in an attempt to explain certain quantum mechanical paradoxes. He envisions the world as a causally disjointed ensemble of all possible universes. There is one universe in which you are a blonde. There is another where you died at three years old. There is another. . . Thus we are allowed to exist because no matter how small the odds against a life-hospitable universe, there has to be at least one and we are in it. This is known as the Anthropic Principle.

How is one to answer such objections? First, other than solving the quantum mechanical difficulties, there is no evidence for these parallel universes. After all, by definition we are unable to communicate with them to verify their existence. Secondly, there are other interpretations of quantum, which do not require the many-worlds hypothesis.[8] The upshot is, that in order to turn the evidence for design in the universe into the anthropic principle, we must believe in something which can not be observed or verified. To believe in the many-worlds hypothesis is to have faith in the existence of the unobservable; and yet many of those holding the many-worlds hypothesis will ridicule those having faith in another unobservable - God.

Modern science has shown that the universe came into being during the Big Bang. Time and space were created and expanded. As the universe expanded and cooled the matter must have condensed to form galaxies because we live in one and can observe others. But galaxy formation presents a difficulty. If the universe at an early age were not expanding at precisely the correct speed we would not be here. Either no galaxies would form if the speed was 1 part in 10^{55} too great or the universe would collapse back on itself before stars could form if it were an equal amount too slow.[9] Thus, the ant exists because of a perfectly balanced cosmological expansion which could not be more than 1 part in 10^{55} different.

The number of photons per proton is also an important number for our existence.[10] This number, a billion, represents the entropy of the universe. If the entropy were less than a thousand then there would be no atoms, and if it were as high as 100 billion then radiation would dominate the universe and the heat from that radiation would have prevented galaxies from forming. No galaxies, no ants. We can calculate a probability of 1 chance out of 10^3 (one chance in a thousand) that the entropy would fall into that range.

Our universe is governed by four fundamental forces. Only two of them are really familiar to most people. The force of gravity, of course, holds us onto the earth, retains our atmosphere in the correct chemical composition and keeps the earth in orbit around the sun. The electromagnetic force is the force that holds electrons around atomic nuclei, gives us electricity, and protects the earth from the solar wind. The strong force holds the nucleus of

the atom together against the very strong repulsive electromagnetic force. Without the strong force there would be nothing but hydrogen in the universe. The weak force is the final of the four forces. It, too, is responsible for the existence of atoms but is the least well known of the four. It governs certain nuclear processes.

Both the gravitational and electromagnetic force are inverse square forces. The force gets weaker with the square of the distance. At a distance of two, the force is four times weaker than it is at a distance of one. At a distance of three, the force is nine times weaker. This is expressed as $1/r^2$ or r^{-2}. If you were to design a force that varied with distance, why would you choose the exponent to be -2? Why not -2.1, -1.98, +2 or even 100? A universe created strictly by chance could have any value at all for this exponent. But there are only two values of the exponent which will allow life to form - one or minus two. Only if the exponent is exactly 1 or exactly -2 can a closed, stable orbit of either a planet or an electron exist. With other values the orbit of the earth would be too erratic for life. A value between 2 and 3 produces an orbit that swings wildly, near then far from the sun. Above 3 the earth spirals away. Below 2 the earth spirals into the sun. In either case life on earth would die either a heat death or a frozen death. Similarly, if the exponent of the electric force were anything but a one or minus two no atoms would exist. In a random drawing of any conceivable real number, (a real number being any conceivable fractional number) the mathematical odds of picking -2.00000000. . . is practically zero. Between any two real numbers lie an infinite number of other real numbers. Between 1.99 and 2.00 lie an infinite number of real numbers. Technically, since anything divided by infinity is zero, the odds of picking exactly 2 by chance is exactly zero. These numbers must be selected by design or we are the most incredibly lucky lotto winners! But for our purposes let's assign this a probability of one chance out of 10^{20} for each of the forces. We can do this because to date, these two forces are theoretically independent of each other. This may change as more knowledge is gained.

One issue needs to be addressed here and that is the mathematical form of the laws of physics. The forms of the laws are essential for our existence. Change the forms and we don't exist. Why were the forms chosen which were chosen? As we saw in the case of gravity and electromagnetism only two mathematical forms would allow stable orbits. But in a world of pure chance even the form of the laws are up for grabs. While the form of gravity and electromagnetism are identical, the form of the strong force is much different.[11] The weak force has even stranger characteristics; it is not applicable to speak of it as attractive or repulsive as the other forces are classified.[12] Thus if we were to even choose a random form for each of the four forces from one of the three known forms for the physical laws based upon pure chance, we would have a one percent chance of choosing the forms which the forces currently possess. And if we allowed any conceivable mathematical form to be picked then the chances of picking just the forms we have becomes negligible.

The strength of the gravitational force is essential for our existence as well. If the force of gravity were 10 times greater, then the sun would be burning so rapidly that it would now be approaching the red giant phase. The earth would have been vaporized since the sun would have engulfed it.[13] Nuclear fusion is unable to create elements heavier than iron because less energy is liberated in the fusion process than is put into it. Without a supernova, no heavy elements can be made. If the gravitational force were three times weaker, all stars would be red dwarfs; there would have been no supernova to create the heavy elements out of which we are made[14]. It can be shown[15] that the odds of choosing a value for the gravitational constant within these bounds is 1 chance out of 10^{10}.

The strength of the electromagnetic force is governed by the electromagnetic fine structure constant. Its value is .0072. If this value were greater than .011, molecules would not form because all of the electrons would be too tightly bound to the nucleus. If the value were smaller than .0055, electrons would be too lightly bound to atomic nuclei and no atoms would exist. Either case would destroy the ant, your aunt and you.[16] The chances of choosing a number in this range is 1 chance out of 36.

The strong force is the force that holds the nucleus of the atom together. The intense electromagnetic repulsion is always acting to tear the nucleus apart. If the strong force were only 3.4% greater, two protons would form a stable atomic nucleus, called diproton. While this does not sound bad, if diproton could exist, all the hydrogen in the universe would have catastrophically been converted to helium.[17] With no hydrogen in the universe, there would be no organic molecules (they all contain hydrogen), no water (it contains two atoms of hydrogen) and possibly no stars. Life would be very difficult under such circumstances. If the strong force were only 9% smaller, a form of hydrogen, called deuterium, would not exist. Deuterium is a form of helium. Deuterium is a crucial link in the chain of nuclear reactions which leads to heavier atoms like carbon, silicon etc. The odds of the strong force falling within these bounds are 1 chance out of 911.

There is not enough data to calculate the odds of the weak force having its present value by chance. But there are limits to how much it can vary. The earth, as has been noted before, is made up of elements that were created during a supernova prior to the earth's formation. Without supernovas, we could not exist. A supernova

occurs when a star can no longer generate enough heat to support itself against its own gravitational pull. The star then implodes or collapses releasing a huge quantity of energy that is carried out of the star by neutrinos. Neutrinos are small subatomic particles which rarely interact with matter because the weak force is so weak. But during a supernova so many neutrinos are formed that they interact with the outer layers of the star and push the matter explosively towards space. The result is a massive explosion which forms, and then scatters, heavy elements into interstellar space. These elements eventually coalesce into planetary bodies such as the earth. Thus, without this interaction the earth would not be here. If the weak force were much smaller, all of the neutrinos would escape from the star without pushing the much-needed heavy elements into space. Then we would not exist. On the other hand, if it were much stronger there would be too few neutrons, which would prevent the formation of helium during the big bang. Without helium, stars would not be able to produce the heavy elements in the first place.[18] We won't calculate the odds.

Feature	Probability
Dimension	10^{-2}
Cosmological Expansion	$10^{-5}5$
Entropy	10^{-3}
Gravity Inverse square	10^{-20}
Electromagnetism Inverse square	10^{-20}
Gravitational	10^{-10}
Electromagnetism	10^{-1}
Strong Force	10^{-1}
Neutron Mass	10^{-3}
Electron Mass	10^{-5}
Electron is Fermion	10^{-1}
Quantization	10^{-1}
Total	10^{-122}

Table 12 Probabilities for Life

There is an amazing coincidence in the mass of the neutron, proton and electron. Without this coincidence, there would be no protons and electrons; only neutrons would exist. This would leave a universe which had no hydrogen. Hydrogen is found in amino acids and nearly every other biochemical molecule. The coincidence is that the mass of the neutron is just barely greater than the combined mass of the proton and the electron.[19] This allows a proton to remain stable and not decay into a neutron. Without this coincidence all protons would become neutrons and there would be no atoms. If the proton mass was just .001 times larger this catastrophe would occur. The odds of this occurring by chance[20] are 1 chance out of 1300.

According to Regge, the slightest variation in the ratio of the neutron mass to the electron mass would destroy the ability of DNA to replicate itself.[21] When only one value will allow for life it is very difficult to determine the correct odds of this occurring. Once again, technically, the odds of choosing the ratio by chance is zero since only one number will allow for life, and there are an infinite number of possible numbers which could be chosen for the ratio. But for the sake of argument, let us assume that the probability of this occurring by chance is 1 in 100,000, although it is in reality much smaller than this.

There are two types of matter in the universe. No, not matter and antimatter. Fermions and bosons are the two types. While this gets a little technical, fermions are particles like the electron which have what is known as an antisymmetric wave function. Protons are bosons and have a symmetric wave function. What does this mean for us? Electrons are arranged around the atomic nucleus in shells. Without this structure electrons would all be in the lowest possible orbit and chemical bonds would not be able to form. Without chemical bonds no life would exist. The antisymmetric wave function of the electron forces electrons to remain separated from each other, which allows for chemical bonds.[22] Since there are only two types of matter we have a fifty-fifty chance for this to occur.

The fact that quantum mechanics is necessary to describe the atom is also essential for our existence. Quantization of the electron orbits means that a given electron can only have certain energies and no other. Without quantization an electron in orbit around a proton could have any energy whatsoever. Every time the atom bumped into a neighboring atom, the electrons would absorb some of the energy and would change orbits. This would cause the chemical properties of the atom to change hundreds of thousands of times each minute. No stable chemical molecules could be formed under such conditions. Since we either have quantization of the electron orbits or we don't, the probability of this occurring is one chance in two.

There are three coincidences in the nuclear energy levels which have allowed for life to exist. These coincidences allow stars to fuse helium into the heavier elements and, as we have seen without the heavier elements there is no way that planets and life could exist. The first coincidence is the half-life of Beryllium-8. Beryllium-8 is so unstable that it decays away in 10^{-17} second. One could say that it hardly exists at all. But beryllium-8 is an essential step in the formation of the heavier elements. Two helium atoms must collide to form a

beryllium atom and then, while the beryllium exists, a third helium atom must strike the beryllium atom to form carbon-12. If beryllium-8 were less stable, then it would decay before the third collision could take place. This would mean no carbon and no life. If on the other hand, the beryllium-8 atom were more stable, all the helium in the star would fuse to form beryllium and then carbon catastrophically. The star would explode before very much of the precious heavy elements were formed. Thus, a slight variation in the lifetime of beryllium-8 has dire consequences for our existence. Since the exact lifetime of beryllium is determined by the strength of the strong and electromagnetic forces we will not place a probability upon this coincidence. However, it does place very tight restrictions on the strength of those two forces.[23]

The next coincidence is the resonance level in the carbon-12 atom. Without this resonance, which allows the beryllium and helium to join, there would be no carbon-12 or life. The final coincidence comes from the fact that an oxygen-16 resonance level lies just below the carbon-12 + helium level. If the oxygen resonance were above the carbon-12 + helium level, all of the carbon would catastrophically fuse to form oxygen. This too would cause the stars to explode. As is too obvious to say, no stars, no life.

The value of 10^{-122} is the odds against pure chance creating just the correct values so that the universe can support life. Is there any way this argument could be incorrect? Yes. The calculations above require that each of the individual chance calculations be independent of each other. If, for instance, choosing a particular value for the gravitational force would fix the appropriate value for the other forces, then the odds of having a universe fit for life is merely the odds of the gravitational force having the value that it does. However, current knowledge does not seem to support such a view.

Physicists today are attempting to create the Grand Unified Theory (GUT) which is a theory of everything. GUTs are attempts to explain all of the four forces of nature as expressions of a single force. If one of these theories proves true then the values of the various constants discussed above could easily be due to requirements in the GUT and not due to chance at all. However, a GUT does not explain the great coincidence and the strong implication that the very structure of the universe is designed for life. The Grand Unified Theories are classified as gauge theories which we do not need to define here. The important point is that GUT's have their own set of constants, free parameters, whose values must also be explained. According to 't Hooft,

> "The strength of the gauge theories is that they require comparatively few such free parameters: about 18 constants of nature must be supplied to account for all the known forces. The tangled phenomena of the strongly interacting particles, which seemed incomprehensible 15 years ago, can now be unraveled by means of a theory that includes only a handful of free parameters. Among these all but three are small enough to be safely ignored."
>
> "Even if the free parameters have been reduced to a manageable number, they remain an essential part of the theory. No explanation can be offered of why they assume the values they do."[24]

If the values of the constants we have examined are not fundamental, then the gauge theories have other constants which are. They too have values that need explanation. Why did those constants assume just the correct values for life to exist? Even if physics reduces the universe to the value of one constant we must still explain why that constant assumed the particular value which allowed life to exist.

We have looked at the very structure of the universe and calculated probabilities that the physical constants have the values they do by chance. Table 12 shows the entire suite of the twelve features. The analysis shows that we have one chance in 10^{122} for existence if we are here strictly by chance. Our existence is extremely unlikely to be due to purely random events. Carl Sagan wrote a novel, Contact, in which an extremely unlikely message was found buried deeply in the number pi. Sagan called this the artist's signature. These probabilities are also a signature. A signature in the structure of the universe that someone wants us to be here.

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12. Robert Eisberg and Robert Resnick, Quantum Physics of Atoms, Molecules, Solids, Nucleii and Particles, (New York: John Wiley & Sons, 1985), p. 653.
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15. The gravitational strength today is 6.67×10^{-11} in SI units. The value can be no larger than 6.67×10^{10} nor less than 2×10^{-11} when compared with the strength of other forces, the range of the various constants spans 10^{-62} to 15. Using this as a range from which the value for gravity can be chosen, then the probability is $(6.67 \times 10^{-10} - 2 \times 10^{-11})/15$ which is 3.8×10^{-11} or 1 chance out of 2.5×10^{-10}.
16. The fine structure constant of the strong force is .2, gravity-5.9×10^{-39}, the weak force - 3.05 x 10-12, and electromagnetism is .007. Using these values as the range of conceivable values that could be chosen we have one chance out of 322.
17. Barrow and Tipler, The Anthropic Cosmological Principle, op. cit., p. 322.
18. Davies, The Accidental Universe, op. cit., p. 65-68.
19. Barrow and Tipler, The Anthropic Cosmological Principle, p. 400.
20. This assumes that it is reasonable for the proton mass to be capable of ranging from nearly zero to double the present mass. The acceptable value must fall within a tiny region which occupies 0.0007 of the total range.
21. Barrow and Tipler, The Anthropic Cosmological Principle, p. 305.
22. Ibid., p. 302.
23. Using the same method as in references 8 and 9 we have a total range of .218 which is the upper bound for the strong force fine structure constant in a habitable universe and .193 as the lower bound. The entire range of values we allow is 0 to .218. Thus (.218-.193)/ .218 = .11 or 1 chance out of 9.
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PREMANITION

Men had been digging up bones of unknown animals for the previous century before Georges was born and the bones had generated much controversy. The animals had not been successively created, according to the prevailing views. Animals had remained constant and unchanged since creation.

There were several theological problems raised by the data.[1] The fossil animals could only be explained in one of two fashions. First, the Bible spoke of only one episode of creation and then God rested. This view implied that the animals wouldn't change morphologically. God wouldn't create something that needed to change. It also implied that the animals were perfectly fit for their environment. They would serve God's purpose and God's purpose didn't include extinction. Thus most Christians of Georges' time believed that these animals lived somewhere on earth and that explorers would eventually find them. Dr. Thomas Molyneux is an example of this view. He was the first to find and describe the Irish elk. He proclaimed,

> "That no real species of living creatures is so utterly extinct, as to be lost entirely out of the World, since it was first created, is the opinion of many naturalists; and '?tis grounded on so good a principle of Providence taking care in general of all its animal productions, that it deserves our assent." [2]

Today we know that Molyneux was wrong and the Irish elk is extinct.

The second option for explaining fossil animals was that the fossils were the result of Noah's flood. These unusual animals should have been on the ark and thus survived to the post-Flood world. As with the first view, this also would mean that they were alive today. This is why Thomas Jefferson believed that Lewis and Clark would find mammoths alive in the western U.S.

This was the world that Georges Cuvier was born into. He was a protestant in an otherwise Catholic French society.[3] Georges believed the Bible was the word of God but faced three problems. First, explorers were scouring the world and bringing back strange animals, but they weren't bringing back living examples of the fossils. People were giving up on the idea that the fossil animals could be found elsewhere. This meant that scientists were beginning to doubt the Bible.

The second problem was that it was becoming apparent that the fossils were not associated with men. This implied that there was a long time on earth before man was created and that violated the concept of creation that only five 24-hour days separated man from the creation of the universe. Once again, more doubt about the Bible.

The third problem was extinction. Cuvier had become the greatest anatomist of his time and proved that animals had gone extinct. Napoleon’s invasion of Egypt had provided the scientists in Paris, like Cuvier, of many mummified cats. By studying the feline remains Cuvier showed that Egyptian cats were identical to modern cats. This meant that cats had not changed for 5000 years. If change was that slow, it required that the strange fossil forms had gone extinct.

Cuvier knew that there had to be a way to harmonize Genesis with observation. To achieve this harmonization, he argued that the world was old but had had many catastrophes. These catastrophes killed the various fossil species. Cuvier, along with William Buckland and Adam Sedgwick, convinced the 19th century church that an old earth was compatible with Scripture. Buckland and Sedgwick identified the last catastrophe with Noah's Flood.

The effects on Christianity were immense. This was the first time in history that Christianity had been forced to deal with an earth before man. It required a new interpretation that was no different than what had occurred at the time of Copernicus. The heliocentric sun had required a change in interpretation of Joshua's long day, a change in interpretation of the firmament and a change of interpretation of the 'four corners of the earth' [Is 11:12, Rev. 7:1]. Some people didn't want to re-interpret those things. At times like those, it is important to realize that it was the interpretation that is changed not the Bible. The Bible is constant, our understanding of it is imperfect. To require an unchanging interpretation of the Bible means that we have a perfect understanding of it. And to assume that our understanding is perfect implies that we are God.

Christians need a new interpretation and this is what will be presented beginning here. An interpretation is not truth but a plausible way of fitting the facts of both the Bible and science together. The Bible is truth, our interpretation is not necessarily truth. In the following, the statements should be viewed in the nature of a hypothesis. If one accepts this interpretation, then here are the consequences. If one accepts this interpretation, then here is how the problem is solved. But an interpretation is false if it violates either Biblical or scientific data.

We have seen how the young-earth interpretation violates observation. Because of this, we need a new interpretation.

Before Adam

What was the earth like before man? According to traditional interpretations of Genesis there was such a short time between the creation of earth and the creation of man, that this type of question is hardly ever asked by Christian apologists. There is so little time that it just doesn't seem important. Arthur Custance wrote one of his Doorway Papers on the topic.[4] In it Custance argues that God prepared the world for man by a series of successive creations. This time period was a premonition of man, or a premanition; God was preparing the world for us. While the view advocated by Custance is interesting, it leaves many things unanswered or unexplained. However, the fact that he asked the question is extremely important because it opens the door to alternative interpretations of Genesis 1 - interpretations which may unite all the diverse data better.

An understanding of Genesis 1 requires an examination of the relationship between the messenger, the author and the audience. The Biblical account of the earth's creation was given to us by Moses. The concept of divine inspiration requires that in some fashion God communicated the information to Moses but no one knows quite how this was accomplished. However Moses got his information, Christians generally believe that he was transmitting to the Hebrews the information that God wanted them to have.

Moses was put in the position of describing what God had already accomplished but at the same time reporting what God said. A look at the New International Version shows that the statements of God appear in the imperative tense: "Let there be." The comments after these statements are in the past tense: "And God saw that it was good"; "And so it was" The tense change is a clue to an alternative interpretation. The structure of the first chapter seems to be one of a proclamation followed by an observation of the results.

The pattern throughout chapter 1 is: God said - and God saw. God looked upon his handiwork at that moment and either adjusted the result or commented on its value. The traditional view of this chapter holds that when God said, "Let there be light," immediately there was light. That is certainly a viable interpretation but one can place another interpretation on it.

Moses was conveying what God did and what was accomplished. Part of Moses communication was of what God did. Part was a statement to the audience that "It was so". The traditional view interprets these verses as God spoke "Let there be Light" and immediately there was light. There are great scientific problems for anyone who might want to view Genesis as the traditional interpretation requires. Does this mean that the Scripture is false? No. The interpretation can be wrong while the Scripture remains true. There is a difference between the traditional interpretation and the Scripture.

What is false is the traditional interpretation, not the Scripture. The problems with the traditional interpretation are legion. The traditional interpretation has land plants before fish; yet paleontology finds fish in rocks lower and older than rocks with plants. The traditional interpretation has the land plants appear before the insects to pollinate them. Paleontology has them appear together.[5] The traditional interpretation has grass as one of the earliest plants, when in fact paleontology finds no record of grass until the last geologic era.[6] The traditional interpretation has stars created after the plants, yet given the distance to some of the stars in distant galaxies, the stars had to have been created first. The traditional interpretation has the birds created at the same time as fish; yet paleontology shows that fish appeared more than 200 million years prior to the birds.[7] The traditional interpretation has whales created at the same time as fish and birds. Whales don't appear in the fossil record until 100 million years after birds.[8] The traditional interpretation has insects created with the cattle, yet cattle appear almost 350 million years after insects. And the traditional interpretation has man created at the same time as cattle and insects, yet fossil men are always found in rocks younger than the cattle.

What is the solution to this? The audience was spoken to in Genesis 1. Every time Moses wrote: "And it was so" he was speaking to the audience--us. Every time Moses wrote: "And God saw that it was good", he was reporting God's editorial comment. When Moses reported "God said, 'Let there be light'" he reported God's statements, not God's actions. To return full circle, when Moses wrote, "And it was so", he was reporting to his audience a completed fact. At the time his audience lived, all of creation was an accomplished fact.

What is important is that Moses did not write "And it was so IMMEDIATELY." The time of fulfillment is not specified and this is what everyone misses. There could easily be a separation in time between the proclamation and the time "it was so" As an example, in Genesis 1:15 God creates two lights to rule the day. In verse 16 God accomplishes the task. Also in verse 16 Moses says "and it was so" to the audience. Moses reported results, not timing. Another example is Genesis 1:12. When it says "And God saw that it was good" it doesn't say ?Immediately

God performed the act and saw that it was good."

Another item missed by advocates of the traditional interpretation concerns the word "saw". The Hebrew word is ra'ah. The definition given by Strong's Hebrew Dictionary includes the possibility "foresee". Thus the phrase "God ra'ah that it was good, could easily mean god foresaw that it was good. This interpretation would fit with the Days of Proclamation view outlined here. The Days of Proclamation interprets the days of Genesis 1 as being before the origin of the universe. God was foreseeing what was to come in the universe.

Reading Genesis 1 as the proclamations of the Designer solves most problems. God foresaw what it would be like. The chapter tells us about the Designer as he mentally visualized what the world would be like. When He saw that it was good, He had not necessarily brought it into existence. God on the first day could have conceived of light and proclaimed that there would be light in His new universe. On the second day God conceived and proclaimed a separation of waters. He did not necessarily create those objects in successive 24-hour time periods. It is possible that only after the seven periods of proclamation did God begin to bring about what He had designed.

After each proclamation, there is a statement like, "And it was so," or "And God saw that it was good." These statements can be understood in the following way: First, from Moses' perspective, everything he was reporting had already occurred. For instance in Genesis 1:15 God states that there will be two lights to rule the sky and in verse 16 God accomplishes that task. But there could have been a long span of time between verse 15 and 16. In verse 16 Moses is reporting results - not the timing of the results. To Moses it all "was so!" Statements like that are Moses' comment to the effect that God has obviously accomplished what He set out to do and not how rapidly He did it. Secondly, as mentioned above, some of these comments are God seeing the beauty of His design.

With this days-of-proclamation interpretation, we may view the developments reported by Moses as reported in parallel style. This is a common style even today when history is being discussed. A book on the causes of World War II might start by having a chapter on the political causes of the war, the Treaty of Versailles, the demilitarization of Germany, and the rise of the National Socialists. The next chapter might discuss the economic factors, the hyperinflation of the Weimar Republic and then the depression. The next chapter might talk about the sociological factors such as the rise of mysticism and the belief in German superiority. All of these may be discussed in a linear fashion but the events they describe occurred concurrently. The order of reporting is not necessarily the order of fulfillment. To report them in this fashion is not deceptive on the part of the historian any more than it would be deceptive for Moses to report concurrent events in a sequence. After all, a human can only write one sentence with one topic at a time. Language requires consecutive reporting of concurrent events and, as will be seen in this chapter, parallel discussions of various aspects of the creation week will bring us over and over again to cover the same time period. It is the contention of this author that the Days of Proclamation provides the best, most consistent framework in which to view the scientific and Biblical evidence.

Before we examine Genesis chapter 1 in detail we need to discuss the meaning of the days. Conservative Christians have always interpreted those days as being 24-hour periods of time. Linguistic evidence is marshaled to support that contention. Walsh notes that the Hebrew word for day, yom, occurs over 1000 times in the Old Testament.[9] Ninety-five percent of the time it is best translated as a 24-hour period. This is truly a powerful argument in favor of believing that the days in Genesis 1 are 24-hour periods of time. This is implied by the use of the terms "evening and morning" in Genesis 1. But scientifically, what does it mean for God to have created the earth during a 24-hour period? Twentieth century physics has proven that time is not constant as was thought in previous centuries. If you get in a rocket ship and accelerate to a velocity close to the speed of light, your time passes more slowly than it does for the people you left behind on earth. If you live on a very massive object, like a neutron star, time passes more slowly for you than it does for someone far away from the neutron star.

Gerald Schroeder has suggested that a clock placed in the universe where the earth would eventually be might have recorded much less time than the fifteen billion years that is the age of the universe.[10] While this idea may appeal to some, the problem with it is the cause of the slower time. The clock would have to travel with a black hole or neutron star in order to tick slower, and if it had done this, where is the black hole or neutron star? It should still be nearby.

To question how you measure the days in Genesis 1 in light of modern scientific knowledge is quite natural. What are these 'days' measured against? Our days are measured by the earth's rotation compared with the apparent position of the sun. According to the Scripture, the sun and moon were created on the fourth day. Until then, the days were not measured by the earth's spin. Even the traditional interpretation can not take "evening and morning" literally on the first three days.

What were these days then? Were they geologic ages as some theistic evolutionists have suggested? No,. As will be shown, to attempt to make these days equivalent to geologic ages results in many absurdities. But

these days could have been short periods of time or events beginning at or just before the big bang. The reason for having the day start at the big bang is that, prior to the big bang, there was no time. God is timeless. Can His activities be described in terms of time? Yes. The only way to describe events before time is through the use of temporal terms. As far as we are concerned, events occur at a given time. As far as we experience, events have an order. Before time, we can't relate events without both of the above techniques. Language requires the use of temporal terms and order. It is inescapable.

Each of the proclamations concerns the physical laws of the upcoming universe. Such laws included the laws governing light, hydrodynamics, gravity etc. The proclamations express those laws in non-scientific terms, but as we will see, each proclamation connects different properties of our universe and allows us to see some of God's planning.

A New Interpretation

DAY 1

"And God said, 'Let there be light.'" Genesis 1:3 NIV

"In the beginning God created the Heavens and the Earth." With that simple statement Moses sums up the entire creation. If he had said absolutely nothing further he could not have better stated the case for creation. Many would even suggest that there would be a lot less controversy if he had written nothing further on the creation. While that would be nice as far as controversy is concerned, the fact is Moses did not stop at this point, so we must come to some understanding of what this verse means and how it fits into the overall story of the creation. How are we to understand this verse?

Verse 1 can quite simply be interpreted as an executive summary of what is about to follow. While most interpreters believe that the Earth was fully formed in verse 1, that interpretation contradicts verse two where the Earth was formless and void. A fully created Earth is certainly incompatible with a formless Earth.

Many authorities have used this formlessness and the inferred formfulness of verse 1 to postulate that there was a catastrophe, which destroyed the Earth. Most often the fall of Satan is placed here, with Satan also bringing about the fall of a pre-Adamic world. This "Gap" theory holds that Satan was cast out of heaven as the result of a rebellion, but there is no simple statement to that effect in the Scriptures. There is very little further Scriptural support for such a view. Higley, a defender of this view, only cites formlessness and the lack of a statement that the first day was good as support for this view, but that is weak support indeed.[11] The nearest statement that can be found in support of the gap theory is found in Isaiah 14:12. It says, "How you have fallen from heaven, O morning star, son of the dawn! You have been cast down to the earth, you who once laid low the nations!" (NIV). But unless you postulate a previous creation, for which there is no Scriptural support, you can not explain how Satan could have "laid low the nations." Custance[12] argues that the Hebrew grammar of verses 1 and 2 require that the Earth became formless and void. Others would discount that possibility, also on linguistic grounds.[12, 13]

Verse 2 can hold a variety of meanings depending upon how tohu and bohu (formless and void/empty) are translated or connotated. Jeremiah 4:23 is the only other place where the two words appear together. That verse is translated 'formless and void'. First, if the connotation of these two words together is "wilderness" or "desolate" then it could easily refer to the time in the Earth's history immediately after the formation of the solid earth but before life began. At that time, the Earth was truly a wilderness. Volcanoes spewed hot molten magma through vents and fissures. The land was utterly barren with only the most rudimentary forms of erosion able to take place. Much of the work of breaking rock down is accomplished by plant roots and lichen and they were absent during the Earth's earliest ages. This interpretation is similar to Custance's view of Genesis 1:2. The Earth had become a desolate wasteland but without the implication of a former period when the Earth was not a desolation.

If, on the other hand, the emphasis is placed on formlessness and the Earth is truly formless and void or empty, verse 2 could be held to be referring to the time before the collapse of the solar nebula. The material that formed the Earth was created in the big bang in the form of hydrogen. Later the hydrogen was cooked into heavier elements, in numerous supernovas during the long eons prior to the sun's formation. But before the coalescence of the solar nebula the material of the Earth had no form. This is the best explanation of verse 2. It refers to a time long before the Earth existed but after matter had been made.

In the first proclamation, God said "Let there be light." God foreseeing what would come did not immediately cause fulfillment of His command. Moses' commentary, "it was so", was made from the vantage point where Moses lived--in a created creation. At the time Moses wrote, there was light. Moses again describes the past

when he reports that God foresaw that the light was good and called the light day and the darkness night.

Science tells us that the universe began as a small quantum fluctuation. All around us, at the most minuscule scale, atomic particles and their anti-matter counterparts, pop into and out of existence in less than 10^{-21} seconds. Amazingly, such short-lived particles have been experimentally detected.[14] In our universe a quantum fluctuation is a common event; our quantum fluctuation was a common event which improbably became a universe. Under normal circumstances quantum fluctuations disappear as rapidly as they appear. But with our fluctuation something took place to cause it to expand and grow. It was at this moment that God began fulfilling His series of proclamations, all of which had been made before.

The first instant about which science is able to say anything is 10^{-43} seconds after the creation. At that time the universe was only 10^{-33} centimeters in diameter.[15] The universe was nothing but a sea of naked quarks - the particles believed to be the ultimate building block of matter. Before a full second was out, the universe was dominated by light. Electrons, protons and neutrons were helpless against the onslaught of radiation, being unable to form atomic nuclei. The radiative energy would rip them apart. After the intensity and energy of the radiation diminished and nuclei could finally form, no atoms were able to form for the next several hundred thousand years.[16] Thus ended the first proclamation.

DAY 2

"And God said, 'Let there be an expanse between the waters to separate water from water.'" Genesis 1:6 NIV

Since the Days of Proclamation view holds that the proclamations occurred prior to the origin of the universe, the second proclamation followed immediately (whatever that means in the time before time) after the first proclamation. Nothing of the first proclamation was yet fulfilled. God proclaimed that there was to be an expanse between the waters to separate waters from waters. Once again Moses commentary made from the vantage point of a completed creation was "and it was so". Then again describing the past, Moses reports that God called the expanse "sky".

What waters? We know that there are no waters surrounding the earth today so the passage must be talking about something else. It could be the waters on other planets in the solar system, such as the water that once existed on Mars. We know that it existed because there are channels on Mars that could only have been carved by liquid water. There is water on the moon and water at the poles of Mars. There is also water in the form of ice on comets and frozen water on the moons of Saturn and Jupiter. While planets around other stars have only recently been proven, in all likelihood there are thousands of planets throughout the galaxy and throughout the billions of other galaxies in the universe. Almost all of these planets must hold water in one form or another. But this may not be what was meant.

The use of water here is probably representative of matter in particular rather than water specifically. The expansion of the universe has spread water and other forms of matter throughout the universe. As we saw in the last chapter the universal expansion rate at early times must be quite precisely chosen or we would not be here.[17] Either the matter would have formed extremely large masses, which would be too large for life to exist on, or it would not coalesce at all. In the latter case there would be no galaxies, stars or planets. Separation of matter into planets is essential for life. But since the rate of expansion was correctly balanced, matter (and water with it) was spread throughout the universe.

Some of the Bible's critics have said that the ancient Hebrews understood the firmament as a solid sphere holding back the waters above the sky. The ancient Hebrews may have understood it this way; that may not be the way God intended them to understand it. And at least some of the Jewish commentators didn't understand it as a solid sphere. Nahmanides (1195-1270 A. D.) was one of those who didn't.[18] He believed that the waters above were suspended in space. This is almost exactly what science found. The waters and matter is suspended in space separated from other blobs of matter. Nahmanides developed this view long before the advent of modern science and, thus, this can't be considered to be a compromise with modern science.

Day 3

"And God said, 'Let the water under the sky be gathered to one place, and let dry ground appear.'" Genesis 1:9 NIV

"Then God said, 'Let the land produce vegetation: seed-bearing plants and trees on the land that bear fruit with seed in it, according to their various kinds." Genesis 1:11 NIV

On day three God proclaimed that the Earth would have dry ground and that plants would appear. It is difficult to conceive of the connection between these two events. Moses reported that God called the dry ground "land" and the gathered waters God called "seas". Moses commentary from the vantage of a completed creation was "And it was so". Then Moses reported that God told the land to produce vegetation. God didn't create the vegetation; the land did! And Moses made his usual comment from his temporal vantage point "And it was so." Moses commentary clearly shows that sometime between the time God told the land to produce the vegetation and the time Moses wrote the vegetation had been created. Moses, going back to report what God proclaimed before time, "God foresaw that it was good."

It is important to emphasize a point. God did not create the plants directly. God told the land to create the plants. And Moses tells us that the land obeyed God and created the plants. The statement can not be more clearly expressed when it says, "And the earth brought forth grass, and herb..." (KJV) or "The land produced vegetation" (NIV). The land is the subject of both sentences. The land is the active element. God is involved to say the least. God commanded the land to do something. But God delegated the job of producing the vegetation to the land. While Christians don't want to hear this, we have been seriously misinterpreting Scripture for centuries.

What would the imposition of topology have to do with vegetation? Amazingly, quite a case can be made for a connection. The connection lies in the laws of physics. The existence of life is dependent upon a planet large enough to hold an atmosphere of significant density but too small to hold hydrogen. The size of a planet must be carefully balanced. Mars has too little of an atmosphere because it is too small. Mercury is even smaller and has almost no atmosphere. With no atmosphere there can be no plants. Jupiter, Saturn and the other outer planets were too big and retained too much hydrogen which led to them having a methane atmosphere. The balance is determined both by the strength of the gravitational force and the size of the planet. Thus the size of a planet must be balanced to hold the correct amount of atmosphere.

There is a counter difficulty which must be addressed. The larger the planet, the smaller a mountain can be.[19] This is because the greater gravity of a larger planet overpowers the material forming the mountain. For the terrestrial planets the largest mountain is approximately 1 percent of the planetary radius. In the case of the earth, the tallest possible mountain would be about 56 miles high. Mt. Everest is about one tenth of this height. However, if the electric force were three times smaller or the gravitational force three times greater, no mountain or continent would protrude from the earth's oceans. Thus, the existence of dry land on earth is in part due to the precise values of the gravitational and electromagnetic forces.

Now why is the existence of a mountain tall enough to protrude from the water important for life? The evolution of life on earth may have been possible only if there were shallow pools of water. Shallow waters are only possible if land protrudes from the sea. And the importance of shallow pools to evolution lies in the need for chemicals to form long chains of organic molecules. Thaxton et al. state,

> "Innumerable smaller bodies of water provided a mechanism whereby the soup could be 'thickened.' In shallow pools, lakes, and shoreline lagoons, alternate flooding by the soup and evaporating of it resulted in a gradual concentration of organic chemicals. Further concentration occurred by adsorption of organic compounds on sinking clay particles in primordial water basins. The catalytic effect of these clays promoted polymerization on a wide scale. Polypeptides and polynucleotides were among the macromolecules produced."[20]

If life evolved on earth, life including the vegetation, dry land was absolutely essential. The ratio of electromagnetism and gravitational force had to be just right or none of this could have happened. Only with the correct balance between these forces can mountains protrude through the sea. The third proclamation had to have dealt with the balancing of these forces.

Day 4

"And God said, 'Let there be lights in the expanse of the sky to separate the day from the night, and let them serve as signs to mark the seasons and days and years.'" Genesis 1:14 (NIV)

The fourth proclamation concerned the formation of the sun, the moon and the stars. In this proclamation Moses reports that God made the celestial objects and set them in the sky. Moses made his normal comment "And it was so". And returning to the past, Moses reports that God foresaw it was good.

Notice the contrast between this proclamation and the last one. God is the subject of the sentence and it is

He who creates the sun, stars and moon. But it doesn't say how. It doesn't say when, and it doesn't say instantly. So how did God do it?

Several physical constants had to be balanced in order for stars to exist. As we saw in the last chapter, the nuclear energy levels in atoms had to be just right or stars would not exist. Without stars, and in particular our sun, the moon would not shine. This difference leads to an interesting division on this day. God's proclamation does not mention the moon, only lights. The moon shines by reflected light. The moon is referred to only in the commentary portion of the day. Moses relates, 'God made two great lights--the greater light to govern the day and the lesser light to govern the night. He also made the stars." This division is understood to mean that during the period of proclamation, God did not make the moon at that moment; it was made eons later and Moses was merely relating the results of the proclamation.

Day 5

"And God said, Let the waters bring forth abundantly the moving creature that hath life, and fowl that may fly above the earth in the open firmament of heaven." Genesis 1:20 KJV

On this day God made one proclamation with two outcomes. He proclaimed that there would be sea creatures and birds. Moses then reports that God created birds and fish ending with Moses' comment that it had all come to pass--and it was so.

But in this case, the commentary continues, unlike the previous days. Moses then says that God created the great creatures of the sea and the winged creatures. As before God created indirectly. He commanded the waters to bring forth the fish. So why does Moses say in verse 21 that God created the fish? Because God did create the fish, indirectly. He did it by commanding the waters to bring forth life. This is a crucial distinction. The Bible does teach a form of creation in which God acts indirectly.

Then Moses reports the blessing God made on the fish and birds at the beginning. God told them to be fruitful and fill the seas and the earth. It is interesting that there is no repeat of the common phrase "and it was so."

On the surface birds and sea creatures have little in common. According to evolution they are distantly related. Thus this passage gets a fair amount of ridicule from biblical opponents. Fish appear in the Cambrian and birds appear in the Jurassic about 300 myr after the Cambrian. Birds evolved from reptiles not from fish. So what is the connection? Both birds and fish move through fluids by a form of flight. Their motions are governed by the laws of hydrodynamics. And this is what God was doing on the fifth day.

Day 6

"And God said, 'Let the land produce living creatures according to their kinds: livestock, creatures that move along the ground, and wild animals, each according to its kind.'" Genesis 1:24 NIV

"Then God said, 'Let us make man in our image, in our likeness, and let them rule over the fish of the sea and the birds of the air, over the livestock, over all the earth, and over all the creatures that move along the ground." Genesis 1:26 NIV

Day 6 brought the culmination of God's creative proclamations. On Day six there were two proclamations again. Moses reported that God said, "Let the land produce living creatures." Here again God does not do the creating himself. Moses reports that God commanded the land to do something--produce living creatures. Moses commentary was the same--and it was so.

Then, similar to day 5, Moses commentary continues. He reports that God made the wild animals and creatures that move along the ground. Why? For the same reasons as above. In spite of God creating indirectly through the land, God did command the land to do the creating. Thus God created the animals.

Before moving on to the next proclamation on this day, we need to look at the biblical definition of kind. It is overlooked by young-earth creationists in their zeal against evolution. In verse 24 the Scripture says "Let the land produce living creatures according to their kinds: livestock, creatures that move along the ground, and wild animals,. . ." (NIV) A look at this shows that after the colon, the Bible itself defines the kind. it is livestock, creatures that move along the ground and wild animals. This, of course, includes all land animals. The traditional view holds that animals must reproduce according to their kind, overlooking the fact that the word reproduce never appears in Genesis 1. Assuming that the traditional view is correct then if the definition of kind includes all forms of land life, then the Bible allows for evolution. Any evolution would be a case of reproducing after their kind. Thus, the Bible allows for evolution and may actually teach it.

Then Moses reports God's second proclamation concerning making man in the image of God and letting them rule over everything. Then Moses makes his second commentary stating that God created man in his own image, male and female he created them.

Departing from the previous sections, Moses then tells of God's post creation instructions. There is a difference between God's statements earlier in Genesis 1 and His statements in this section. All the above statements begin with the word "let". These statements don't begin with "let". They are expressed in the past tense and are directed to living creatures. They must have been delivered long after creation.

The first instruction was that God blessed them and told them to be fruitful and increase in number. He told them to fill the earth and subdue it and to rule over the fish, the birds of the air, and the land creatures. The second instruction was that God gave them every seed-bearing plant for food. The third instruction was to the beasts of the earth. They were given green plants for food. And Moses ends it with his usual commentary written from his time vantage, "And it was so".

God set in the laws of nature the adaptations necessary for land life and then conceived of the creation of a being like man. Two things will become important later but should be noted now. First, God told mankind to spread over the Earth. It is quite likely that one of the sins of the pre-flood world was that mankind failed to spread across the earth. This made them vulnerable to the flood. Secondly, while green food may have been the only item that Adam and Eve could eat, it may not have been the only food that the animals of Earth could eat. God said, "And to all the beasts of the earth and all the birds of the air and all the creatures that move on the ground--everything that has the breath of life in it--I give every green plant for food." [Gen. 1:30 NIV]

The word translated as 'earth' in verse 30 is eretz and it can also be translated as land or ground. The NIV translators rendered the same word once as earth and once as ground in the same verse. To render the word as earth gives a very different picture to a modern man; a picture that would not have come to the mind of an ancient Hebrew. We think of Earth as the planet, the sphere that orbits the Sun. They did not have that concept. They thought of earth in terms of the visible land upon which they stood. If the word is rendered as land then the fact that God gave green plants for food may have had a limited scope. It may have only applied to the animals that were in the immediate vicinity of Eden. After all, if you had just created a new and important life form, the last thing you would want to happen to it was for some predator to come and eat it. God could easily have prepared the limited region around Eden to be free from predators to protect his new creation. By universalizing the meaning of the word eretz, earth-land-ground, we may have perpetuated a gross misunderstanding of the early chapters of Genesis. This will become even clearer when we discuss the Flood.

Another very important point to notice in this passage: God said let the land produce living creatures according to their kinds. Verse 24 has the waters producing life. This will be more extensively discussed later; but in evolutionary theory, the land oceans did produce living creatures; water did produce life. This verse may imply evolution and says nothing about what kind of offspring a creature is supposed to produce.

Objections

This view allows for an explanation of abundant evidence of death before the Fall seen in the fossil record. The fossil record clearly shows that thousands of species have gone extinct. It also shows carnivorous activities throughout. Shells have bite-marks healed and unhealed where carnivorous animals tried to eat the animal.[21] This occurred long before man was ever on the scene because the fossil record show NO evidence of mankind existing on earth with these extinct species.

Another objection is that God is more powerful than this viewpoint implies. Why would God take such a long time to create man? After all, 15-20 billion years is a long time. Surely a powerful God could do it more rapidly. But let's not forget two facts. First, if God is so powerful that He could create the entire universe instantaneously, then why didn't He do it? Even under the young earth view, God took an entire week! While God is certainly powerful, He apparently limits His displays of that power in some circumstances.

What the Scripture seems to be telling us is that a certain amount of time may be necessary for the universe to work like He wanted it to. According to Psalms 139:13, God knits us together in our mother's womb and yet He does not do that instantaneously either. He takes a full nine months. Secondly, we must not forget that God is not bound by time. Second Peter 3:8 says, "But do not forget this one thing, dear friends: With the Lord a day is like a thousand years, and a thousand years are like a day."(NIV) To God, 15-20 billion years is nothing.

Another difficulty that this view will face is the deeply ingrained teaching in Christianity that science and the Bible can never be harmonized. Alfred Rehwinkel states,

> "It is obviously impossible to take seriously the Creation story and the account of the universal flood as recorded in Genesis and also to accept the current geological theories concerning the origin and development of the earth. If the Bible is true and infallible in all matters in which it speaks, then these theories can not be true. If, on the other hand, the geological theories are right, then we must modify our attitude toward the Bible. The two cannot be harmonized. Even if we extend the six days of Creation to the unlimited eons of time and ages, a compromise between these two views is impossible."[22]

The irreconcilability believed to exist between the Bible and modern science sets up an unnecessary conflict and tension. It has several unintended consequences. First, it forces a choice between believing the Bible and believing our eyes! This is an intolerable position in which to place a person. I know many people who have rejected the claims of the Bible on their lives simply because of this dichotomy. One philosopher I know, became a Christian in grade school and an avid advocate of young-earth creationism a few years later. After having a discussion with a couple of classmates who raised some issues that he could not answer, he began actively searching for the answers. He met with his youth pastor seeking solutions to his questions, but no satisfactory answers were forthcoming. He said that most answers were pretty standard young-earth creationist fare. By early college he had rejected Christianity altogether and is now an active antagonist to the Christian faith. Those who know him know him to be an extremely intellectually honest individual. If Christian apologists had been able to answer his questions, I believe that he would still be a believer. Another man, formerly a young-earth advocate who had become convinced of an old earth, once wrote me, "Yeah, I know there are a lot of Christians who have abandoned the young earth. I know a number of those personally. I never managed to reconcile myself with the idea of old-earth Christianity, so I abandoned Christianity."

Secondly, the dichotomy forces a dualism upon the believer. There is religious knowledge and there is scientific knowledge but the two are incompatible. Theology is excluded from rational scientific demonstrations. In other words, theological knowledge does not have to have anything to do with science. Science does not have anything to do with theology. This is the course that much of American Protestant Liberalism has chosen.[23] It is all right, according to them, that the Bible is full of errors and does not represent physical reality; it is RELIGIOUS truth. Far better, in my opinion, is to be like the philosopher mentioned above; reject it all rather than have this dichotomy. If the Bible has no connection with reality how in the world can I know that it has any connection with truth?

More conservative scholars also fall into this trap and don't realize it. Henry Morris writes,

> "Since the Bible cannot be reinterpreted to correlate with evolution, Christians must diligently proceed to correlate the facts of science with the Bible."[24]

This view changes the location of the dualism. Instead of having science yield one truth and the Bible yield another, we now have Biblical truth, True science (Biblical science) and presumably false science (evolutionary science). The dichotomy now is entirely on the scientific side. Science is full of errors. Biblical interpretation is the arbiter of all truth. Notice I did not say the Bible. I say biblical interpretation because it isn't the Bible that rules out evolution; it is the interpretation. To take this approach assumes that one is an infallible interpreter. And to assume one is an infallible interpreter is a sin of pride. This approach leaves, the Christian searching for True science as a sort of Holy Grail. Morris advocates rewriting all of science. He writes,

> "One of the greatest challenges facing modern Christians is that of re-orienting the actual facts of science within the framework of true Biblical history. This is obviously no simple matter, since these data have been forced to fit into the evolutionary mold for over a hundred years now and the sorting and sifting and re-arranging required is almost overwhelming in magnitude. To re-evaluate all of the actual observational data of geology, biology, paleontology, anthropology, astronomy and other historically-oriented sciences in terms of the Biblical chronology is an undertaking calling urgently for significant numbers of dedicated Christian scholars, and they must be supported in these efforts by concerned Christians everywhere."[25]

And further,

> "True science, as we have noted, includes particularly the systematic study of present relationships between different natural systems and phenomena."[26]

> "These great events of the past are non-repeatable and non-observable, and therefore are beyond the scope of the scientific method. They are history, not laboratory science. To know the real truth concerning them (and remember that 'science' means knowledge), we must rely on the written record of the One who was there!"[27]

> "Nevertheless, the Bible does contain all the basic principles upon which true science is built. These principles do not pass out of fashion and have always been valid."[28]

The first statement is saying that all scientific knowledge is wrong. Logically this can lead only to one of two conclusions: either scientists are liars, engaging in a conspiracy and advocating what they know to be false; or, scientists are dupes, unable to understand what they are advocating. Neither of these is likely to be the case. The last statement is quite interesting because it says that true science does not change its viewpoints. True science is static. Is that really what Christianity must advocate?

And then there are actual facts and other facts. We saw this term in the first quote above. Morris repeats it when he notes,

> "The creation model thus also includes as another major component the global cataclysm of the Deluge. It maintains that the actual facts of geology, including the sedimentary rocks and their fossils, as well as the present structure of the earth's crust and surface features, can be more easily and naturally explained in terms of the Flood than they can in terms of the uniformitarian model."[29]

Some may say that I am quibbling about the choice of vocabulary. But this is not the case. Morris uses this term or the term "real facts" repeatedly throughout his writings indicating that this is not a isolated choice of vocabulary but a term with meaning. He has used the same term at least 8 times in four different books.[30] He appears to use it as an indicator that scientists are not dealing with 'actual facts' but with some other kind of fact, which he defines as evolutionary interpretations. And he indicates that if science would use the 'actual facts' they would support his view of Genesis. Thus, this term is a 'doctrinal term' of young-earth creationism and indeed is used by other creationists.[31]

Some may say that there are no brute facts but only interpreted facts. By this they mean 'interpreted facts.' Thus, this camp holds that evolutionists interpret one set of facts and creationists another. This is not true. The fact is that the sky is blue. There is no interpretation whatsoever. It is blue. This is a brute fact. It is an absolute fact that the Austin Chalk, upon which Dallas is built, lies above the Eagleford shale. There is no interpretation whatsoever. Facts are facts and are not interpretations. Scientific theories are interpretations of the facts. Young-earth creationism is an interpretation of the facts. But facts are facts and should not be confused with interpretations.

The dichotomy generated by conservative Christianity is no healthier than is the dichotomy produced by the liberal brand. Both place a dualism on the structure of the world. We must believe some things at some times and other, contradictory things at other times. This is impossible but here we are trying to do it. As Alice said,

> "There's no use trying," she said: "One can't believe impossible things."
> "I daresay you haven't had much practice," said the Queen, "When I was your age, I always did it for half-an-hour a day. Why sometimes I've believed as many as six impossible things before breakfast."[32]

Scientists observe the universe and put theories together from what they have seen, touched, heard and smelled. Christians, whose Biblical interpretation forces such a dichotomy upon believers, should remember that one of the most effective evangelistic tools in the early church was that of personal observation. The apostle John wrote: "That which was from the beginning, which we have heard, which we have seen with our eyes, which we have looked at and our hands have touched -- this we proclaim concerning the Word of life." (1 John 1:1 NIV). If conservative Christians can not believe their senses, then how do we know that John was reporting truthfully what he saw?

In truth the conflict is not between science and the Bible but between a particular interpretation of the Bible and science. This is an extremely important distinction. A Christian can believe that the Bible is inspired and true, but he must not place his interpretation on the same logical plane as the Bible. His interpretation is merely a human

guess at what the Bible says. (While the Holy Spirit guides our interpretations, there is no guarantee that we are able to fully understand what the Spirit is telling us.) The dichotomy properly lies between what the Bible says and our understanding of it. The error of conservative Christianity is not in believing in the primacy of the Scripture, but in believing in the primacy of their interpretation of the Scripture. The days of proclamation interpretation provides the best harmonization between an absolutely historical Scripture and the scientific data.

Evolution

Another deeply ingrained view in conservative Christianity is that evolution contradicts the Bible. This is assumed practically everywhere in conservative Christian literature. But, as we will show, all such rejections are based on one of two objections. First, rejection of evolution is based upon the idea that there is no way to harmonize a historical interpretation of the Bible with evolution. The second reason for rejecting evolution is that the young-earth creationists are seeking absolute proof of Christianity. Disproving evolution, they think, proves the Bible. This is like the sign sought by the Pharisees of proof of Jesus' divinity (see Matthew 12:38,39). There is no statement in the Bible that God did not evolve life. If there were, then we could shut down this centuries-long argument and either reject the Bible or reject science, but at least it would be absolutely certain which way the Bible stood.

Whitcomb and Morris[33] present a few arguments against evolution. First they say that evolution is the underlying dynamic of pantheism. Pantheism is the view that God is the universe and the universe is God. You are part of God as are the lions, tigers and bears. It is true that pantheism needs evolution as an explanation of why life is here, but that does not logically mean that evolution requires pantheism. This argument is what is called a non sequitur. Just because pantheism needs evolution it does not follow that acceptance of evolution disproves the Bible or supports pantheism. It is perfectly consistent for a theist to believe in evolution. Whitcomb and Morris' argument seems to imply that God would not evolve life because He would want to rule out pantheism. In other words, God would want to prove His existence to man, i.e. give man a sign. Jesus said of this, "A wicked and adulterous generation asks for a miraculous sign! But none will be given it except the sign of the prophet Jonah." (NIV) God asks for our faith, not for our knowledge.

Morris presents more arguments against evolution in one of his Impact articles.[34] He first objects that in Genesis 1:24 God commanded all animals to reproduce after their own kind. He says, "The Biblical 'kind' may be broader than our modern 'species' concept, but at least it implies definite limits to variation."[35] To this author, Genesis 1:24 represents the most incredible misinterpretation. This verse does not at all mean that animals are to reproduce after their kind. Animals are never ordered to bring forth life after their kind. Land is the subject of the sentence. It is the land that is commanded to do something. Land is commanded to produce living creatures after their kind. Animals are not commanded to do anything because they are not the subject of the sentence.

God created all the bacterial life as well as macroscopic life. If God wanted animals, even bacteria, to reproduce without any variation, then why did He create in the bacteria the ability to incorporate other bacterial and viral DNA? Scientific American reports,

> "Evidence is rapidly accumulating that a blizzard of genetic material blows freely through the microbial world - not only between bacteria of the same species but also between members of distantly related species and between bacteria and viruses. 'In terms of the flux of DNA, the general impression is that it goes anywhere and everywhere,' says Julian E. Davies, a microbiologist at the University of British Columbia. And although the genetic material of multicellular plants and animals tends to be better buttoned up, the exchange involves them, too."[36]

Once DNA material is shared between species, there is absolutely no limit to variation.

Another argument against evolution is that the death of animals was against God's love and compassion. To use misfits, mutants and other deleterious organisms to evolve animals surely is against God's nature.

This argument is entirely based upon Morris' interpretation of God's relationship to nature. It is most certain that God's love and compassion led Him to sacrifice His son for human redemption but that does not necessitate that God has such warm feelings for animals. In Job 39:13 God takes credit for having created the Ostrich, who "treats her young harshly." It also says that she does not care that a foot may crush her eggs. This certainly does not sound like a compassionate animal. So if it is against God's compassion to create animals that kill each other, why does God take credit for creating an animal that doesn't care whether or not her young live?

What is in error here is the conception of God's compassion. His compassion was evidenced by the

sacrifice for us. But God does not consist simply of love and compassion any more than we do. He has other traits and other purposes. If the young-earth view that there was no animal death before the Fall because of God's love and compassion for animals is true, then one must wonder why it is that God, Himself, was the first one to kill and animal? Why didn't He choose another means for salvation?

One of the objections made by anti-evolutionists is that evolution requires that animals ate other animals for millions of years prior to Adam's fall. God, being good, would not allow this to go on. Henry Morris says,

> Evolution is naturalism, limited to mechanistic processes in its operation. This necessarily means endless ages of random changes which, in the process, leave untold waste and pain and death in their wake. Theistic evolution is a contradiction in terms. The God of the Bible is a God of wisdom and power and love, and such a God could never be guilty of such an incredibly inefficient and cruel scheme of development as evolution."[37]

Ken Ham is even more direct,

> "To believe in evolution is to deny a universal paradise before Adam, because evolution necessarily implies that before Adam there was struggle, cruelty and brutality, animals eating animals, and death."[38]

John Morris says,

"There was to be no carnivorous activity by man (Genesis 1:29) nor animal..."[39]

The view of no animal death before the Fall is adding to the Bible. Carnivores have specially adapted teeth and claws for the capture of prey. If carnivory began at the Fall, God must have recreated the world at that time. The Bible mentions no special creation after the Fall. Nor do we find a statement from God that animals can eat animals after the Fall. Young-earth creationists add these ideas to the Bible--the Bible doesn't say it.

These men also overlook a couple of facts in their rejection of animal predation. First, They are inconsistent in their attribution of predation to events after the flood. If, as they believe, all the fossils are the result of a global flood, then the animals lived prior to the flood and were herbivorous. And yet, the animals found in the fossil record have carnivorous teeth, claws, and fangs. That these carnivorous tools were used is clear. There are millions of examples of predation in the fossil bones. Trilobites, cephalopods, and other animals have been found with bites taken out of them. Fish have been found fossilized eating other fish.

Secondly, they did not consider all options. The position outlined in this book that the events of Genesis 1 actually relate to the planning of the universe and took place before or at the very beginning of time is certainly worth consideration. Thus God's statement that green plants are given for food may have been in the context of a statement concerning the plan of the earth. Green plants are the basis upon which the entire food chain rests. Without green plants, no animal life, indeed, no life at all could exist on earth.

This constant repetition of the idea that predation is evil, bad for nature, and contrary to God's character sounds persuasive. Are animals eating animals outside of God's plan? What happens to an ecosystem with no predators? Is it a better and more peaceful place? Surprisingly, the answer is no. Experimental data suggests that the world is a much more diverse place with predation than it would be without it. Cox and Moore relate,

> "More recent studies of natural communities have largely confirmed the hypothesis that predators may actually increase the number of different species that can live in a habitat. The American ecologist Robert T. Paine made an especially fine study on the animal community of a rocky shore on the Pacific coast of North America. The community included 15 species, comprising acorn barnacles, limpets, chitons, mussels, dog whelks and one major predator, the starfish Pisaster ochraceus, which fed on all the other species. Paine carried out an experiment on the small area of the shore in which he removed all the starfish and prevented any others from entering. Within a few months 60-80 per cent of the available space in the experimental area was occupied by newly-settled barnacles, which began to grow over other species and to eliminate them. After a year or so, however, the barnacles themselves began to be crowded out by large numbers of small, but rapidly growing mussels, and when the study ended these completely dominated the community, which now consisted of only eight species. The removal of predators

thus resulted in the halving of the number of species and there was evidence, too, that the number of plant species of the community (rock-encrusting algae) was also reduced, because of competition with the barnacles and mussels for the available space."

"A general conclusion then is that the presence of predators in a well-balanced community is likely to increase rather than reduce the numbers of species present, so that overall, predators broaden the distribution of species. Only a few experiments similar to Paine's have been performed and so one must be cautious about applying this conclusion to all communities. There is some independent evidence, however that herbivores, which act on plants as predators do on their prey, may similarly increase the number of plant species that can live in a habitat. In the last century, Charles Darwin noticed that in southern England, meadowland grazed by sheep often contained as many as 20 species of plants, while neglected ungrazed land contained only about 11 species. He suggested that fast- growing, tall grasses were controlled by sheep grazing in the meadow, but that in ungrazed land these species grew tall so that they shaded the small slow-growing plants from the sun and eliminated them. A similar process occurred in chalk grassland areas in Britain, when the disease myxomatosis caused the death of large numbers of rabbits; the resulting reduction in grazing allowed considerable invasion by coarse grasses and scrub. As a result many of these areas are much less rich in species than they were under heavy 'predation'.

"On the Washington coast, Paine performed another series of experiments in which he removed the sea-urchin Strongylocentrotus purpuratus, which grazes on algae. Initially, there was an increase in the number of species of algae present; the six or so new species were probably ones that were normally grazed too heavily by the sea-urchin to survive in the habitat. But over two or three years the picture changed as the community of algae gradually became dominated by two species, Hedophyllum sessile on exposed parts of the shore, and Laminaria groenlandica in the more sheltered regions below low-water mark. These two species were tall and probably 'shaded out' the smaller species, as did the tall grasses studied by Darwin. The total number of species present was in the end greatly reduced after the removal of the herbivores."[40]

The experimental evidence clearly shows that the world is a better place with predators. A careful examination of the Scriptural record does not require a belief that predators were herbivorous originally. Green plants are the ultimate basis of energy for all animals. In that sense, God has given us green plants as food.

People who feel that God would not use evolution have not understood Isaiah 45:7. The King James Version translates this verse as, "I form the light, and create darkness: I make peace, and create evil: I the Lord do all these things." This is certainly not what we are taught very often. Maybe the word "evil" is translated improperly. A look at Strong's Concise Dictionary of the Words in the Hebrew Bible shows that the word rah can also be translated as: bad, calamity, distress, sorrow, or misery.[41] None of these are words that Morris would like because they all contradict his interpretation of what God is like. But unless one is willing to ignore what the Scripture says, we must certainly take these characteristics of God into account.

The fifth argument is that evolution is the basis of communism and Nazism. This is quite simply irrelevant. While it is true that communism accepted evolution, and that dialectical materialism[42] was a form of pre-biological evolution, evolution was not the cause of the horrors of communism. The sinfulness of man was the cause of the horrors of communism. The personality cult of Stalin was the cause of the atrocities. What is unknown among the young-earth creationists is that some of the communists didn't

EUCLID'S AXIOMS
1. Given two points an interval joins them
2. An interval can be extended forever
3. A circle can be built from its center and a point on the circle
4. All right angles are equivalent
5. Given a point and a line only one parallel line can be drawn through the point.
EUCLID'S COMMON NOTIONS
1. Things equal to the same thing are equal.
2. If equals are added to equals the sum is equal.
3. If equals are subtracted from each other the remainders are equal
4. Coincident items are equal
5. The sum is greater than a part.

Table 13 Euclid's Postulates

accept Darwinism. Lysenko, Stalin's agricultural commissioner, was not a Darwinist.[43]

In the case of the Nazis, they certainly used the concepts of evolution in their eugenics experiments, but to say that evolution was the basis of Nazism is certainly wrong. The basis of Nazism as it came to be known was a personality cult led by one man, Adolph Hitler. Besides, this type of argumentation, while certain to get attention, can also be used to denigrate Christians. Some have charged that Christianity is wrong because it is the basis of the Ku Klux Klan, or of the Branch Davidians. Every belief system has sinful people whose actions discredit their beliefs. We, as Christians, are no exception and should not use this argument.

Morris' final argument is that evolution contradicts the twenty-four hour days of creation. This assumes that the days can't be prior to creation. What we have seen here is that at least some of the days are almost certainly not 24-hour periods and others, if they are 24-hours in length, can certainly accommodate God's proclamations. The Bible can be historically true, and an old universe can be incorporated into conservative Christianity. Evolution does not have to violate the reality of twenty-four-hour days. The only necessary change is that the days occurred a lot longer ago than had previously been believed. Once again, it is the Biblical interpretation of the young-earth creationists, which leads to rejection of evolution. What the Bible says is true; the young earth interpretation is almost assuredly not.

We will see in the next chapter that a historical interpretation is not ruled out even when evolution applies to man. But before that we need to examine how evolution can occur. Does it violate the Second Law of Thermodynamics? Can order (more properly, complexity) come out of chaos? In other words, having seen that there is nothing wrong theologically with the evolutionary viewpoint, we now need to look at the scientific validity of the standard scientific view. We must do this since there are so many charges made by the young-earth creationists that evolution violates scientific postulates and laws.

The Origin and Evolution of Life

According to modern scientific estimates, eighteen billion years or so ago the universe formed in a flash of light and kinetic energy. The expanding ball of matter, anti-matter, light and exotic particles was not expanding into a pre-existing space but was a part of the created space-time. The exquisite organization and tuning of the fundamental parameters of the universe was built into this fireball from the very beginning. This pre-destination of the universe (not in the classical meaning of that phrase) is evidence of the skill of the designer. Our existence was assured in this fashion.

This pre-planning of the universe is best explained by an analogy with the laws of geometry. Euclid, the father of geometry, started with five postulates and five common notions. From these ten items all of the theorems of geometry have been derived, merely by the logical manipulation of the assumptions and then the theorems. The Pythagorean theorem, the area of a square, and all other geometric knowledge are somehow contained within these five postulates and five common notions. In one real sense, if you memorize the items in Table 13 you know everything there is to know about Euclidean geometry.

In the same way, the parameters that physically designed the universe contained all the subsequent information for the construction of stars, galaxies and life. Only in this way could the existence of life be assured. As we saw in the last chapter, someone rigged the game to create a universe that allowed for life. There is a theological hint in the Bible that this was precisely what God did. How else is Revelation 13:8 to be understood? That is the verse which says that Jesus was the lamb slain from the foundation of the earth. That would imply both foreknowledge and pre-programming of the universe.

God is clearly powerful enough to have programmed the universe in this fashion. But why would God create the world in this way? Maybe God had to, in order to achieve the effect that He desired. This obviously assumes that God is limited by the logical system we find in the universe. Does this place some type of metaphysical limitation upon God's abilities or power? It does not as long as God Himself set up the rules. It would be against the traditional view of God's nature for Him to violate His own rules. Thus, the length of time God took to create the Earth and man could easily be due to the rules of logic He established within the universe. All science is doing is re-discovering these rules.

There is an obvious objection that an omnipotent God should be able to create the world in an instant. That is true, but what are we looking for in God - a magician who can pull the ready-made universe out of His black top hat with the tap of a wand? This objection can be turned against those who prefer a traditional one-week creation. Why did an omnipotent God take any time at all to create the universe? Maybe God needed the time to bring forth what he wanted. Why not do it in a second? But one must always remember that time is the creation of God and what to us seems like a long time is not to a God who is above time, unaffected by its passing

The big bang has much observational support. Evidence has been collected which is quite difficult to explain if the world were only 6,000 years old.

First, in a star's outer atmosphere each chemical element absorbs a characteristic pattern of electromagnetic frequencies. In distant galaxies, these patterns are shifted towards longer, redder wavelengths. There are only two proven methods of shifting these characteristic wavelengths. If the object is traveling away from you at a high rate of speed, the wavelengths will shift. If the light is escaping from a very heavy object the light will be shifted. Neither gravity nor the theory of "tired light" can explain the red shifts.[44] When something is far away, it looks smaller. Considering that galaxies which are further off also look smaller, as do all distant objects, and the fact that, statistically, smaller galaxies are more greatly red shifted lends strong support for the cosmological expansion.[45] Thus cosmologic expansion appears to be the only viable option.

Second, the existence of a 2.7^{o} K (-455^{o} F) blackbody radiation can only be explained as the remnant of the fiery heat of the initial moments of the big bang cooled by the expansion. As the universe expands, it is space itself that is expanding. The photons that are traveling across the universe expand with space. Thus a short wavelength photon is stretched over the lifetime of the universe until it is very, very low frequency. The data from the recession velocities matches the data from the blackbody radiation. If the big bang had not occurred it would be unlikely for these two pieces of data to agree. If the universe were young there would be no explanation for this data.

Somewhere around 11-12 billion years ago galaxies formed. While no observation to date definitively proves that galaxies formed at that time, very recently there have been some very red proto-galaxies discovered. Even though the redshift has yet to be determined, the spectral characteristics of these objects are indicative of a highly red-shifted object. The formation of the galaxy gave rise to a period of star birth. Many of the stars in our galaxy have the chemical characteristics one would expect of old stars. Since the galaxy formed out of hydrogen and helium created in the big bang, the original stars are deficient in the heavier elements. The oldest stars were formed only from hydrogen and helium but had no heavier elements like oxygen. The heavier elements were formed later when supernovas exploded. If the universe were young all stars should either have no heavier elements or all should have them (assuming that God created the heavier elements in the creation). Their absence in only the oldest stars is only explicable only in an old universe.[46] If the universe is young then God, in creating these appearances of age, would be subject to the charge of deception. Since God can't create a deception or lie, the universe must, then, be old.

Somewhere around 4.5-5.0 billion years ago our sun formed from a nebula which had been compressed by the shock wave of a supernova. The sun contains heavy elements and is thus a late forming star. Only by having had enough time between the galaxy formation and our sun's formation can there be enough time for the heavy elements like iron, silicon, oxygen and carbon to have been baked in the stellar ovens. There had to be enough time for numerous supernovas to occur to spread these elements throughout the galaxy. Without time there would be no earth. It is truly difficult to build your house on a hydrogen-helium foundation.

Time is the only way to account for the existing radioactive isotope ratios. The young-earth creationists spend much of their effort attempting to discredit isotope dating processes and, as we saw earlier, their attempts fail. How much easier it would be for them merely to accept the old ages. The Days of Proclamation interpretation of Genesis allows these ages to be accepted and incorporated into Christianity without doing any damage to the historicity of Genesis. Is it reasonable, as Morris seems to suggest, for God to require Christians to believe that every single item in science is erroneous?[25]

We must remember the calculation made in the last chapter which showed that the odds of having a planet in the habitable zone around a star is something like one chance in ten. Applying similar logic to the size of the planet placed in that zone, we have a one in 1000 chance of having the correctly sized planet there. This probably underestimates the odds of having the correct sized planet because, at the earth-sun distance, the Earth can not hold on to hydrogen. Thus, if Jupiter were in the Earth's orbit, the heat from the sun would drive the hydrogen off to space, causing the mass of the planet to shrink. Thus, out of the billions of stars in our galaxy, more than a million would have planets of the correct size at the correct distance from their star for life to form. Just recently planets have been found around a sun-like star 44 light years away.[47]

But if we have a planet with the proper characteristics, how likely is life to form? The standard young-earth creationist view is that there is absolutely no way for life to have arisen by chance in the time allowed. Thaxton, Bradley and Olsen state,

> "With the help of high-speed computers, programs could be run which simulated the billions-of-years' process based on the neo-Darwinian model of evolution. The results showed that the complexity of the biochemical world could not have originated by chance even within a time span of

ten billion years. Eden's conclusion was a reasonable if unsettling one."[48]

Scott M. Huse, in describing the probability of forming a short 200 amino acid long protein, notes,

> "Assuming that none of the first trial groups work, let us continue trying over and over again at a generous rate of 1 billion (10^9) trials per second. Furthermore, to give the evolutionist every possible advantage, let us keep on trying for a period of 30 billion years (10^{18} seconds) since this is the presumed age of the universe. But even granting such liberal concessions, we find that the maximum number of trial combinations which could be attempted is still only (5×10^{77}) (10^9)(10^{18}) = 5×10^{104}. This is far too short of the needed 10^{375} trial combinations required for success. . . Simply stated, the chance that a system composed of 200 integrated parts could develop by mere chance is for all practical purposes, non-existent."[49]

Among Christians it has been widely promulgated that these numbers rule out the origin of life through chemical evolution. If these assertions are true then evolution is impossible. However, the odds calculated are wrong! The work of Joyce once again proves that the probability of finding a functional protein for a given task is much, much greater than that described above. Remember Joyce was using an RNA molecule that was longer than the one Huse used for his calculations. Joyce's molecule was 393 units long and has 10^{236} different possible combinations. Using Huse's "generous" production rates, we would still have too little time to find the sole functional molecule that Huse is looking for. Yet Joyce was able to find a molecule that could perform the task in only two years.

So why was Joyce able to find a functional molecule? Was he incredibly lucky? No. Joyce started with 10^{13} molecules, examined no more than 10^{14} molecules and discovered hundreds of functional proteins. Some were more efficient than others were but all were able to perform the task Joyce desired. Assuming that his vat was average (and there is no reason to think otherwise) then there are $10^{236}/10^{14} = 10^{222}$ different molecules which will perform the same function. Thus, if one wanted to find one of those molecules by making only one combination every second, one would be able to find it in only three million years. This is quite a small amount of time in comparison to the age of the earth. If one were to set up a small chemical factory in a warm pond and produce only 100,000 of these combinations every second, quite a slow rate, a functional version of the RNA molecule would be found in only 31 years, less than the time I have lived on Earth. Joyce required only two years.

This is consistent with what we found with the advent of nylon eating bacteria. Nylon was invented in the 1930s.[50] Nylon stockings were first marketed in 1939. Nowhere on earth was nylon in existence prior to the 1930s. By 1981, less than 50 years after nylon was created, bacteria arose that could eat nylon.[51] The protein that eats the nylon is 472 units long, longer than Huse's protein and longer than Joyce's protein.

```
5RANDOMIZE:CLS:KEY OFF
10 SCREEN 2:DIM X(3),Y(3)
20X(1)=100:X(2)=240:
25X(3)=400:y(1)=200:y(2)=0
30Y(3)=200:x=100:y=200
60 A=INT(3*RND)+1
70Y=y-(Y-Y(A))/2
75X=X-(X-X(A))/2
80LINE(2*X,2*Y)-(2*X,2*Y)
90 GOTO 60
```

Table 14 Program for Sierpinski's Gasket

The probability arguments against evolution fail. If they were valid, Joyce would never have found just the one functional molecule he was searching for.

It is this multi-exponential functionality which must explain why the first fossil life is found in rocks 3.8 billion years old.[52] This is the time that the earth cooled from the meteor bombardment. This is less than 400 million years after the earth cooled enough for life to survive on the surface. This extremely rapid formation of life is often used by anti-evolutionists to discount the inorganic origin of life. However, in the above example we calculated that for a 393-unit-long RNA molecule there are 10^{222} different combinations which will satisfy the functionality of Joyce's purpose. But to this number must be added those that will perform the function by using either a 392 or 394-unit-long RNA. This would essentially add three times the number of possible chemicals that would perform the function. When other length nucleotides are added in, the number of possible solutions to any given biochemical problem must be enormous. In other words, rather than, "How could it happen so fast," the question might better be asked, "Why did it take as long as 400 million years for life to form?"

The final problem for the origin of life is the problem of bringing complexity out of chaos. Some definitions

are required. Creationists often say that we need to bring order out of chaos. What we need is complexity not order. An ordered sequence is 0101010101010101. This is like a crystal. There is very little information in that sequence. A complex sequence is 846294947562. Life is complex not ordered. Dead mineral crystals are ordered, but not very complex. Let me illustrate.

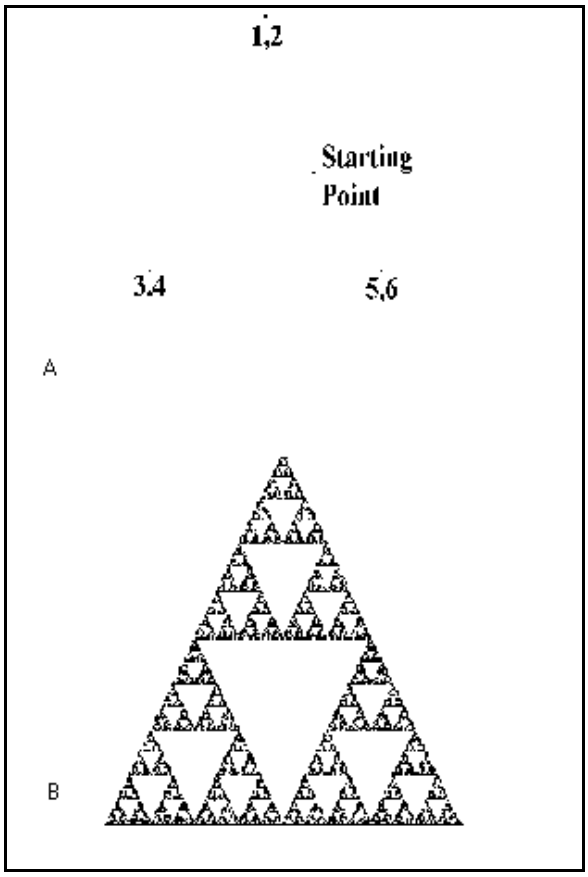

Figure 20 Creating Sierpinski's gasket. A: starting points. B: Sierpinski's gasket, order out of randomness

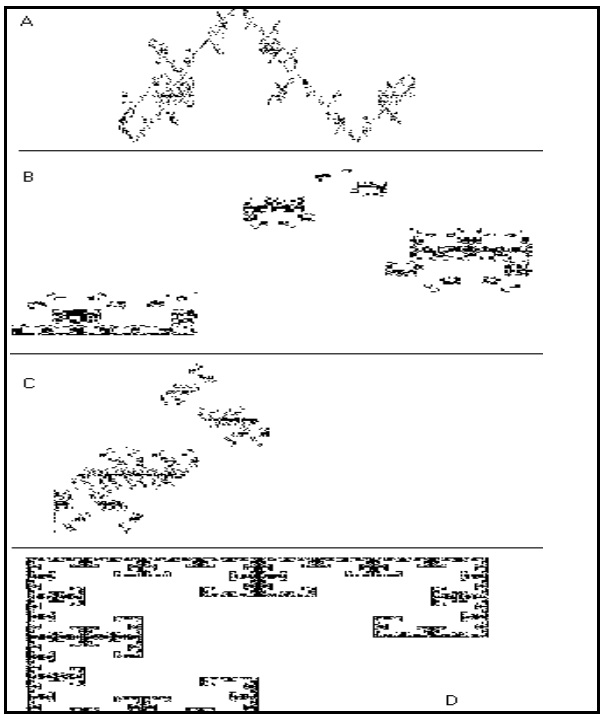

Figure 21 Mutations of Sierpinski's Gasket Program

Ordered sequences have no information. Living systems contain much information. The sequence 'aaaaaaaaaaaa' is ordered but tells us nothing. The sequence 'that is a cat' tells us something. It is complex. Sentences are complex and contain much information. Consider the sequence 'complex sentences look random'. If you retype it by shifting your hands on the keyboard (index fingers on g and h), it looks like: 'vinokrc drbyrbvrd kiij tsbfin'. This looks like random typing. Yet it has lots of information.

Paul Steidl makes the normal young-earth creationist claim,

> "It is a manifestation of a law of physics, called the second law of thermodynamics. When a large enough number of particles is involved, their behavior is governed by statistical laws which state that particles left to themselves will take the state of greatest disorder, or least organization."[53]

What Steidl doesn't realize is that highly informative sequences are disordered. Steidl has inadvertently shown that evolution is compatible with the second law of thermodynamics. The more random a sequence appears [as shown above], the more information it contains. This sounds backwards but this is exactly what information theory shows.

But the key to this Steidl's argument is the phrase "left to themselves." Physically, what this phrase means is that no energy enters or leaves the system. In point of fact, there is no such energetically isolated system except the universe itself and that only if we assume that God does not operate in the universe. Thus the second law of thermodynamics is an idealization; it represents what happens--or would happen--under
circumstances we do not normally observe.. But in nature there are no perfectly isolated systems as required by the second law. Energy is exchanged among all systems on the face of the earth. We can make the exchange very slow but we can not eliminate it. So the second law may not be applicable to a system with free energy exchange. Consider this analogy. A person floating in the Niagara River, left alone, will go over the falls and die. But if that person is able to harness some energy to move his arms extremely rapidly, theoretically it is possible for him to swim up the falls. He merely needs to somehow accelerate the falling water to a high rate of speed, thus propelling himself upward.

If you think this is fanciful, it is exactly the principle a helicopter uses to stay aloft in a downdraft of air. Living systems are able to harness energy and expel entropy, thus increasing their complexity.

Order arises from chaos all the time. The atmosphere is the most chaotic system one can think of.

Meteorologists all over the world are at a loss to make accurate predictions from it, and yet, out of this chaos come highly ordered systems like hurricanes and tornadoes. Both a tornado and a hurricane are highly ordered circulation systems with fantastic amounts of energy. According to the typical young-earth creationist interpretation of the second law of thermodynamics these vicious storms should not arise.

Another example can be seen in a can of mixed nuts. Go to the store and purchase a can of mixed nuts with one of those plastic replacement caps. When you open the can you will see the large nuts are on the top of the pile of nuts. Take a spoon and carefully stir the large nuts throughout the can until you are satisfied that the mixture is uniform. Place the plastic cap on the can and leaving the plastic top as the top, shake the can for a few minutes. When you open the can again, all the large nuts will be on top again. Out of the chaos of your shaking, the nuts order themselves by size. Order has arisen from chaos.

Since the origin and evolution of life require chance mutations to produce the order, it is a fair question to ask whether chance can do this. As a matter of fact, random chance is able to create beautiful order and patterns.

Take three points like those shown in Figure 20A. Pick a fourth point at random as your starting point. Roll a die. If you roll a one or a two, move half the distance from your starting point to point 1,2. If you roll a 3 or 4 then move half the distance to point 3,4 and similarly for point 5,6. Use the new point as your new starting point and repeat the procedure. Every time you make a move mark the paper. What eventually appears if this procedure is continued ad nauseam is what is called Sierpinski's gasket. This geometrical object is shown in Figure 20B. It is an infinite regression of inscribed triangles. This object was created by the roll of a die and one rule.[54] This is a prima facie case of chance producing order.

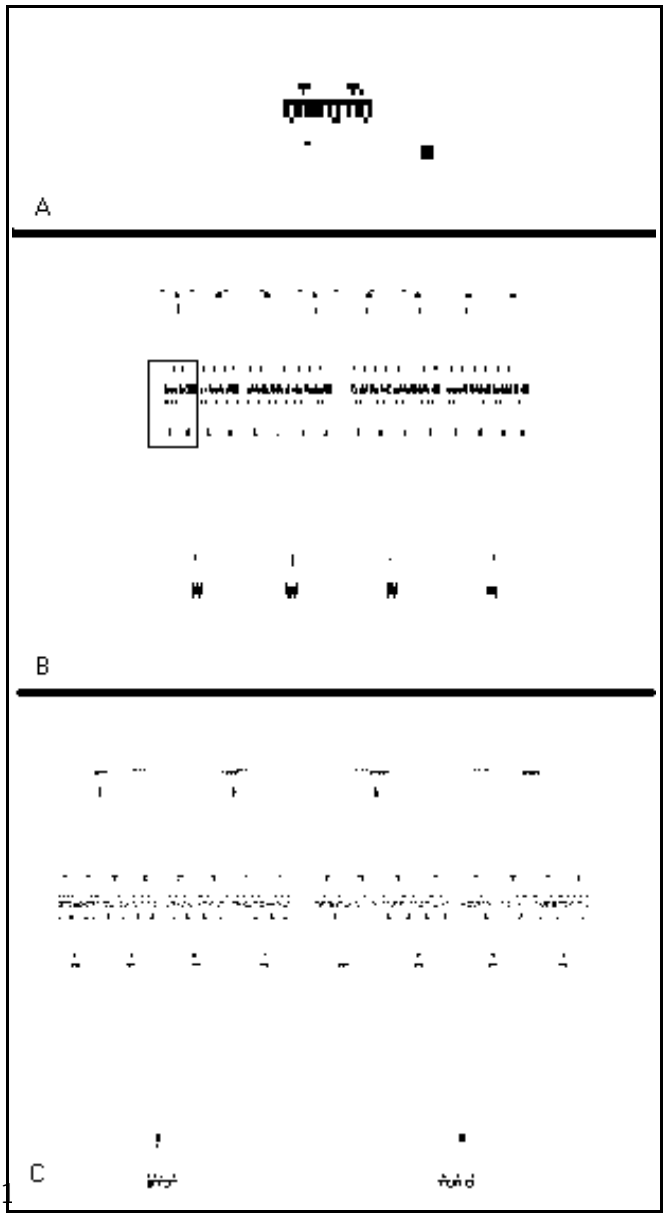

Figure 22 Sin Cos mutations A entire object, B: enlargement of A, C: Enlargement of B

Sierpinski's gasket is static. It is unchanging and as such has nothing to offer as far as evolution is concerned. But the program somehow allows chance to pull the order out of the rule. Can we improve this program by random mutation? Many, including Roger Penrose, believe that mutation can not improve an algorithm, i.e., a computer program. Penrose writes,

> "Moreover, the slightest 'mutation' of an algorithm (say a slight change in a Turing machine specification, or in its input tape) would tend to render it totally useless, and it is hard to see how actual improvements in algorithms could ever arise in this random way."[55]

From this we would expect that errors would all be bad. But this is not the case. One day at lunch I was trying to rewrite the program of Sierpinski's gasket from memory. I made an error. Instead of writing line 70 as in Table 14, I wrote it as "70 Y=(Y-Y(A))/2:X=(X-X(A))/2." This was not much of an error, just a tiny one. But when I ran it, nothing appeared on my screen. Being frustrated, I then changed line 70 as follows:
"70 Y=ABS(Y-Y(A))/2:X=ABS(X-X(A))/2"

Once again it was not much of a change but what a difference it made. Running this new program the screen displayed the results (Figure 21A) This obviously is not Sierpinski's Gasket. I saved the program so that I could find out what the difference

was when I went home and could make the comparison.

But an even larger surprise awaited me the next day at lunch. I left this new mutation of Sierpinski's Gasket at home. I rewrote the program from memory once more. Once again, I made an error. This time the mutation was not in line 70 but was in line 20. I had written line 20 as "20 X(1)=100: X(2)=240:X(3)=0." Point three was different from yesterday. The pattern that appeared on my screen (Figure 21B) was once again so different from the one above that I thought something was wrong with my computer.

Computers are supposed to be able to perfectly reproduce results from one day to the next, but this one didn't seem to be able to do that. What I did not realize was that there was nothing wrong with the computer; the error was mine. A mutation in my program in one location had completely altered the program. The change of the 4 in 400 to a zero had accomplished this amazing morphological transition. Comparing Figs. 20, 21, and 22 one would not suspect that the forms were related. And yet they are created by the same equation with slightly different origin points.

Other changes can be made to the program. A change in the number X(3) to 160 gives Figure 21C. Any of the points can be altered and each give different shapes, some interesting and others rather boring. The equation provides a six dimensional space, called a phase space, for exploration of the various shapes. Thus, contrary to what Penrose claims, a mutation can "improve" an algorithm if it is in the correct location.

But the starting points are not the only items that can be mutated. Line 50 has the statement that A=(3*RND)+1. If we alter that statement by merely removing the +1 we get one of the most beautiful of the curves. It is shown in Figure 21D.

We can take the program and mutate line 70 again. This time we will make two changes and have the line read "70 Y=Sin((Y-Y(a))/2): X=Cos((X-X(a))/2." Figure 22 shows what this looks like. As you can see it is not very interesting, not like the TEASE. But Figures 22A and 22B enlarge this boring creature and suddenly a beauty different from the other curves appears. Why should a curve created strictly by the random roll of a die know the multiplication table? Count the dots on each level and you will realize that each subsequent level has four times as many dots as the one before it. (One must greatly enlarge the picture to see this.). There is an infinite regression; the points multiply and successively larger magnification parameters are needed to elucidate this order.

In all of these examples, small mutations to the computer program yield large alterations in morphology of the output. These programs were discovered by random errors on my part in copying the program. The only intentional mutation I made was in the case of SIN-COS, Figure 22. All of these morphologies were created by random chance and random mutation. Billions of other morphologies are hidden within this family of equations.

Is it possible that life itself could have evolved in a similar manner?. Just as lines 40-100 determine where the dots can lie on the screen, so our DNA controls where our arms, legs, eyes, etc. are located. Random changes in the starting points are similar to changes in the homeobox genes.[56] These genes are the ones that control morphological development.

In the late 1940's Edward B. Lewis at Cal Tech began a study of mutations in the Drosophila (fruit fly). He discovered that major morphological changes could be caused by the mutation of a single gene. Some of these morphological changes include multiple thoraxes or legs where antenna ought to be. He had found the master control switch of development. Thus, just as we saw in the programs above a small single change in one number creates tremendous morphological change, so in a living system: the change in one "number" on a gene can cause tremendous change in the animal. The mathematics of morphological development must be somewhat similar to that seen here, except on a more comprehensive, complex level.

Notice that if we attempt to create different "species" in the program above by random mutation, most of the mutations will be bad. That is, most will cause the program to fail to run or in terms of the analogy, die. For instance if I change line 80 from LINE (2*X,2*Y)-(2*X,2*Y) to DINE (2*X,2*Y)-(2*X,2*Y) the program will fail at this point and nothing will be produced on the screen. Almost any change in that word will kill the program. Other major changes to that word will not kill the program but then the function will be entirely different. Other points will not harm the program at all if they are mutated. The starting points can be changed, the +1 can be removed from line 50 and the program not only runs, but also produces new forms.

This is the way speciation and evolution could occur. Modern developmental biology is coming to this conclusion.[57] The program with the first mutation of line 70 can be modified to run and mutate the starting points, then run again. The forms shown on the screen gradually change from the original shape to others, the form never changes much from the previous form, but never ever goes back to precisely repeat a previous shape. Each subsequent form gradually changes in shape as the starting points move through their six-dimensional space. Perhaps when God programmed the mathematics of life into the universe, he set in motion a never-repeating, always-changing organic system of living beings. Could it be that evolution was programmed by God, by means of

the nonlinear nature of life?

Does God love mutations? There is new evidence that God designed microbes to intentionally and randomly mutate themselves when they face a threat to their existence. These are called mutator genes.[58] If God was against random chance creating mutations, why did He create a system where microbes did this? It was the God's love of His creation that led him to give bacteria a means to save themselves when they faced a hostile environment. This God-given system is based upon random mutation. We disparage God's creative abilities when we say what He created was bad.

Young-earth creationists claim that there are no transitional forms found in the fossil record. In the program above, sudden large changes in the coordinates of the initial three points can make large morphological changes. The differences between Figures 22 and 23 are so large that no one would suspect that they are governed by the same equation. Secondly, in nonlinear systems what appear to be gaps are really connected, but the connection can not always easily be seen.

Figure 23A is a rather famous nonlinear system, the Mandelbrot set. A close examination of Figure 23A shows that there is a small island on the left side of the small box. There is no noticeable connection between the island and the "mainland." If we enlarge the area in the box (Figure 23B), however, we suddenly discover new islands, some of which are connected to the mainland. These islands line up in a direct path from the mainland to the large island at left. A further enlargement (Figure 23C) between the smaller island in the middle of the figure and the mainland reveals a peninsula connecting all the islands.

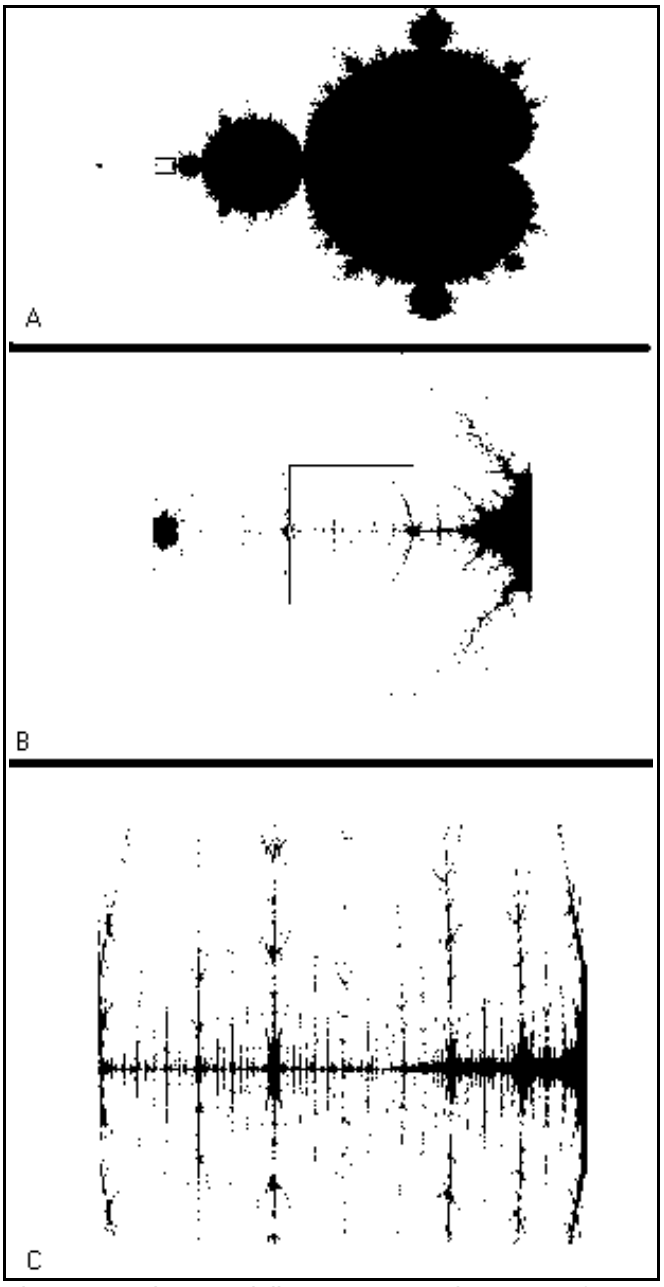

Figure 23 The Mandelbrot Set., B: enlargment of A, C: enlargment of B

expressed as a 4 x 4 two-dimensional plane.

```
A****
T****
G****
C****
 ATGC
```

Each dot in the plane represents a single two-nucleotide DNA. If you add a third nucleotide, you add a third dimension; add a fourth nucleotide to your DNA you add a fourth dimension. Human DNA is 3.5 billion nucleotides long. The human DNA has a 3.5 billion dimensional sequence space.

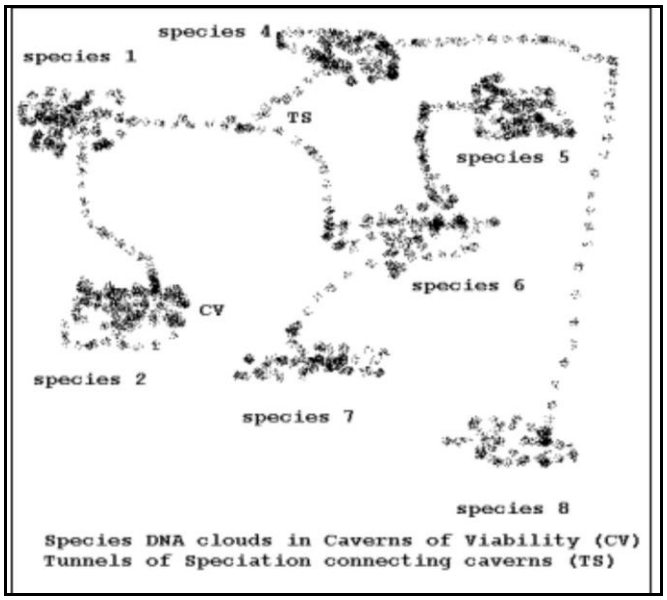

Figure 24 Species Caverns in DNA space

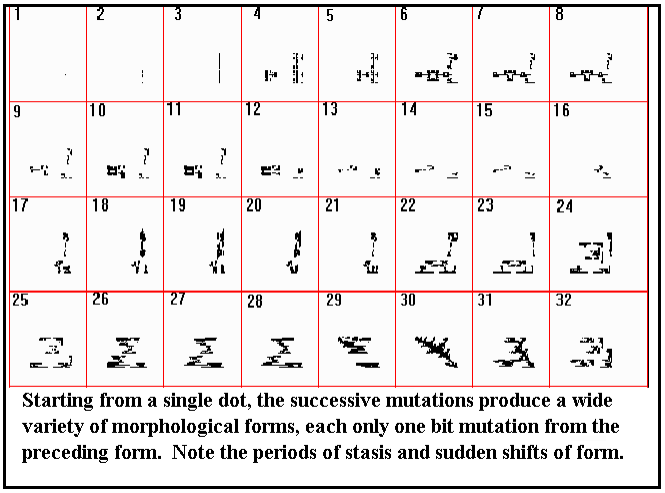

Figure 25 Punctuated-Equilibrium in a computer.

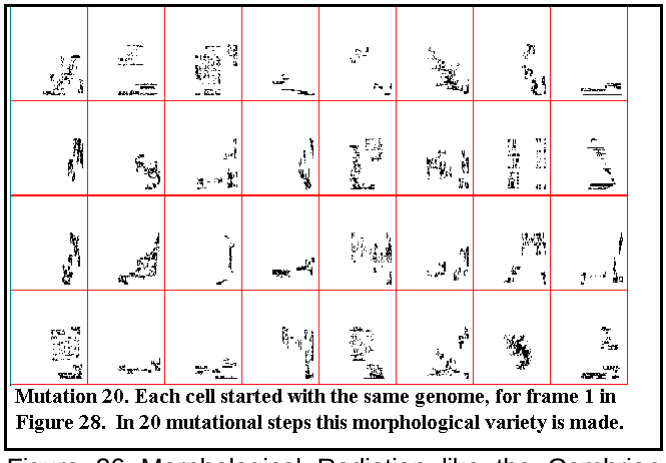

Figure 26 Morphological Radiation like the Cambrian Explosion

Each living human occupies a single point in the DNA sequence space. When a mutation occurs, the point they occupy moves to the adjacent point in the sequence space. The entire human population forms a cloud of points in a particular region of the sequence. This is because no two people, excepting identical twins, have the same DNA. This cloud of points defines what could be described as a cavern of viability. Any DNA whose point lies in this region is capable of producing a living human. Some mutations are harmful and kill the embryo. Such locations in the sequence space act like walls and any embryo with mutations lying within the walls (outside of the cavern of viability) dies. As a species evolves, the cloud of points representing the population moves out of one cavern of viability into another, thus creating a new species with a unique cloud of DNA points.

Consider the sequence space of DNA combinations, which define the set of all possible living creatures. In this sequence space, life can only exist in certain regions, the caverns of viability. Each unique species with its unique DNA occupies a separate cavern. Having billions of dimensions, the space must be more convoluted than the Mandelbrot set. One can expect small tunnels of viability, or tunnels of speciation, connecting larger caverns of viability (Fig. 24). These tunnels define the possible paths of evolution through the sequence space. Along these paths of viability and these paths alone can animals evolve to some new form of life. Some paths are broad and relatively easy to find. These paths define evolution within a family, i.e., the radiation of various genera within a family. Other paths are quite difficult to find due to their small size or circuitous route. The smaller the path the less likely it would be found. These paths may be found only by luck and they define the sudden jumps between what we define as families.

What is being proposed here is that God created the DNA system in such a fashion that it could evolve living species. God set up the equations that govern life in this multidimensional sequence space. Whatever equations govern life, they will be quite complex with a multidimensional sequence space. The quest for all transitional species will not succeed.

After the first life formed, somewhere between 3.8 billion and 3.4 billion years ago, it rapidly evolved to multicellular associations. The first filamentous algae appear in rocks dated as 3.46 billion years ago. Is this rapid rate of evolution reasonable? Yes, it appears so.. Martin E. Boraas at the University of Wisconsin at Milwaukee was growing an unidentified microflagellate species in a dish with Chlorella pyrenoidosa, a microscopic alga. The flagellate was having a feast eating the algae that grew to 2-5 micrometers in diameter. In the presence of predators, this algae did

something which it had never done before. The algae began to form clusters of from 4 to 10 cells which allowed the algae to escape predation.. A new behavior and species was born.[59] A variation of the program above produces morphological forms that mimic all the behaviors seen by morphological lineages found in the fossil record. Figure 25 shows one sequence (in the order of the numbers) of a mutational lineage. It starts as a single cell (dot) and each successive frame is a one-bit mutation. Frame 2 and 3 are like the multicellular animals which form strings like filaments.. Notice the stasis between frames 4-9, 17-21, and 25-28. This program mimics punctuated equilibrium. If each cell is allowed to mutate simultaneously and follow their own evolutionary path through the program's "DNA" phase space, Figure 26 shows the immense diversity possible in a "DNA" genome of only 4 units. Living systems have billions of units in their DNA.

The metazoa, multicellular life, eventually gave rise to the rest of life. For the first three billion years, life on earth evolved only slowly. This may be due to the narrowness of the sequence path into the creatures alive today. But once life found its way through, it found new worlds to spread into. Somewhere around 545 million years ago,[60] life found the path into a region that allowed much smaller mutations to have major morphologic effects. This time is known as the Cambrian explosion. Life literally exploded all across the face of the earth. The explosion was not merely one of mere numbers but also involved many new kinds of animals - animals that had never been seen on earth before. Shellfish, various arthropods, sponges, snails, sea cucumbers and seaweed are just a few of the new forms of life which arose. By 400 million years ago land plants had evolved.[61,62] Shortly afterwards, in the Devonian period, animals in the form of amphibians invaded the land. Reptiles came a few million years later and they gave rise to birds and mammals. All of this occurred by God's plan when He designed the DNA sequence space.

One final item must be addressed in this discussion of life before man. Young-earth creationists often make much ado about living fossils.[63] These are animals which are believed to have not changed for periods of millions of years. The horseshoe crab and ginkgo tree are two such examples. In point of fact, aside from algae, no living creature alive today is represented exactly in the fossil record. Figure 27 shows the morphological differences between Permian, Jurassic and modern horseshoe crabs. While their structure is similar, they are not identical. Similarly, all of the living fossils have morphological differences. The young-earth creationist view of fossils is quite simply wrong. If all the animals, which are found as fossils, were destroyed in a Flood, then what came off of the ark were new forms of animals, because fossil life is different from living animals.

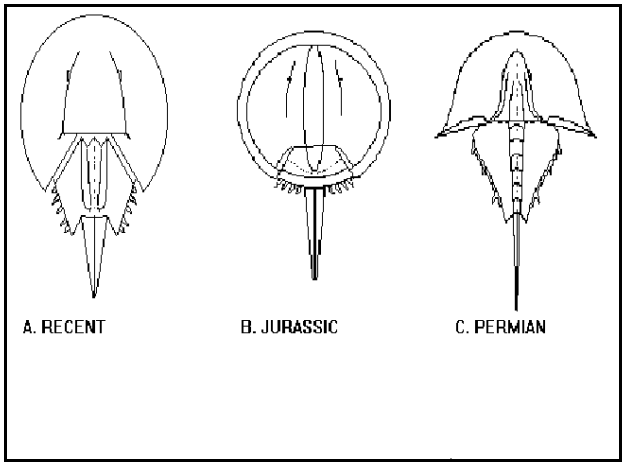

Figure 27 Fossil and Recent Horseshoe Crabs

In this chapter it has been shown that the evolution of life is quite consistent with this new Biblical interpretation. Far from having to make a choice between rejecting everything that science has discovered in the past four hundred years.[25] or rejecting the Bible as a source of historical information, the Christian can believe both and remain logically consistent. The most critical portion of this Days of Proclamation viewpoint concerns the origin of man and the way the Bible views him, and that is what we will discuss next.

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SNAKEBIT

In the autumn of 1855, an American publisher received an offer for the publication of a new book by Hugh Miller. Miller was a famous British geologist who was also a devout Christian. He had written a very popular book on the Old Red Sandstone. Miller believed the Bible. He was also concerned with the distortions concerning geology, which were being made by his fellow Christians. This new book would address the tension between geology and the Bible. The publishers were very interested and closed the deal at once.

Over the next year, advance pages were written and dispatched to the American publisher. As the editor perused the papers they were convinced that this book was a monumental work. They wrote, "It became more and more evident that the work was destined not only to extend his fame, but to establish for him new and special claims to the admiration and gratitude of mankind." The editor felt that Miller had been successful in dealing with the science/religion issue.

As Miller struggled with the issues and finished his work, he became more and more depressed. No one knows what was actually going through his mind during the final stages of manuscript preparation but the issues of how to explain the Divine record were clearly on his mind. As a geologist, Miller knew that he had not solved the issue of the flood. All he had done was explain why the Flood could not be global. He had not offered a detailed and successful scenario for the Flood. He had suggested that the Caspian basin was the locale for Noah's flood. His scenario did not allow one to point to a group of rocks and say, "There, those are the rocks deposited by the Flood." All he did was note that the Caspian used to be bigger than it is now, but that does not prove that the Caspian was catastrophically filled. It simply proves that the water is evaporating more rapidly today than the rivers can replenish it. He admitted that he was on weak ground and called his view a 'conjecture'.[1] He also admitted that the Flood might have been miraculous rather than natural.[2] This was almost equivalent to admitting that he had not solved the problem.

Miller's despair grew. On the night of December 23, 1856, after finishing the proof reading of his manuscript, Miller called his doctor to dinner. There he told the doctor that he had been up at night for several weeks working on the book. The doctor told him that he had been overworking, that he should stop work and take a rest. Miller agreed that that would be good.

After their dinner, Hugh Miller took his bath, and retired to his bedroom. An hour or so later, the maid entered the room and found a look of horror on his face. She fled the room rapidly. Later that night, Hugh Miller, the famous author, wrote a note to his wife, pulled out his pistol and shot himself to death.

Christians who do not study geology are unaware of the difficulties this subject presents to the believer, but Hugh Miller knew! While not coming to the depths of despair Miller faced, I have found it very difficult to deal with the misunderstandings of geology I hear from the pulpit. Miller knew, as I know, that what my fellow Christians are teaching about science is not correct. It challenges one's faith when he realizes that most of one's fellow believers are quite willing to make definitive statements about geology and other areas of science when they have never studied the subjects. It is painful to know that Christian apologists regularly ignore observational data.

As I have said many times, apologists are actively advocating ignoring those difficulties rather than explaining the data. There are lots of examples. Whitcomb and Morris note,

> "In conclusion, we find ourselves faced with an important alternative. We must accept either the current theories of paleontology, with an inconceivably vast time-scale for fossils before the appearance of man on the earth, or we must accept the order of events as set forth so clearly in the Word of God. Both views cannot be true at the same time, any more than can a Biblical anthropology and an evolutionary anthropology be true at the same time."[3]

Bolton Davidheiser adds,

> "Theistic evolution contradicts the Bible both historically and doctrinally. As to the historical approach, there is one fact which should forever settle the matter for Bible-believing Christians. There is a fact which cannot possibly be wrested and fitted into an evolutionary interpretation. It is expressly stated in Scripture that Eve was formed from a portion of the side of Adam, which the Lord removed for that purpose. This is usually said to be a rib, for the term is so translated in the King James version of the Bible. Since the Bible plainly states that the first woman was formed from a part taken from the side of the first man, we are given a detail of creation which cannot be forced into any theory of evolution."

> "Denying the historical accuracy of the Bible in the account of creation leads to a doctrinal position known as modernism. If men evolved from the beast, the sin nature is an inherited animal characteristic and cannot be due to the fall of man through disobedience. This denies the need of a Redeemer, and thus the atonement of Christ is neglected or denied."[4]

None of these authors are offering an explanation for the data, they are just calingl for the rejection of observational data. They are implicitly acknowledging that the observational data does not support their interpretation of the Bible. They also believe that their interpretation is equivalent to God's interpretation. Rather than admitting that they are men, capable of error, they claim that they can't be wrong in their interpretation. Believing in one's infallibility is pride. And this pride leads to the rejection of observational data (science) because it doesn't support their self-proclaimed infallible interpretation.

If the observational data truly does not support Christianity, it will wither in numbers and influence. This has happened in the U.S. in this century. The unusual agreement between atheists and young-earth creationists that science and the Bible are irrelevant to each other has consequences. It has usually led to young scientists, the intellectual elite, coming to regard Christianity as irrelevant and erroneous. What we hope to show in this chapter is that it is possible to unite these two views of man that everyone says cannot be united. If truly they can not be united, then Christianity will be doomed to wither, both in numbers and in influence, as it has during this century in the United States. It is crucial to find a solution in this area.

One objection to evolution is that every time someone attempts to harmonize evolution with the Bible, it is the Bible which is forced give. While historically that may be true, it certainly is not true of the view advocated by this book. So far, we have retained every important historical event in the Scripture. As we examine the origin of man in this chapter, we will start a little differently than we have in other chapters. The issues of man's origin as they affect Christianity need to be clearly outlined and freshly reviewed.

There are four issues which must be held to if the logical basis of historical Christianity is to remain viable. 1. Man is a special creation of God, the highest of the creation. The scripture clearly states that man is to have dominion. 2. There must be a historical Adam and Eve. Without a first pair, their sin could not become an original sin for the rest of humanity. 3. Eve's formation from Adam's side is less important for Christianity as a doctrine, but it, too, must be explained since it bears on the veracity of the record itself. If it is untrue, then the question is open as to what else is untrue. 4. An actual Fall must occur. A symbolic Fall does not raise the need for a Messiah that a real Fall does. For instance, if man evolved without a Fall and arose in a state of imperfection, the fault for his sin would not be his. For God to spiritually condemn a race, mankind, for sin that was caused by God Himself is unjust. To condemn the race for a sin committed by a representative of the race and confirmed by the choices of each subsequent individual is not unjust. The Fall must be real to retain the justice of God. To do away with the Fall makes sin a symbol only. A symbolic sin could be paid for by a symbolic Messiah, say Charleston Heston as the symbolic Christ in one of his movies.

Young-earth creationists often point out that if evolution is true, then man is not special. The Bible, they correctly note, presents man as a special creation of God. But what they miss is that if God had really wanted to leave His mark on our bodies, He most certainly could have. Instead, God created our bodies with proteins that are absolutely identical with the animals, an identical genetic code and enzymes. The stock answer is given by Gish,

> "Is it surprising that the biochemistry (life chemistry or metabolism) of the human is very similar to that of a rat? After all, don't we eat the same kind of food, drink the same water, and breathe the same air?"[5]

But this still does not preclude God from leaving his mark. An example of such a mark comes from the cold war. U.S. intelligence experts received a surprise when they examined a captured Soviet air-to-air missile. On one of the circuit boards was a useless screw. Not only was it useless, it was a "backwards" screw - it turned counter-clockwise. Further investigation revealed that the board had been copied from an American air-to-air missile. The useless screw was the personal signature of the American design engineer who, it seems, always put this useless screw on anything he did. The Soviet engineers, examining their captured American missile, but not knowing what purpose the screw served, were afraid not to include it on their copy of the circuit board. Thus, when the Americans captured the Soviet missile, the screw, so to speak, had made a full turn.[6]

The point of this tale is that with that one single useless screw the designer's mark was left on the circuit. You could prove in a court of law that this board was copied. God could easily have left in our genetic code patterns that have no relationship to other animals and marked our bodies as special. He could have created us and never

created the monkeys or great apes. If God had wanted to leave His mark or His signature on our bodies without changing the biochemistry, He could have created a radically different means of human reproduction, a means unlike any other group. He could have made us the only animals with leaves instead of hair. Mankind then would be unrelated to the other animals and thus would be unique. But God didn't do that. This would certainly have set us apart even while we had the same biochemistry as other living beings. We would have been an order totally separated from the rest of life. At the very least God, could have created us without the identical pseudogenes found in the humans, gorillas, chimpanzees and gibbons. (See Chapter 7). But for some reason God chose not to do that. There are only a couple of reasons which immediately come to mind: 1) God deliberately wanted us to look like we were related to the rest of the animal kingdom, even if we weren't, or 2) God created us by means of this relatedness, i.e., He evolved us. The first option leaves God in the position of being a deceiver. Since we know that God does not deceive, then this evidence must be telling us something true about our world. Thus, the second option, evolution, is preferable. We can be special, even if our bodies are not.

The Gap in the Record

A look at the Scriptural record shows that, beginning in Genesis 2:4, there is a second account of creation. This creation account focuses on the creation of man. The traditional explanation is that this merely fills in more details that were left out of chapter 1.[7] While there is a certain truth in that view, it does seem excessively verbose of Moses or God to repeat what he had just described. Why weren't these details given in chapter one? They could have been. In fact this second account has been used by the advocates of the JEDP theory (a theory that advocates that the Pentateuch was not written by Moses but by a committee pasting four contradictory creation accounts together with each letter, J, E, D, and P stand for a different source) as evidence that the Bible is really an amalgam of the beliefs of at least four different groups. A better alternative, which would preclude the JEDP interpretation, is that the second chapter is relating an entirely different event, one which occurred many billions of years after the events of chapter one. By looking at Genesis 2 in this fashion, the redundancy is removed and there is a logical reason for the second account. The first account is a proclamation of man's future existence, the second is the actualization of his existence.

Theology

Genesis 2:7 states that God made man from the dust of the ground and breathed life into him. This verse omits several pieces of information, which are often supplied by the Biblical interpreter. This verse does not say when God created man. There is no time reference for us to measure from, so it could have been thousands, hundreds of thousands or millions of years ago as far as this verse is concerned. This verse does not say how God created man. The traditional view is that God scooped up some mud and went "poof," like a magician. But, as we have mentioned before, this view of God as magician makes Him more a showman than a thinker or planner. Evolution is not excluded as the means. Evolution actually says that men and animals arose from the 'earth'. Genesis 1:24 agrees: "And God said, 'Let the earth bring forth the living creature..." Evolution and the Bible are in agreement.

Genesis 2:7 also does not define what the "breath of life" is. Was it different than what the animals had? It appears so from what God said about making man in His image. Genesis 2:7 also does not state that the body God breathed into was identical to modern man's. This is assumed only because Christians want to avoid evolution. In other words, Adam's body may have looked quite different from ours.

This point requires a little more expansion. Unless we believe that God Himself has a physical body, the statement in Genesis 1:26-27 about the "image of God" must refer to our spirit, not our body. Thus from a purely theological point of view, we could have looked like lizards and still been made in the image of God. This conclusion must follow logically from the assumption that our body is not what God was talking about.

The standard objection to the idea that our bodies might have been different from Adam's is that God commanded all creatures to reproduce after "their kind." Henry Morris says,

> "In the five verses quoted above, the phrase 'after his kind' or 'after their kind' occurs ten times, as emphasized. While the broad categories as listed certainly do not enable us to determine the exact meaning of the term 'kind' (Hebrew min), the principle is clear that distinct categories within the plant and animal kingdoms have existed right from the beginning. Whatever the 'kind' may be, it is something. Each kind was designed to reproduce after its own kind, not to become

> some other kind. Creationists insist that these clear statements of God's creative act and purpose absolutely exclude theistic evolution as an option for Christians who really believe the Bible to be God's Word."[8]

Morris cites Genesis 1:11-12, 21 and 24-25. A careful look at those verses reveals that they say absolutely nothing about reproduction of static creatures! Verses 11 and 12 state that,

> "Then God said, 'Let the land produce vegetation: seed-bearing plants and trees on the land that bear fruit with seed in it according to their various kinds.' And it was so. The land produced vegetation: plants bearing seed according to their kinds. And God saw that it was good." (NIV) (Emphasis mine)

Morris' view, which stems from not understanding which word is the subject of the sentence, is a gross misreading of this verse which has somehow inculcated itself throughout evangelical Christian theology. The verse says that the land is to produce vegetation according to their various kind or types. The word "land" is the subject of the sentence, not "vegetation." The verse does not say that the vegetation is to produce vegetation after its kind. This is merely a command for various kinds of plants to be produced, each producing a specific kind of fruit, but nowhere is there a command that the kind can't change or must remain static.

Verse 21 says that God created the sea creatures according to their kind. It does not say that the sea creatures reproduced according to their kind. This is equivalent to stating "I went to the store and purchased fruits after their kinds (or fruits of all kinds)." The young-earth creationist is reading far more into the verse than it actually says. Finally, verses 24 and 25 repeat these patterns. Verse 24 has the Earth as the subject; verse 25 has God as the subject. If the Bible were to state "Let the animals produce animals after their kind," Morris' interpretation would have merit. But since nowhere are the animals stated to be commanded to reproduce only after their kind, we have no reason to conclude that Morris' viewpoint is the only logical or reasonable viewpoint for us to hold.

This restriction upon what life can produce has trapped young-earth creationists in a no-win situation. All evidence of speciation and change must be ignored. Biologists attempt to show young-earth creationists evidence of speciation and change, but due to a particular interpretation of the Bible the young-earth creationist must reject it. The error once again is not in what the Bible actually says, but in what the interpretation says. Man's truth placed in the stead of God's Word.

The point of this extended discussion of "kind" is that it is not Biblically excluded for man's body to change with time. Indeed, there is absolute proof that man's body has changed with time. Chinese look different from Europeans, who look different from Africans, who look different from Native Americans, who look different from African pygmies. Mankind obviously did not strictly reproduce after their 'kind.' Yet all of these races are fully human and included within the plan of salvation. What is the limit of variation of man's body? At what point has he crossed the line between reproducing after his kind and reproducing another kind? Morris would concede that Homo erectus is fully human[9] and yet its cranial capacity is much less than the modern value, by about 66%. There are other skeletal differences between them and us. So even Morris would accept that the image of God could be put in a body much different than the one which we wear.

The Creation of Man

Within the confines of the above outline, any explanation of the origin of man within the Biblical framework must account for the pseudogenes, the different chromosome number of apes and man, and the fact that God did something special in the creation of man. If you remember (Chapter 7), a pseudogene is a useless, broken copy of a gene which has been inserted into a particular place in the genome. The occurrence of the same pseudogene inserted into the same spot on gorilla, chimp, gibbon and man demands an explanation. To say that someday, some way, we will find a nonevolutionary explanation for such a fact, is equivalent to ignoring it and hoping it will go away. Such an approach is out of the question for anyone with intellectual integrity. Currently no design argument can account for the supernatural design and placement of useless parts on different species. In fact this could open the door for charging God with deception in making the species appear related when, in fact, they aren't. Once again as Hebrews 6:18 shows, it is impossible for God to lie. Therefore, the only correct theological conclusion is that the pseudogenes are telling us of our bodies' relationship with the primates.

The second item which must be accounted for is the chromosomal fusion which must have occurred if man were to have been derived from the apes. All the great apes have 48 chromosomes; man has only 46.[10] The most

likely explanation within an evolutionary framework is that the speciation process included the fusion of two pairs to form one new and larger chromosome and a few other chromosomal re-arrangements.[11] Chromosome fusion is rare in men but it has been known to occur. One man was born with all of his chromosomes fused into one gigantic chromosome.[12] While chromosomal fusions are not common in mankind, they are not uncommon in certain animals, such as the equines mentioned earlier.

Third one must also account for genetic inversions--sections of the chromosome. Some sections of the human chromosomes have been turned upside down and re-inserted into the chromosome if compared to the chimp. One in 7000 newborn children have such inversions today and are quite normal.[13] Pictures of chimp and human chromosomes clearly show such inverted regions.[14] It strains credibility that God would make these types of changes when creating a being that was supposed to be totally separated from the rest of the animal kingdom.

The fourth item, which must be accounted for, is the fact that God did something special in the origin of man. He breathed life into man, something that is not said of the other creatures. Man must also have first appeared without any available mates, certainly a curious circumstance under most conditions. It is this point which makes a purely naturalistic evolution of man unbiblical. God was most assuredly involved in the creation of Eve.

These are the conflicting facts which must be accounted for. The goal is to create a scenario that accounts for all these items. The explanation must fit all the above facts or the explanation is false. The explanation can not rely on future discoveries since that is assuming that one can foretell the future. The scenario presented below is no more speculative than the scenario presented by a prosecutor when he is trying to convict a criminal. It, too, is a speculation which must match the facts.

At least one set of circumstances can account for all these facts. Assume that God had watched His carefully planned evolution cover the world with plants and animals and was awaiting the evolution of some creature which would serve His purpose for creating a dominating form of life. He wanted to create a creature who could worship Him. The great apes arose according to His previously laid out plans, but they can't communicate complex ideas by vocalizations.[15] Communication is required for worship. The apes don't have the requisite bent pharynx or Broca's area in the brain that controls speech. Also, their hands are not adept at handling delicate objects. But one ape was pregnant with a significantly mutated offspring. The mutation was extremely rare among primates and would be unlikely to occur twice during the same lifetime. One pair of chromosomes had fused, giving this creature only 46. At birth, the child was stillborn. God then became miraculously involved as the Bible says. God then took this creature, and miraculously fixed the defects which had killed the child. God gave the new being Broca's area which allowed speech (see the next chapter). In this way, Adam was born. His body still shows the relationship to his parent species in the form of the pseudogenes. He was also a special creation of God. Only in this way can the scientific data be reconciled with the divinely revealed data of the Bible.

There are two reasons that the creature, which God turned into Adam, needed to be still born. First, Genesis 2:7 clearly states, "the LORD God formed the man from the dust of the ground and breathed into his nostrils the breath of life, and the man became a living being." (NIV) If Adam had been born alive, this would have been impossible. Secondly the term dust of the ground is an interesting phrase. This phrase has most often been interpreted literally as dust--chemicals of the earth. But a dead body is just that, nothing but chemicals that become part of the earth. The connection with the Fall is seen in this. In Genesis 3:19 when Adam sinned, God said, "By the sweat of your brow you will eat your food until you return to the ground, since from it you were taken; for dust you are and to dust you will return." (NIV). When we die, in a real sense we become dust. Our bodies without spirit and soul are nothing but dust.

But does the dust need to be dust? This objection has been advanced. God used dirt, not a dead body to create Adam, some have said. An interesting phrase occurs when God is pronouncing the punishment for sin. God said,"...for dust you are, and to dust you will return." (Genesis 3:19). Adam was at that moment a living body and God called him "dust". If God can use "dust" to refer to a living body, certainly there can be no objection to using the term "dust" to refer to a dead body.

One reaction to this view is quite predictable. There will be an emotional reaction because Christians somehow think it is alright for God to use dirt but not a dead body (which is really no more active or alive than dirt). This is merely an emotional reaction to the idea of the use of a corpse. This is also an emotional reaction to the idea that we might be related to the apes. Christians have been told for so long and by so many authors that we were not evolved, that there will be an emotional reaction that this just can't be so. It threatens our worldview. But if this were to be so, then to reject it would place us in the position of the clay in Isaiah 45:9. "Woe to him who quarrels with his Maker, to him who is but a potsherd among the potsherds on the ground. Does the clay say to the potter, 'what are you making?'"(NIV) This view of man's origin can not be proven, but at this point there is not enough evidence to be able to disprove it either. Before we act like the clay, we need to think about the possibility

that we just might be related, physically, to the apes.

Just like his mother, Adam could not talk. He had the mental capacity but there was no one to teach him, because language is learned in infancy by the baby making noise and getting responses. Moskowitz reports,

> "Most infants coo and babble during the first six months of life, but congenitally deaf children have been observed to cease babbling after six months, whereas normal infants continue to babble. A child does not learn language, however, simply by hearing it spoken. A boy with normal hearing but with deaf parents who communicated by the American Sign Language was exposed to television every day so that he would learn English. Because the child was asthmatic and was confined to his home he interacted only with people at home, where his family and all their visitors communicated in sign language. By the age of three he was fluent in sign language but neither understood nor spoke English. It appears that in order to learn a language a child must also be able to interact with real people in that language."[16]

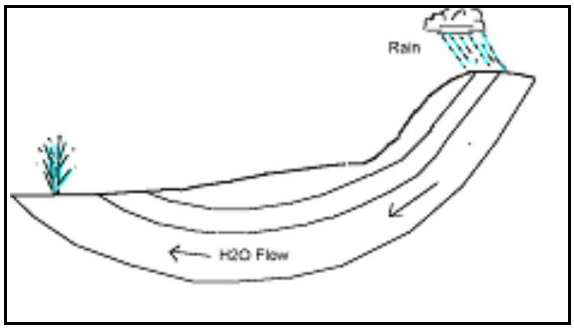

Figure 28 Topography necessary for artesian flow.

Adam had no one to interact with except God. Langer, reports on feral children in this regard,

> "The only well-attested cases are Peter the wild boy, found in the fields of Hanover in 1723; Victor, known as the 'Savage of Aveyron' captured in that district of Southern France in 1799; and two little girls, Amala and Kamala taken in the vicinity of Midnapur, India, in 1920. Even of these, only Victor has been scientifically studied and described."
>
> "One thing however we know definitely about all of them; none of these children could speak in any tongue, remembered or invented. A child without human companions would of course find no response to his chattering; but if speech were a genuine instinct, this should make little difference. Civilized children talk to the cat without knowing that they are soliloquizing, and a dog that answers with a bark is a good audience; moreover Amala and Kamala had each other."[17]

From all this we can conclude that it would be unlikely for Adam to learn to speak by himself and he would need a teacher. God was that teacher. Genesis 2:19-20 reports that God brought all the animals to Adam for him to name. But why did God have him name everything? Apparently the concept of names for objects is an important step in either speech or consciousness of the exterior world as a separate entity. The story of Helen Keller is a case in point. Jacquetta Hawkes wrote,

> "The uneducated born deaf (who offer a fair analogy in certain respects to mankind before language) are unable to break down the world confronting them; they experience life as a continuous procession of total events, and their attempt to communicate leads to a miming of these unanalyzed events. Individuals in this position can remember but cannot reason logically and are therefore most unlikely to be inventive. The story has often been told of how Helen Keller, blind, deaf and dumb, was suddenly reached in her dark silence and made to realize that 'everything had a name.'"[18]

Helen Keller wrote of her awakening in a 1936 book. She said,

> "We walked down the path to the well-house, attracted by all the fragrance of the honeysuckle with which it was covered. Someone was drawing water and my teacher placed my hand under the spout. As the cool stream gushed over my hand she spelled into the other the word 'water', first slowly, then rapidly. I stood still, my whole attention fixed upon the motion of her fingers. Suddenly I felt a misty consciousness as of something forgotten - a thrill of returning thought; and somehow the mystery of language was revealed to me. I knew then that w-a-t-e-r meant the wonderful cool something that was flowing over my hand. That living word awakened my soul, gave it light, hope,

joy, set it free. There were barriers still, it is true, but barriers that in time could be swept away.

> "I left the well-house eager to learn. Everything had a name, and each name gave birth to a new thought. As we returned to the house every object which I touched seemed to quiver with life. That was because I saw everything with the strange new sight that had come to me."[19]

It is quite interesting that the making of man was intimately associated with the naming of objects.

The rarity of the mutation and its lethality left Adam without any ability to procreate his kind. Nowhere on earth was there a creature like him. After naming all the animals, Adam then realized that there was no one for him. At this point, God produced Eve by that well known surgical technique, the spare rib and the miracle (Genesis 2:21-22).

When did this take place? We saw in a previous chapter that the universe is indeed old. Thus there is a much greater range of time in which to place Adam. He does not have to be within the past few thousand years as most conservative Christians have been taught. For reasons which will become obvious later in this chapter, I am going to suggest that Adam was created somewhere around five and a half million years ago.

Eden

Genesis 2:5,6 states,

> "and no shrub of the field had yet appeared on the earth and no plant of the field had yet sprung up, for the LORD God had not sent rain on the earth and there was no man to work the ground, but streams came up from the earth and watered the whole surface of the ground--"(NIV)

These verses are claimed to be a description of the antediluvian world. There was (1) no shrub of the field, (2) no plant of the field, (3) no rain, and finally (4) no man. What is strange in the young-earth creationist interpretation of this verse is that it is applied inconsistently. Whitcomb and Morris state,

> "This verse is applied specifically to the initial completed Creation, but there is no mention made of any change in this meteorological phenomenon after the Fall, so it evidently continued until the time of the Deluge." [20]

Young-earth creationists claim that this verse says that there was no rain before the Flood. To apply this verse to the entire preflood period, would not only mean that there was no rain, but also that there were neither plants nor man until Noah's world was washed away. No plants; no farming. No man; no Noah. The only item, which the young-earth creationists want to extend up until the Flood, is the lack of rain. This is illogical.

As long as the Earth is a sphere, energy will be unevenly distributed across the Earth's surface. That will set air currents in motion in an attempt to equalize the temperature and density differences. This atmospheric motion will most assuredly cause rain.

A better translation of Gen. 2:5-6 would be to use the word "land" in place of "earth." As mentioned earlier, the Hebrew word "eretz" can be translated so. This alters significantly the meaning of these verses but not in a bad way. The verse would then apply only to a region of the Earth in which there was no rain. It would not apply to the whole Earth.

We must consider three points of view when discussing the meaning of a word. The first is God's intent. What did He mean? Second, is the understanding of Moses and the Hebrews, as to what God intended. This may or may not have been the correct understanding. We can not assume that their understanding was necessarily special or better than ours. Finally we must consider our understanding of the word and the connotations raised by the particular word chosen in the translation.

The use of the word "earth" with a twentieth century man has global or astronomical connotations. To the Hebrew, the word probably had a more limited meaning of "land" or "country" since they really had no concept of the spherical planet Earth.

A look at the description of the hydrology in verse 6 is truly strange. The land is described as one with no rain and water coming out of the earth to water the land. In today's world springs do emit water, but this occurs only over limited areas under limited circumstances. Topographically elevated areas are required to provide the necessary pressure gradient to push the water against the force of gravity and friction. Figure 28 shows how rainfall on a mountain or hill soaks into the ground, flows underground through an isolated rock layer and emerges in the

form of a spring. The elevation is necessary to cause the flow. Over a broad surface, with gravity holding the water down, there is no way for the water to rise. Thus, to conceive of a land in which the entire surface was watered by spring seepage requires much different circumstances than the laws of physics allow. Morris presents an interesting explanation of the water that came out of the ground, but a physical analysis of it made by this author shows that the water must come out of the ground boiling hot. Steam must be used to lift the water. If there is no steam then a cycle like this violates both the First and Second Laws of Thermodynamics. In either case it is impossible! [21]

But the hydrology of the preflood world gets even stranger when Genesis 2:10-15 is considered. It says,

> "Now a river flowed out of Eden to water the garden; and from there it divided and became four rivers. The name of the first is Pishon; it flows around the whole land of Havilah, where there is gold. And the gold of that land is good; the bdellium and the onyx stone are there. And the name of the second river is Gihon; it flows around the whole land of Cush. And the name of the third river is Tigris; it flows east of Assyria and the fourth river is the Euphrates." (New American Standard)

Rivers generally do not split into four except at a delta. But when that happens, it is difficult to describe them as flowing around entire lands. What does the text say about the geography of Eden? Does the text indicate that the direction of the split in the rivers was downstream? No, it says a river went out of Eden, not four rivers went out of Eden. The literal Hebrew word order is "river went out of Eden watered garden". This differentiates the garden from Eden as two slightly separate places. Yatsa', the Hebrew word, can mean 'to go out. It implies that the river was formed in Eden then flowed to the garden. Eden was upstream and the garden downstream. The verse also does not require that the springs creating the river were located in Eden itself. Eden could have been at the conjunction of four rivers where four rivers formed one.

When the Scripture uses the Hebrew word, sham, meaning 'from thence it was parted,' one must ask from where? Was the river parted from the garden or from Eden? We have already seen that there was one river from Eden to the garden. The Hebrew would indicate that the split was upstream from Eden. Ro'sh, is the Hebrew word for headwaters. It can also be translated as "beginning", "highest part", or "chiefest". All of these possibilities imply that the Scripture is speaking of the source for the rivers that are found in the higher elevations. From this we can conclude that it is reasonable for the four rivers to be upstream of Eden. The Bible names these four rivers as the Pishon, the Gihon, the Tigris and the Euphrates.

Thus, there are three weird facts which must be explained: 1) a land with no rain, 2) a land where water oozes out of the ground, and 3) rivers which join into one. There is a place which could conceivably satisfy these three criteria: the bottom of a deep, deep canyon such as was formed once when the Mediterranean Ocean was a desert. It is suggested that this was where Eden was. To explain this we need to take a look at the geology of the Mediterranean basin.

The Mediterranean

Isaiah 50:2, says "By a mere rebuke I dry up the sea, I turn rivers into a desert; their fish rot for lack of water and die of thirst."(NIV)

Few in science knew how true those words are. Beginning at the end of the nineteenth century, and continuing into the 1980s, strange geologic facts were learned about the Mediterranean basin. While workers were drilling for water, they found a deep channel under the Rhone River. This river, which empties into the Mediterranean from southern France, had apparently cut a channel into hard granite as deep as 300 feet below sea level at Valence, France. Eventually, drilling showed that the gorge extended for more than 124 miles south to La Camarque, where the channel bottom was more than 3,000 feet deep. [22] Rivers can not erode the landscape below the level of the sea, but this river apparently had. In Sicily it was discovered that a deep-water deposit, called the Trubi marl, immediately overlies a shallow-water salt deposit.[23] In 1961, the first seismic studies were conducted in the Mediterranean Sea, and they revealed an amazing sight. Objects were seen in the deep, abyssal part of the sea that looked exactly like the salt domes that had been drilled in the Gulf of Mexico and elsewhere. Salt domes have a characteristic pattern on a seismic line. The difficulty the salt domes presented was that nobody knew how to deposit 6,500 to 10,000 feet of salt in the deep ocean basin. [24] In the mid 1960s, a seismic survey vessel, the Conrad, revealed a massive erosional channel across the Mediterranean Ridge under thousands of feet of water [25]. Geologists in Libya and Egypt discovered huge river-cut channels buried beneath the North African coast, including

the Nile. [26] In Egypt at Aswan, 500 miles south of the Mediterranean basin, Russian engineers drilled holes in search of the bedrock underneath the proposed Aswan dam and found that the solid granite had been eroded more than 600 feet below sea level. At the mouth of the Nile the paleocanyon was estimated to lie more than 4,500 feet deep. Only a serious lowering of the Mediterranean water level could do this. Also, the cave system on Malta was found to extend more than 6,600 feet below sea level. Since caves are only known to form above sea level, this was truly a puzzle.[27] Finally, karsts, an above-sea-level erosional feature, are found on the Mediterranean Ridge more than 6,600 feet below sea level.[28]

All of these features, as well as others, paint a puzzling, incongruous picture of the geologic history of the Mediterranean Ocean. It was not until the voyage of the D/V Glomar Challenger in August and September of 1970 that these discordant facts were joined into a coherent and understandable picture. The D/V Glomar Challenger is a research vessel employed to drill into the ocean bottoms around the world and sample the sediment. Its aim was to understand the geology of world's oceans; a goal it magnificently attained in the Mediterranean.

Off the coast of Majorca in the Balearic Sea, the drill ship recovered a core that contained both anhydrite and stromatolite. Anhydrite is an evaporitic mineral which forms only at temperatures higher than 35^{o} C (95^{o} F).[29] Finding this mineral under 8,500 feet of water and 1,000 feet of sediment, where the temperature is always less than 35^{o} C, was quite a shock. But the discovery of the stromatolite proved at once that this ocean basin had been covered with less than 30 feet of water.[30] Stromatolite is a peculiar, shallow-water algal deposit which depends upon photosynthesis to form! The voyage also discovered desiccation cracks filled with salt, eolian silts, shallow-water ostracods and desert-like alluvial fan deposits.[31] (An alluvial fan is a conical shaped pile of dirt and rock which forms at the foot of a mountain where streams deposit the material.) They also found plant roots in the sediment on the bottom of the Mediterranean (which proves that plants grew at this site).[32] Examination of these strata which have since been uplifted and now for part of Italy shows that they contained acorns, land turtles, fresh-water reeds, a daddy-long-legs spider, leaves from Sequoia and bird feathers but no deep water lantern fish which live in the abyssal ocean. This assemblage of fossils is consistent with the Mediterranean basin having been dry land with a lively ecosystem flourishing on its bottom.[33] It gradually became obvious that the Mediterranean Basin had been a dry desert, but how could this have been?

If the Strait of Gibraltar were to be dammed up today, the Mediterranean would evaporate in approximately 1,000 to 4,000 years. The surface level would drop a little over four feet per year. Small basins with brine lakes would be all that remained.[34] The drying up of the Mediterranean is prevented only by the continued influx of new Atlantic waters. Rivers don't deliver enough water to match the loss through evaporation. In a dry Mediterranean, the continents of Africa, Europe and Asia would appear as a surrounding ring of 10,000-ft-tall mountains. The rivers pouring off the continents would begin to erode huge canyons into the continental shelves. Huge alluvial fans would be deposited at the base of the continental slope, like those encountered by the D/V Glomar Challenger in 1970. Anhydrite would be deposited on the former sea floor since the temperature would easily be above the critical 35^{o} C temperature. Salt would also be deposited in some areas, while fresher water areas, where rivers flowed in, would allow for the deposition of stromatolites. Rainwater falling on Malta would percolate through the subsurface limestones, forming a cavern system all the way down to the abyssal levels of the Mediterranean. The erosional channel on the Mediterranean Ridge could easily have been cut 6,600 feet below sea level, as one Mediterranean sub-basin spilled into another through a narrow opening. This is like Lake Erie's spilling into Lake Ontario, eroding a channel between the two lakes by means of Niagara Falls.

The Prediluvial World

The Mediterranean desiccation has major implications for the interpretation of the first few chapters of Genesis and the inverted hydrology it describes. Assuming that the Bible is describing an area similar to the desiccated Mediterranean basin, the reversed hydrology becomes understandable. The lack of rain would be understandable, since the major source of water for rainfall in the Mediterranean region is the Mediterranean Ocean itself. But as noted above, there would be rain on earth. Without that abundant supply of moisture, rain would practically cease in the region. The prevailing wind in the Mediterranean region is from the north in January and from the east in July.[35] This would make it extremely unlikely that any rain would fall in this basin. It is a well-known fact that there is a rain shadow, a region which receives less rain, in basins immediately downwind from mountains because an air mass moving downhill lowers its relative humidity. This means that any moisture contained in the air as it spilled over into the desiccated Mediterranean Basin would be even less likely to form rain clouds. Rain would occur only near isolated mountains, like Malta, where the wind was forced upwards. The basin would be on the lee side of huge mountains in all directions.

While it is rare for a region not to receive rainfall, it is not unknown. The Atacama Desert in Chile has regions which go as long as 5 years or more without any rain. Heavy rains fall on the desert only 2 to 4 times per century.[36] Some parts of the eastern Sahara like at Bir Tarfawi, has had no rainfall this century.[37] Thus, for the Mediterranean to dry up, creating a region which did not receive rain, would be novel but not inconceivable. As to the mists, or streams, which rose up out of the ground, two possibilities exist. First, the aquifers underlying the surface of the continental plateaus of Africa, Europe and Asia would have been busy disgorging their contents along the former continental slope, which was a mountainside when the Mediterranean basin was emptied. Many springs and seepages of water would arise in this fashion because the hydrostatic head on the subterranean waters would force the flow to lower surface in this fashion. Secondly, as rivers flow into the basin, on the apex of an alluvial cone, some of the water would soak into the ground and would ooze out of the ground at a lower elevation on the alluvial cone.

The strange description of the division of the rivers can only be accounted for in a situation similar to that of the desiccated Mediterranean. At the foot of the continental slope, where the four rivers came together watering the garden. This produced an oasis in the large desert on the bottom of a former sea. This was Eden, or 'pleasure'.

Consider the first description of Eden (Genesis 2:8, NIV):

> "Now the LORD God had planted a garden in the east, in Eden; and there he put the man he had formed."

Why is it mentioned that the garden is in the east? In the east of what? The location is a relative term and has been normally interpreted to imply somewhere east of Israel. It is certainly possible, in light of the paucity of evidence, to claim that the term refers to the eastern Mediterranean basin, specifically along one of the distributaries of the Nile. The effects of a desiccated eastern Mediterranean Basin seem to match those described in Genesis which, by itself, should be a powerful argument. There is no place east of Israel that matches what the Bible describes.

The next few verses lay out the prediluvial geography quite specifically. Genesis 2:10-14 (NIV) states,

> "A river watering the garden flowed from Eden; from there it was separated into four headwaters. The name of the first is the Pishon; it winds through the entire land of Havilah, where there is gold. (The gold of that land is good; aromatic resin and onyx are also there.) The name of the second river is the Gihon; it winds through the entire land of Cush. The name of the third river is the Tigris; it runs along the east side of Asshur. And the fourth river is the Euphrates. "

The eastern Mediterranean setting matches the rivers described at least it would have five million years ago when it was a desert. It is suggested here that the rivers are Dhiarizos on Cyprus (Pishon), the Nile (Gihon), the Tigris and the Euphrates. These identifications rely on the identifications of the lands mentioned in Genesis 2. The Pishon encircles Havilah whose location has eluded scholars for centuries. Munday writes:

> "To help his audience in fixing Havilah's location, the recorder provided ancillary data on Havilah's natural resources. Unfortunately, none of them yield information very helpful in fixing Havilah's location. Gold was produced from various locations in Arabia and its environs. Bdellium, or aromatic resin, possibly amber, is only one possible translation of [Hebrew word]; another is 'pearl.' Num. 11:7 uses its appearance in a color comparison with manna, but to no advantage here. Bdellium is a traditional product of Arabia but this offers no suggestion on how to narrow possible locations of Havilah within Arabia."[38]

The Dhiarizos(Pishon) river flowed through the land Havilah, where there was gold and onyx, and "aromatic resin." According to Derek Kidner, the word which is translated as "aromatic resin" might be better translated as pearls.[39] Resin seems to be a poor match with the other riches found in Havilah, but pearls would fit the nature of the listed items. There is a place on the Mediterranean floor that would fulfill this description. Biju-Duval et al. describe an arc of mineral rich rocks, ophiolites, which stretches from Turkey west across Cyprus and continues along the Mediterranean ocean bottom.[40]

Ophiolites are igneous rocks that were once part of the ocean floor and are well known for their mineral deposits. One part of this ophiolite chain presently rises above sea level on the island of Cyprus. These mineral rich deposits contain onyx (Chalcedony)[41], copper[42] iron, manganese,[43] silver and gold.[44] If the area of Cyprus was part

of the land of Havilah, then oyster beds with pearls inside them would have been exposed high on the slopes of the continent of Asia. The oysters which grew along the Asiatic seashore prior to the time when the Mediterranean dried up, would be stranded high on what then appeared as a mountain chain. One could walk along the mountain slope, open the decomposing shells, and find pearls. The Pishon is a river coming off of Cyprus, possibly the Dhiarizos River of southern Cyprus.

The Gihon is possibly the Nile. Munday gives the best discussion of the identification of this river. He relates,

> "This river is identified only as winding through or around all of Cush (Gen. 2:13). The Hebrew [Hebrew word] derives from a root meaning 'to bubble'; such a name could hardly apply to a placid river on a plain, unless it were in hill country. Nor could the name apply to the 'Circumfluent Ocean' around the inhabited world, as claimed by Neiman, without ignoring the word's root, confusing the terms for river and sea, and regarding Cush as a pointer to all distant lands instead of to a distinct region.
>
> "The term [kuwsh the Hebrew word for Cush--GRM] is found in many Hebrew scriptures and is identified as either Cush or classical Ethiopia (i.e., modern Sudan).The identification Ethiopia is certain in many instances, such as Num. 12:1; Esth 1:1; and Jer. 12:23. But an African location is not at all indicated in Gen. 2:13 unless Eden's geography is regarded as fantasy."[45]

But here I think Munday is rejecting the Scriptural evidence too quickly because he can't envision something that is different than the old, falsified interpretations of Scripture. In the scenario advocated here, the Gihon and Cush match exactly what the Bible is saying. Consider the meaning of Gihon--to bubble. The Nile at the time when the Mediterranean was an empty basin would have had many cataracts over which the waters bubbled and boiled as they fell into the abyss. There was one cataract in particular in which the Nile fell 5000 feet in a distance of 1.4 miles.[46] The water would certainly be bubbling as it fell that distance. No river in lower Mesopotamia can possibly be described as 'bubbling' which argues against the traditional interpretation of this locale. Our interpretation allows the Gihon to flow around or through Sudan and for Eden's geography to be real. The Gihon must be the Nile since it is the only river that does flow through the biblical Cush, which Strong's Dictionary defines as Ethiopia.

The Tigris is the Tigris of today with one exception. Today it runs on the east side of Assyria. During the time when the Mediterranean was dry, it easily could have emptied into the basin. The Euphrates is the Euphrates. Even today it gets within 75 miles of Mediterranean before bending back to empty into the Persian Gulf. The only thing that keeps it from going into the Mediterranean is the uplift that occurred along the Dead Sea rift. This uplift alters the topography turning the river to the southeast. What is being proposed is that the rivers joined on the bottom of the Mediterranean, and flowed out of Eden to water the Garden.

Another objection might be that deep basins like the one being postulated would be too hot for creatures to live. There is paleogeographic evidence that this is not so. The hippopotamus was able to travel from the Nile to Cyprus during this time frame.[47] Due to the huge cataract mentioned above, hippos could have traveled down the Nile (Gihon) but not upstream. That huge cliff along the Nile which dropped 5000 feet in about a mile and a half would act as a one-way gate for animal life.[48] The hippopotami inhabiting the Nile simply followed it down into the Mediterranean from where they traveled a short distance to another river coming off of Cyprus. From there, they merely followed the Cyprus river upstream.

If hippos could survive the journey from Africa to Cyprus then other animals could too. Hippos require huge quantities of forage each day which implies that there was plentiful foliage along the Mediterranean floor. As noted earlier, land plant roots have been found on the basin floor[49] as well as sequoia leave, spiders, land turtles and the like.[50] The bottom of the Mediterranean was anything but a hellhole. It was full of life.

There is a modern example of this. In south central Africa, in the Kalahari Desert, rivers full of water flow out of tropical paradises into the desert. Many rivers in the Kalahari, such as the Okovango and Chobe, are examples. Tropical plants grow in a narrow belt, which follows the river's course. Animals follow the water and eat the plants. The Encyclopaedia Britannica states,

> "True forest, which occurs only on the banks of the Chobe, consists mainly of mokwa or bloodwood modusi, and monato or Rhodesian ash."[51]

Mountjoy and Embleton, writing about the Okovango, report,

> "At the Botswana border the average annual flow of the Okovango is no less than 13 billion cubic metres: it is 150 yards wide and up to 17 feet deep. Farther downstream it splits up into a maze of reed-choked channels, where much of its flow evaporates. Some water used to find its way to Lake Ngami (which Livingstone reported as a shallow lake in 1849, but which has been generally dry since 1925, with grass and thorn trees growing on its floor)."[52]

This must represent what the basinal Mediterranean would have been like. It would have been hot on the basin floor, but where rivers poured into it, green tongues of life would have extended deep into the desert. Along the basin edges, where artesian effects occurred and water oozed out of the ground, life would be able to spread widely. But in the deepest part of the basin, the salt pans would kill all but the hardiest forms of life. But even there, it is unlikely that it would be lifeless. On a salt flat in Australia a lizard lives off of insects which blow in on the winds.

The desiccation of the Miocene Mediterranean would be expected to have an effect on the climate of Europe. Hsu notes,

> "Although the deterioration of climate in the east preceded the Messinian Stage, the desiccation of the Mediterranean Sea had nevertheless left its imprint on the European climate, as illustrated by the fossil floras of the Vienna Basin. During the Middle Miocene (Helvetian) large evergreen leaves Cinnamomophyllum (Poltawa element) were predominant. During the early Late Miocene (Tortonian) small, serrated, thin-skinned deciduous leaf forms (Turgaya element) became more numerous. Both of these became rare or disappeared altogether during the late Late Miocene (Sarmation or Messinian time), when tough, mostly smoothed-edged rounded leaflets of woody, Leguminosae became the dominant flora remains. Apparently a warm and dry savanna covered the Vienna Basin when the Mediterranean was being desiccated. Willows, poplars, and water elms grew only along water courses. As the forest was turned into a grassland, the grazing animals moved in: the late Miocene fauna of the Vienna Basin consisted largely of antelopes and gazelles. A cooler and damp climate returned at the beginning of the Pliocene when the Mediterranean assumed its present configuration; the Turgaya elements reappeared and the Vienna Basin was again turned into extensive deciduous forests."[53]

The obvious objection is that this is claiming that Eden was in a hellhole - not at all the paradise that we so often envision. This is not necessarily against the Biblical view of Eden. The Hebrew word for Eden means pleasure.[54] The term which is often synonymous for Eden is Paradise. Paradise is a Persian word that was used in the Septuagint and means a park. Paradise today means something quite different from what was implied even by the translators of the Septuagint. It means a place or condition of perfect happiness, contentment or beauty. This concept is a far cry from the original Hebrew word. It is poor theology to make hard doctrinal stands based upon a particular word used in a particular translation.

The idea that Eden was a paradise is quite widespread and many authors believe that the Earth could not have had deserts in the pre-diluvial world. Morris and Morris state,

> "If real desert-formed features do exist in the deeper geologic deposits, this could indeed be a problem for the Biblical model since the antediluvian environment was said by God to be all 'very good' and the future promised restoration of these to good conditions to the earth includes desert reclamation (e.g. Isaiah 35)."[55]

It is strange that Morris and Morris think that deserts are bad. They obviously have not considered that people who grow up in desert regions find them truly beautiful and do not always want to move away. A good friend, who lives in a brown, nearly lifeless region of the country told me that he would not consider living anywhere else. For the Morrises to condemn what God made seems presumptive. Isaiah 50:2, says "By a mere rebuke I dry up the sea, I turn rivers into a desert; their fish rot for lack of water and die of thirst."(NIV) Deserts are rarely spoken of in a positive light in the Bible, but God still made them. They are important in the ecology of the world. Dust blown out of the desert over the oceans provides nutrients and minerals for algae, stimulates the growth of clouds and precipitation.[56] How can something that is that useful be bad? In such a setting as we are considering for the location of Eden, trees along a river's course would indeed merit the term "pleasure."

Some may wish that there were evidence that mankind had lived on the Mediterranean Sea floor at some point. Actually, there is plenty of evidence. About 10 kilometers south of Haifa, Israel, and 300-400 meters offshore

in the Mediterranean sea, lie the ruins of the ancient village of Atlit-Yam.[57] The village was buried under the silts of the sea bottom until it was eroded out. The villagers raised wheat, hunted, and fished in order to eke out a living. The deep-water fish that they ate imply that these people had enough maritime technology to sail into deeper waters in order to fish. Apparently, they did not have the technology to produce pottery, since no pottery has been found. Today the village lies in about 40 feet of water. Obviously, these are not preflood people, since they lived in such a shallow region, but the concept of humans having lived on present day sea floors is fact.

The Trees

"And the LORD God made all kinds of trees grow out of the ground--trees that were pleasing to the eye and good for food. In the middle of the garden were the tree of life and the tree of the knowledge of good and evil." Genesis 2:9 (NIV)

"And the LORD God commanded the man, "You are free to eat from any tree in the garden; but you must not eat from the tree of the knowledge of good and evil, for when you eat of it you will surely die." Genesis 2:16,17 (NIV)

To understand the function of the two trees we must understand the initial condition of man. The primeval state of man was that of a mortal, not an immortal as is commonly supposed. Many scholars seem to imply that absolutely nothing would have killed Adam and Eve. Absolute immortality requires that Adam be able to survive the impact of a hundred-ton meteor to his head, like a Saturday-morning cartoon character. This view of absolute immortality would lead to such an absurdity. To grant absolute immortality to Adam and Eve would go far beyond what the Scripture actually says. The Scripture never says that Adam and Eve were immortal; it says that they would die when they ate from a particular tree. You are not immortal but you will die if you eat certain mushrooms. You, the reader, may not die that day, but within a few days you will be buried. Similarly God's warning of death does not therefore imply that man was immortal at that moment. Augustine put it best when he wrote "It is not impossible to die; but it is possible not to die."[58]

It is certainly valid to object that if Adam could die prior to the Fall it would undermine the theological logic of redemption. David H. Lane notes,

> "This claim that physical death is not a consequence of the Fall, and that the spiritual death of man was its only result - undermines the theology of the atonement. Yes, Adam and Eve did die spiritually at the Fall, but this is learned from New Testament writers. However, they also received the penalty of physical death as a consequence of their actions. (Gen. 3:17,19 cf. Ezek. 18:20; Rom 5:12,14: 18-19; 6:23)."[59]

God did intend man to live forever. If God did not intend man to live forever, then why place the tree of life in the garden? The tree was what would grant immortality to mankind, not immortality of the absolute kind, but of Augustine's variety. God admitted that the tree of life had this power in Genesis 3:22. The fact that a tree would grant immortality to Adam strongly suggests that Adam did not already possess immortality. Why have a tree there to give what Adam already possessed? If eaten, the fruit of this tree would allow man to live forever. Thus, the reasonable suggestion can be made that man condemned himself to death by his sin, which separated him from the healing effects of the tree of life.

Adam and Eve were told not to eat of the Tree of Knowledge and that they would die if they did. Since the only three mentions of this tree are in Genesis 2 and 3, not much is known about why it was placed in the Garden nor what it did. Nor can speculation shed much light on the effects of this tree. It seems inconceivable that God would place a tree in the Garden solely for the poisoning of the Garden's inhabitants. We must assume that the tree had some purpose, just not the purpose to which it was put. Further, it is possible that they would have been able to eat from it at some point in the future, say, after they ate from the tree of life. Maybe that would have acted as an inoculation against the bad effects. In other words, maybe they ate it too soon.

In reality we don't know much about the tree of knowledge of good and evil. The suggestion which makes the most sense is that the tree held some sort of psychoactive substance which had two effects. One allowed Adam and Eve to view their nakedness differently, the other affected their germ plasm to pass this on. While some branches of Christianity view the eating from tree of knowledge of good and evil as the onset of sexual relations between the primal pair, this is unlikely. Sex is not evil. It is clear from the Scripture that something that altered

man's view of nakedness occurred. It could represent a change in the sexual behavior of man. Most higher primates rarely engage in copulation outside of the estrus period;[60] mankind rarely waits. A chemical in the plant that altered behavior permanently is a possibility, but exactly what that was will forever remain a mystery. It must have been more than simply sexual behavioral changes. It must also have included some increase in self-awareness. There are psychoactive substances that at least partially fulfill the requirements. LSD has been linked to both an altered mental state and chromosome damage.

More can be said about the possibilities of the tree of life. It conferred immortality. It is not entirely clear whether one bite would accomplish this feat or whether one had to eat continuously in repeated doses. Today, the limit to our lives seems to be determined by the number of times the cells in our bodies can divide. Microscopic plants and animals have the ability to divide forever. In one sense they are the truly immortal life form on earth. But human cells, if cultured under the most advantageous conditions, will only divide about 50 times and then they die. This very effectively limits the length of time that we can live to somewhere around 100 years. Recently the cause of this limitation has been discovered. The ends of nuclear DNA molecules have repeating patterns, telomeres, which act like aglets on a shoestring to keep the molecule from unraveling. During reproduction, occasionally the tips of the DNA molecule are snipped off. In bacteria an enzyme called telomerase repairs and restores the molecule to its original length. Oliwenstein reports,

> "Back in 1985, Greider and Elizabeth Blackburn (who was then Grieder's advisor) discovered an unusual enzyme in the single-celled protozoan Tetrahymena thermophila. The enzyme, which the researchers dubbed telomerase, adds nucleotides to the telomeres each time the organism divides, replacing the nucleotides that are lost. As a result the telomeres never get shorter, and the signal to stop dividing never gets sent. Each Tetrahymena cell is immortal, in the sense that it doesn't die unless something kills it."[61]

In humans there is no telomerase in their body cells, so during successive divisions the telomere gets shorter and shorter, eventually leading to the loss of some important genetic information. When this occurs the cell dies. When enough cells die, we die.

Recently it has been discovered that humans do have the genes necessary to create telomerase but it is never turned on in the cells of our bodies.[62] It may be a necessity in the creation of the sperm and egg cells since, in some sense, they are immortal. The enzyme has also been detected in certain immortal cancer cell lines. This has opened up a new approach to fighting cancer. If telomerase can be destroyed or the gene turned off, then metastasizing cancers can be more effectively fought. This enzyme would allow our cells to divide forever.

The tree of life may have been able to turn on the gene for telomerase without destroying the governors on how rapidly the cell can divide. In this way the tree of life could have given man the ability to live forever. Thus the fall did produce a loss to man of his immortality, but it was not the loss of actualized immortality only potentialized immortality. This view is supported by the fact that Genesis 3:22 implies a sense of urgency in getting the tree of life out of the reach of fallen man. If man were initially immortal, the tree of life would not have been of any benefit or purpose. Available to fallen man, the tree of life would be too horrible to allow.

The Fall of man occurred as described--he was snake-bit. After the Fall mankind continued to show his snake-bitten nature. Cain slew Abel - snakebite. Lamech murdered a man - snakebite. And contrary to God's command in Genesis 1:28 for man to fill the Earth, mankind remained where he was. And where he was turned out to be a dangerous place.

Eden was only intended as a temporary place for man's abode, not permanent. God's command to fill the earth certainly implies this conclusion unless one wants to equate Eden with the whole Earth and that seems to stretch things a bit. But, as the Bible says, "Man's every thought was evil" (Genesis 6:5). It also says that God was sorry that he had made man and determined to wipe man off the face of the land. Every parent, at certain moments, knows this feeling. Man's disobedience to God's command to spread out made the coming destruction easy, mankind was a huddled target.

Nicolaas Rupke

Few young-earth creationists today remember the name of Nicolaas Rupke. This is because few young-earth creationists read young-earth creationist literature from the 1960s. Most creationists, however, know of Rupke's arguments for a global flood however. Most have even used them without attributing the argument to Rupke. Rupke was the man who invented the polystrate tree argument for a global flood.

Rupke was the son of a Dutch Reformed minister. He grew up believing the young-earth views of his father. He also held the all too prevalent view among Christians that non-believers and their arguments are threats to the faith. He viewed them with suspicion.

He became fascinated with geology and entered college seeking a geology degree. While an undergraduate, he spent a summer in Canada looking at the Joggins section of Nova Scotia. This was a famous geological section where the oldest reptiles were found. This section had tree trunks that cut across the strata. Rupke believed that this was evidence of rapid deposition and evidence of the global flood.

While in Nova Scotia he lived in a trailer with a fellow young-earth creationist, Harold Coffin. Coffin was a Seventh-Day Adventists and a creationist of some fame. Together they did field work, studying the strata looking for clues to the global flood. Coffin and Rupke agreed to publish the results of their studies separately. Coffin would publish in the young-earth creationist literature and Rupke would try to publish in the secular geological journals.

Rupke's Dutch professor found out that he wanted to publish a young-earth article in the geological literature. His teacher was appalled and warned Rupke sharply that to remain a young-earth creationist would cause him much professional grief. But to the professor's credit, he helped Rupke write the paper and it was published in the Geological Society of America Bulletin.[63]

Because of Rupke's professor's warnings, the U.S. creationists thought that Rupke was being discriminated against because of his beliefs. This was not the case. Rupke, in spite of his beliefs, was duly granted his degree. But at the urging of his creationist friends, Rupke was persuaded to seek a Ph. D in Geology from Princeton. He was told not to show his beliefs to his professors for fear of what they would do. The U.S. creationist community thought they would finally get a Ph.D. geologist on their side. Things didn't work out as they planned.

While pursuing a Ph. D., Rupke met a friend who showed him that the world was not as hostile to Christians as he had been led to believe. He also began to see that what he had been taught was not correct. As a result of both forces, his interest in Christianity began to wane. His own, "proof of the global flood" was not enough to hold this young-man's faith. By the time he earned his Ph.D. he was no longer a Christian.

This caused much pain on the part of his parents. Because his rejection of Christianity had taken place while he was in the U. S., there was only limited opportunity for him to discuss these issues with them.[64] His father remained a young-earth creationist; the son didn't.

This is a story I have heard over and over. Once while recruiting geophysicists at a university, I had a dinner with a famous young-earth creationist professor and his wife. He complained to me about the effect of geology on young people. His son had gone to college majoring in geology. When he had finished, his son was no longer a believer. The father blamed his son's professors. He never blamed his own poor knowledge of geology or what he taught his son. Person after person in the geological sciences must struggle with the fact that the data does not support what they are taught about the Flood. Because of this it is imperative that we have a Flood scenario that matches the data of geology. Below is just such a scenario.

The Extent of the Flood

As argued previously, the Scriptures do not require and the geologic data does not support the concept of a worldwide flood. Thus, if there is to be a flood, it must be a more limited event. The language used in the Scriptures at first glance gives the impression of a global event. But many of these verses use the word 'eretz' which if translated land instead of Earth give a different meaning to the language.
A few examples are as follows:

Genesis 6:7 - I will wipe man from the face of the land
Genesis 6:12 - all the people on the land had corrupted their ways.
Genesis 6:13 - I am going to put an end to all people, for the land is filled with violence because of them. I am
Genesis 6:17 - And, behold, I, even I, do bring a flood of waters upon the land, to destroy all flesh, wherein is the
Genesis 7:3 - Of fowls also of the air by sevens, the male and female; to keep seed alive upon the face of all
Genesis 7:4 - For yet seven days, and I will cause it to rain upon the land forty days and forty night; and every
Genesis 7:17 - And the flood was forty days upon the land; and the waters increased, and lifted up the ark, and
Genesis 7:18 - And the waters prevailed and were increased greatly upon the land; and the ark went upon the
Genesis 7:19 - and the waters prevailed exceedingly upon the land; and all the high hills, that were under the who
Genesis 7:21 - And all flesh died that moved upon the land, both of fowl, and of cattle, and of beast, and of every

Reading these verses with "land" substituted for "earth" one is struck by the relative lack of evidence for a

global flood. (Chapter 6) Our modern concept of 'Earth' is what requires the global view. But there are two places that might seem to imply a global flood. These occur in Genesis 6:17 and 7:19 and refer to the phrase "under the whole heavens." Given the lack of support for global flood in the verses listed above, the issue now rests in the meaning of the phrase 'under the whole heavens' or 'under heaven'. If this phrase was understood by the Hebrew mind as referring to the encircling sky, then the flood must be global. However even this phrase is used in a local sense in two of its occurrences.

This phrase, or one similar to it, occurs in 10 other verses. In Deuteronomy 30:4 the NIV translates the passage "the most distant land under the heavens," but it is not exactly clear what the Hebrew view of that was. This verse is possibly a case of the term being used globally. Job 28:24 is also a case in which it is probably used in a global sense. God, in this verse, sees everything under the heavens. In Jeremiah 10:11 it is talking about other gods who did not make the heavens and the earth. They will perish from the 'eretz' (land or earth) and from under the heavens. Since most ancient peoples believed that their gods were only gods of the local region, this usage must be considered inconclusive. Lamentations 3:66 is also inconclusive. The phrase is isolated with little context to decide. Pursue and destroy them from under the heavens. How are we to decide on this case? In Daniel 7:27 the phrase is global. In Daniel 9:12 the term is definitely used in a limited sense. Daniel is talking about the destruction of Jerusalem saying that nothing under the whole heaven had ever been done like that to another city. Locally, Daniel's statement was true, but globally it was not. Even Jericho, not too far away, had been totally destroyed by an invasion of the Hebrews themselves. In this case, the term must be used either locally or hyperbolically. In Deuteronomy 2:25 it says,

> "This day will I begin to put the dread of thee and the fear of thee upon the nations that are under the whole heaven, who shall hear report of thee, and shall tremble, and be in anguish because of thee."

This is surely used in a local perspective. The people in the Americas had no fear of the ancient Hebrews. The Australian aborigines also had no fear. Deuteronomy 4:19 is unclear as to its usage. The verse says "serve them, which the LORD thy God hath divided unto all nations under the whole heaven." That does not make it clear either way. Job 28:24 says, "For [God] looketh to the ends of the earth and seeth under the whole heaven;..." While we might view this in a global perspective, it is still unclear from this exactly how the Hebrews viewed it. In Job 37:3 is a clear-cut case of the local or hyperbolic use of this term. Job 37:2-4 states

> "Listen! Listen to the roar of his voice, to the rumbling that comes from his mouth. He unleashes his lightning beneath the whole heaven and sends it to the ends of the earth. After that comes the sound of his roar; he thunders with his majestic voice. When his voice resounds, he holds nothing back." (NIV)

Elihu is the speaker and he is describing the lightning and thunder which he has seen and heard. Lightning can only be seen out to the horizon and it can be heard out to about 5 or 6 miles. What Elihu is describing is the fact that he sees the lightning and then hears the thunder. He could not hear thunder from Damascus or Babylon or Beijing or Washington, D. C. He must be using the term "under the whole heaven" to refer out to the horizon. Here we have one case which undoubtedly uses the term in a local or hyperbolic sense.

One final evidence that "under the heavens" can be understood in a local sense. The Hebrew word for heavens is "shamayim". According to Strong's Hebrew Concordance, it refers to the visible vault of the sky or the region where the planets revolve. If one takes the latter meaning, then a literal reading of Genesis 7:19 would imply that the mountains on Mars were covered also. Clearly this is not so. Thus it is far more reasonable to use the term "heavens" or "shamayim" as referring to that region between the horizons.

The importance of the last two cases is that if a phrase can be used in either a global or a local sense, then the decision of how to interpret a verse containing it can not be based solely upon the phrase alone. Other clues and logic exterior to the phrase must be used. We have seen the multitudinous problems associated with a global flood. In fact, without everything being accomplished by miracle, a global flood is impossible. Thus, the phrase "under the whole heavens" in Genesis 6 and 7 must be used in a limited sense. If there is any truth to the idea that the Biblical account is a memorized account from Noah himself, then as far as Noah would be able to observe, everything under the entire heavens was under water. For Noah to believe and report that the whole world was inundated is not unexpected. But what Noah believed may not be fact.

One final observation on the extent of the flood. Genesis 6:13 states,

> "So God said to Noah, "I am going to put an end to all people, for the earth is filled with violence because of them. I am surely going to destroy both them and the earth." (NIV)

Most advocates of the global flood miss a subtlety in this verse. It says that God will destroy both the people and the earth. Everyone knows that the people were destroyed by the flood, but if the term "eretz" is to be interpreted in a global, planet-wide sense, then God did not accomplish what He said He would. He did not destroy the Earth! But God did destroy the land! The deep Mediterranean basin is no longer dry land and hasn't been for the past 5.5 million years. Thus we must conclude that the flood was a regional event involving the Mediterranean basin rather than a global occurrence.

The Need for an Ark

Noah found favor in God's eyes and was told to build an ark. We saw in a previous chapter that there are too many problems with the ark as a carrier for all the world's animals; but a smaller boat, carrying only the animals necessary to man's existence or animals which were unique, would not be out of reach at all. But if there was a local flood, why wouldn't God simply have Noah and his sons climb the hills surrounding the Mediterranean? I can think of two possible reasons. First, Noah and his sons could not preach to the people if they were gone. Presumably there was still enough room on his boat for a few late converts. Unfortunately there were none. After all, in a land such as the Mediterranean basin, where rain had probably not been observed, who was going to believe a crazy old coot who claimed the land was going to be flooded?

Secondly, unless Noah was a long way from the basin (e.g., hundreds of kilometers), he would be just as likely to die as those who were at the bottom. The rain would extend for hundreds of kilometers away from the basin. The empty Mediterranean would contain about 4 thousandths of today's atmosphere. This would displace air in a 400-km band around the basin. As the air rose, cooled and caused rain, it would spread out for at least 400 kilometers away from the Mediterranean causing rain. This is why an ark was needed.

The Size of the Ark

Why such a large ark for a local flood? The ark was much bigger than was necessary for a local flood. This objection to a local flood is based upon the assumption that the unit of measurement, the cubit, is known. According to Whitcomb and Morris[65] the cubit measured from 17.5 to 20.65 inches in length. Under the assumption that the cubit was 17.5 inches, the ark would have been 437 feet by 73 feet by 44 feet. A boat of this length was not made until the 19th century. The carrying capacity of such a vessel was surely too large to build simply for the preservation of a few local varieties of animals which is what the local flood advocates often suggest. Custance suggests an escape from this conundrum,

> "The dimensions of the Ark are given as 300 cubits long, 50 cubits across, and 30 cubits deep. This is generally interpreted as meaning that the vessel was 450 feet by 75 feet by 45 feet. This is an immense structure. It may be that the Ark really was of such proportions: but it may also be that the terms of measurement are no longer correctly known. The cubit may not at this early period have been equal to 18 inches. I think anyone who tries to visualize the construction of a vessel 450 feet long by four men will realize that the size of the timbers alone for a 'building' 45 feet high (analogous to a four story apartment building) would seem by their sheer massiveness to be beyond the powers of four men to handle. With all the means later at their disposal, subsequent builders for 4000 years constructed seaworthy vessels that seldom seem to have exceeded 150 to 200 feet at the most. The Queen Mary has a total length of 1,018 feet which is not very much more than twice the length of the Ark. It was not until 1884 apparently that a vessel, the Etruria, a Cunard liner, was built with a length exceeding that of the Ark."[66]

If Custance is correct, the Ark may have been significantly smaller than is assumed by Whitcomb and Morris.

The Day of Reckoning

Life in the prediluvial world would have come to an end when the dam at Gibraltar catastrophically failed.

Hsu hints at the size of the failure needed to cause the flood described by Noah. He states,

> "One can picture the desiccated Mediterranean as a giant bathtub, with the Strait of Gibraltar as the faucet. Seawater roared in from the Atlantic through the strait in a gigantic waterfall. If the falls had delivered 1,000 cubic miles of sea water per year (equivalent to 30 million gallons per second, 10 times the discharge of Victoria Falls), the volume would not have been sufficient to replace the evaporative loss. In order to keep the infilling sea from getting too salty for even such a hardy microfauna as the one found in the dark gray marl the influx would have had to exceed evaporation by a factor of 10. Cascading at a rate of 10,000 cubic miles per year, the Gibraltar Falls would have been 100 times bigger than Victoria Falls and 1,000 times more so than Niagara. Even with such an impressive influx, more than 100 years would have been required to fill the empty bathtub."[67]

All it would take for the flood to occur would be for these falls to erode their way through to the Atlantic Ocean. There is an indication of how deeply the Gibraltar Dam collapsed. The Trubi marl in Sicily, which rests on desert deposits, contains sea bottom dwelling animals that can only live in water depths in excess of 3,000 feet. The dam at Gibraltar must have broken at least to that depth so that these animals could crawl or be washed into the Mediterranean basin. This means that the collapse would have been catastrophic. Calculations show that with a break 3,000 feet deep, 15 miles wide, and a water speed of 15 miles per hour, the entire Mediterranean would refill in 8.4 months, an extremely short time compared with the massive quantity of water needed to fill this large basin. This is a time frame comparable to the time reported in the Bible for Noah's Flood.

As the water rushed in, the first phenomenon would be that the air would begin to rise as the water replaced it. The air would pick up moisture via evaporation from the floodwaters as they continued to pour into the Mediterranean. As the air rose, adiabatic cooling would take place, clouds would form and rain would fall around the entire basin. Rains from this mechanism would be torrential! A mass of air over an area of 964,000 square miles was moving upwards simultaneously. The modern world has never seen such a convection cell. Forty days of rain is easy to account for without having to postulate the impossible.

In this hypothesis of the flood, Noah would have looked out his window and seen the tallest peaks in his land being covered by the deluge. His entire land and all that was in it would be destroyed. Due to the torrential rains around the basin, even the present shorelines of the three continents would have been flooded. The rains most likely would have extended far from the basin itself, drowning large tracts of the circum-Mediterranean (Which is why the ark was needed). The ark would have grounded in the eastern Mediterranean. The water filling the Mediterranean basin was pouring in from the west. A floating object would be forced to move towards the east. It will be suggested that the ark came to rest on the African coast up the Nile valley. The reason for this selection will become apparent when we examine life after the flood, and the anthropological data in the next chapter. If Noah knew the African coast as the mountains of Ararat this fact would be passed on to his descendants as the place where he landed. But these "mountains" would no longer appear as mountains to the descendants and they would be very unlikely to recognize the coast as the landing place.

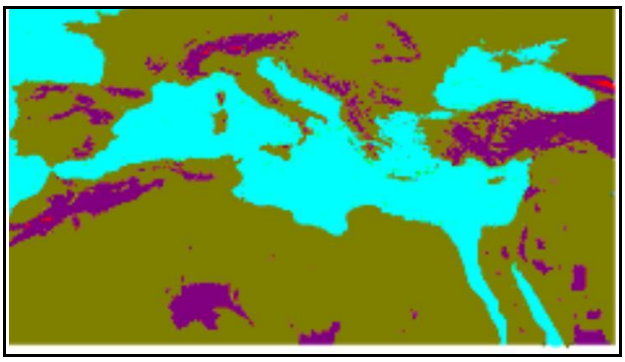

Figure 29 Mediterranean after it refilled with Nile Gulf

All Noah could see from the ark's window was torrential rain. The continuing rains and humidity in the air would prevent him from seeing distant peaks. Ft. Worth is 30 miles west of Dallas. On a clear day one can see the skyline of that great city from Dallas, but if there is much humidity or haze, no amount of squinting will allow those buildings to be seen. Similarly, Noah would not be able to see very far. As the rain tapered off, Noah would have seen the distant peaks.

This view of flood in the Mediterranean basin explains one very serious objection to all other local flood theories. Under most local riverine flood theories, the flowing waters would carry the ark to a lowland, or to the sea. Thus it is impossible to explain how, by flowing downhill, the ark could land on top of a mountain. With this proposal, the ark could float along with the water and still land on mountains, albeit ones which were no longer

mountains in the post-flood world. Like a rubber ducky that is lifted to the top of the bathtub when the bathtub is filled, the ark would rise from the bottom to the top of the Mediterranean basin. This view fulfills all the Biblical conditions.

The astute reader will be certain to ask the question concerning the flow direction of the water running off the flooded rim of the Mediterranean basin. Water would be flowing off the land toward the center of the basin. Any object attempting to float toward shallow water would be pushed back by the advancing water up to a point. So how was the ark able to land on the shoreline? Earthquakes, with their associated tsunamis, would be quite numerous. The additional weight of 3.7 million cubic kilometers of water would depress the basin even further over the next few centuries, but the earthquakes, making that adjustment would begin immediately. The ark could have been pushed onshore by a minor tsunami. Tsunamis do not all have to be huge; they come in all sizes. One only ten inches high struck Seattle, Washington in response to a minor Pacific earthquake.[68] Once grounded, the ark would most likely remain stranded.

The ark would either have rotted, been plundered for housing, firewood, etc., or have sunk beneath the Mediterranean waves due to the tectonic down-warping of the coastline in response to the new weight of water. Many Christians are searching for Noah's ark on Ararat. If this view is correct, the search for the Ark on the present Ararat is futile. Wood does not preserve well unless it is under water. The original Ark was probably destroyed long ago.

Where did the Ark land? I have changed my mind on this from the first two editions of this book. The ark could easily have landed on the Turkish coast. From there over the centuries, the descendants moved into Africa. Only later did mankind re-emerge from that continent. The reasons for this will become clear later.

The incident with the olive tree and the dove is really only understandable with a local flood. It is inconceivable that the olive leaf had survived one year under water. Remembering that there would have been widespread rain extending even away from the basin, the flooding would have swollen streams on the surrounding landscape. In this model, the olive tree could have lived along a stream course somewhere higher than the general inundation that would have taken place along the Turkish coastline. When the bank gave way from the flooding, the tree was washed downstream and grounded in the area of the ark, where the dove took the leaf and returned it to the ark. Noah would then know that the land was nearby. Of course, the obvious question is: does the olive live in Turkey? Not only do members of that family live there naturally, fossils of it have also been found on that continent.[69]

Whitcomb and Morris[70] attempt to explain the olive by saying that only a few months are necessary between the planting of an olive branch and the sprouting of the leaves. Only forty-seven days had elapsed between the appearance of the mountaintops and the plucking of the olive leaf. There would not have been enough time for the olive to sprout.

Conclusions

The views presented here concerning the origin of man provide a logically consistent framework for incorporating the biological, geological and anthropologic data into the historical Biblical record. There will be many who just won't like these views; that is always a predictable reaction to novel ideas. These views, while unusual, do accomplish the major objective of this book, to harmonize science with the Scriptural record which leaves the five important doctrines (the six days, the creation of Adam, the creation of Eve, the Fall and the Flood) unharmed historically or theologically.

The model of Noah's Flood presented here is also a novel but plausible scenario for the flood, which fits all the disparate facts outlined in Genesis and in the geological record of the Mediterranean. The main objection that most creationists are likely to express is that to advocate a local flood is equivalent to giving in to the demands of modern geology. Strictly speaking this is not true since, as Filby notes,

> "The Bible speaks of a Flood that annihilated every living thing - everything that had breath - within that area of 'the world known to Noah as the whole earth - or land.' If it should be asserted that such a view of the Flood is merely a concession to modern geological observations it may be well to point out that Matthew Poole in his Synopsis (1670), and Bishop Edward Stillingfleet in his Origines Sacra, (1662), both held that the Bible did not necessitate a belief that the Flood covered the entire planet. These books were written 180 years before the real development of modern geology."[71]

Matthew Poole wrote,

> "Peradventure this flood might not be simply universal over the whole earth, but only over all the habitable world, where either men or beasts lived; which was as much as either the meritorious cause of the flood, men's sins, or the end of it, the destruction of all men and beasts, required.. And the or that whole heaven may be understood of that which was over all the habitable parts of it. And whereas our modern heathens, that miscall themselves Christians, laugh at the history of this flood upon this and the like occasions, as if it were an idle romance; they may please to note, that their predecessors, the ancient and wiser heathens, have divers of them acknowledged the truth of it, though they also mixed it with their fables, which was neither strange nor unusual for them to do. "[72]

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LIFE AFTER DEATH

Herbert's father was a shopkeeper; his mother was a lady's maid and a devout Christian. These humble beginnings caused the young man to leave school at age 14. Four years later, through personal effort, he won a scholarship to the Normal School of Science in South Kensington. The young man was smart.

His mother was worried that her son would study under a well-known atheist, T. H. Huxley. She was against her son taking the scholarship. The school officials spoke to the mother, pointing out the fact that Huxley was a 'Reverend', which was the title given to all professors in the 19th century. Reluctantly, the mother gave her permission, and Herbert went off to college.

When Herbert entered school in 1884, there was only one recognized example of a fossil man. It was the original Neanderthal material from Germany that had been found in 1856. His teacher, Huxley, had written on this material in 1863 in a book entitled, Man's Place in Nature. Two years into Herbert's education there was a startling discovery of two Neanderthals from Spy, Belgium. This increased the debate about the origins of man. Was man a divine creation? Was man just an accident?

Neanderthals were not like modern humans. With three examples it confirmed the normalcy of the Neanderthal shape. Most Christians had gone along with Rudolf Virchow's view that the original Neanderthal was a modern human deformed by sickness. In Virchow's case he suggested it was rickets. Indeed today, you will hear that Neanderthal was as he was due to some disease.[1] The fact that the skulls of the Spy Neanderthals were identical to the German find disputed the view that Neanderthals were merely sick humans. Rarely do diseases affect skulls in absolutely identical ways. The fact that this type of sickness was found only in old rocks also made the sickness argument weak. It was becoming more difficult to claim, as many churchmen claimed, that Neanderthal was merely a sick individual. Neanderthalers were not like apes either. Their bones did show that mankind's morphology was not constant which, of course, argued against the creation of mankind in its modern form.

Like today, Christians were telling Herbert that if he believed that mankind's morphology had changed, then he couldn't be a Christian. Herbert agreed with them. By the time Herbert left school, he too believed that man was no divine creation. He saw no historicity in the Bible. He saw no sin. He saw no need for an atonement. His mother's fears had been realized; her son was lost to the faith. Herbert George Wells, otherwise known as H. G. Wells, was now an atheist. He wrote,

> "It was only slowly that the general intelligence of the Western world was awakened to two disconcerting facts; firstly, that the succession of life in the geological record did not correspond to the acts of the six days of creation; and, secondly, that the record, in harmony with a mass of biological facts, pointed away from the Bible assertion of a separate creation of each species, straight towards a genetic relation between all forms of life, in which even man was included! The importance of this last issue to the existing doctrinal system was manifest. If all the animals, and man had been evolved in this ascendant manner, then there had been no first parents, no Eden, and no Fall.. And if there had been no fall, then the entire historical fabric of Christianity, the story of the first sin and the reason for an atonement, upon which the current teaching based Christian emotion and morality, collapsed like a house of cards."[2]

When I first heard the story of H. G. Wells, I was convinced that it was the story of a mother not protecting her son. The story was told that way. The implications are that Christians should withdraw from the world and not face the intellectual arguments of the non-believer.

That is the wrong way to view this story. It is a story of a lost faith. It is the story of the failure of Christianity to adequately respond to the anthropological data. It is the story of Christians sending their children to face the intellectual barrage empty handed and then blaming the professors for stealing our children. This last view implies that the professors are greater than God. It implies that the parents and preachers have no responsibility to give their children an adequate explanation for the scientific data. It is the story of an abdication of our spiritual responsibility.

What Christians desperately need, but they often don't know it, is a comprehensive theory of where fossil man fits into the Biblical narrative. Young-earth views are contradictory. Some believe that the fossil men are biblical humans while others view them as apes. Liberal Christian views place the origin of humanity at the origin of our species, 100,000 years ago. They ignore the genetic data that indicates that the genetic diversity observed

today among modern humans would take one million years to develop. They ignore the very human and human-like behaviors these men engaged in as long ago as two million years ago. We must now examine the place of fossil man and fit him into the biblical narrative.

Ardipithecus ramidus was found in 1996. This species has been given a separate genus from Australopithecus although some authorities still believe it to be a new species of Australopithecus. Whether Ardipithecus has any relationship with man is still up in the air. Ardipithecus first appears at Lothagam, Kenya dating 5.5 million years ago. This is just about the time that the Mediterranean basin filled up. Noel Boaz draws the obvious correlation. He wrote,

> "Five million years ago is also the age of the first fossil hominid in Africa, making a suggested connection between the cataclysmic drying up of the Mediterranean and human origins almost irresistible."

THE FOSSIL JAW FROM LOTHAGAM-THE EARLIEST KNOWN HOMINID

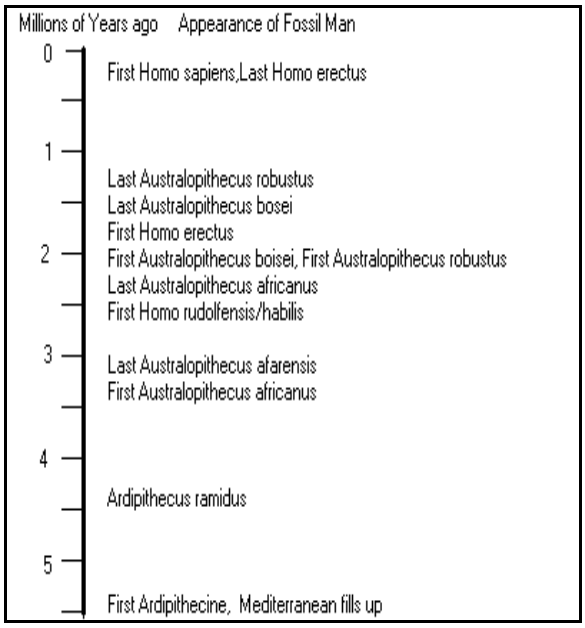

Figure 30 Chronology of Hominids

"This similarity in timing of the end of the Messinian Event and the appearance of the first hominid fossil in the paleontological record is remarkably close. A half mandible from a site near Lake Baringo in the Eastern Rift Valley of northern Kenya known as Lothagam was discovered by paleontologist Bryan Patterson from Harvard University in 1965. The specimen has the squarish, thick-enameled molar of a hominid, and its mandible is both thick from side to side and high from top to bottom-also hominid traits. Dates on the sediments at Lothagam indicate that the mandible is between 5.0 and 5.5 million years old. Patterson and colleagues published the mandible as a hominid, tentatively referred to the species Australopithecus africanus, and suggested that its age was about 5 million years old. In the intervening years many paleoanthropologists, including myself, have studied the specimen in the Kenya National Museum in Nairobi, and agree that it is a hominid."[3]

Another 600 thousand years would pass before another Ardipithecine would leave a fossil in rocks dated 4.9 million years ago.

The second beings believed to be on the line leading to modern man were the Australopithecines. Fossils of A. afarensis are found in rocks from 4.5 to 3 million years in age (See Table 15). A. afarensis is best known from the fossil known as Lucy, which was found by Donald Johanson. The fossil is the most complete skeleton of the Australopithecines. They were the only australopithecines to be found for 1.5 million years. An important fact for the creationist is that in rocks of these ages, there are no fossils of modern-looking Homo sapiens, Homo erectus, stone tools or other evidence of culture. This fact can not be ignored.

Beginning about 3 million years ago and extending to around 1 million years ago, four species of Australopithecines appear.[5] Australopithecus africanus fossils range from just before 3 million years ago to around 1.5 million years ago.[5] A. aethiopicus has been found in rocks dated to 2.5 million years. A. boisei clocks in between 2.3 million and 1.2 million, while A. robustus extends from 2 to 1 million years ago (See Figure 30).[6] Very recently a new Australopithecine has been found. It is A. garhi and it was found in association with stone tools and cut-marks on butchered animal bones. This is the first hominid species for which meat eating can be documented.[7]

The brain capacities of these australopithecines range from 435 to 815 cubic centimeters. A modern human with a brain that size is usually mentally retarded, but not all as we shall see. In spite of that, they were quite mobile. Collectively australopithecines have been found from South Africa and East Africa. They disappeared shortly after the appearance of Homo erectus. There are several suggested phylogenies for the transition from A. afarensis to the oldest of the Homo genus, Homo rudolfensis. Suffice it to say that one of the Australopithecines is

believed to have given rise to the genus Homo.

Homo rudolfensis is the oldest species of our genus Homo. It is found in rocks dated 2.4-1.8 million years old and is quite human below the neck.[8] It has a human pattern of birth in which the infant triples its brain size from birth to adulthood. The large brain implies pain in childbirth, sweat, a lack of fur and the need for clothing. We will examine these issues later.

Homo habilis fossils are found from around 2.1 million to around 1.5 million years ago. Homo habilis is so named because he appears to be the first tool-making human.[9] His brain capacity is also much larger, averaging 750 cc. His tool-making activities place him a quantum leap above the australopithecines. He is believed to have evolved into Homo erectus.

Ma	Location	Remains
3.0	Hadar, Ethiopia	Lucy
3.35	Koobi Fora, Kenya	ER 2602
3.5	Laetoli, Tanzania	Mandible
3.5	Laetoli, Tanzania	Bipedal Footprints
<4	Maka Ethiopia	femur
4.0	Belohdelie, Eth.	cranial fragment
4.0	Kanapoi, Kenya	humerus
4.0	Koobi Fora, Kenya	radius
>4.2	Chemeron, Kenya	humerus
4.9	Tabarin, Kenya	mandible
5.5	Lothagam, Kenya	mandible

Table 15 Remains of A. afarensis

Homo erectus appears a relatively brief time after H. habilis. The oldest H. erectus appears in rocks dated 1.75 million years ago, a mere 350 thousand years after the appearance of H. habilis.[10] Very recently the re-dating of erectus remains in Java have suggested that H. erectus was also in Java at this time. The wide dispersion of H. erectus when he first appears in the fossil record suggests a much earlier origin, possibly earlier than the appearance of H. habilis.[11]

Physically H. erectus was the same size as modern humans. Johanson and Shreeve write,

> "In 1984, Kamoya Kimeu had made a sensational discovery at West Turkana; a nearly complete skeleton of a twelve-year-old erectus boy. The skeleton, found in deposits dated at 1.6-million-years old, stood about five feet four inches tall. If one assumes human rates of growth, the boy would have reached six feet in height as an adult-as tall as a modern American male."[12]

Homo erectus used fire, made stone tools, and may have engaged in ritual killing. Johanson and Shreeve report on an odd arrangement of bones laid out 400,000 years ago at Toralba, Spain,

> "Almost the complete left side of one elephant skeleton was found arranged as if for display, each bone turned over and replaced in the position it would have held in life. At the nearby site of Ambrona, Howell found several leg bones lying end to end in two perpendicular lines."
>
> . . .
>
> "The oddly symmetrical half-carcass was harder to explain - perhaps it was the remnant of some ritual, though no other signs that Homo erectus indulged in ceremony had ever been found."[13]

H. antecessor was discovered in Spain and dates to 800,000 years ago. This species was the ancestor of both modern humans and the Neanderthals. This species was the first one who had a human dental development pattern that also implies a long period of care for the young.[14]

Between 100,000 and 40,000 years ago, the predominant humans in Europe were those of the Neanderthal race. While these people were given a rather brutish appearance during the nineteenth and early twentieth centuries, they are now considered to be a subspecies of Homo sapiens. They lived from central Asia (Uzbekistan) west through Europe and North Africa.[15] In the Middle East, Neanderthals and modern men apparently lived together. These fellows must be considered fully human.

Anatomically modern Homo sapiens appeared in Africa and the Levant around 50,000 years earlier than they did elsewhere[16] and they became widespread throughout the world about 25,000 years ago.[17] Modern man spread throughout the world, but it wasn't until around 1,000 years ago that mankind finally covered the earth. Some of the Pacific Islands, like New Zealand, were just settled a thousand years ago.[18]

What is Man?

Biblically, the definition of man can be reduced to the statement of Genesis 1:26.

> "Then God said, 'Let us make man in our image, in our likeness, and let them rule over the fish of the sea and the birds of the air, over the livestock, over all the earth, and over all the creatures that move along the ground.'" (NIV)

This definition is amazingly inclusive of all humanity. A Congolese pygmy and I do not look at all alike. His hair is dark and kinky; mine is lighter and straight. I am of average height (5' 9"); he is very short (4' 4"). His skin is dark; mine is fair. My nose is thin; his is relatively broader. But both of us are made in the image of God. The important point is that one can not determine who is and is not made in the image of God based upon external appearance. The image is found in the soul of the being, not the looks.

So if we are unable to determine humanity by outward appearance, what hope is there of evaluating the humanity of fossil man? There are two ways-hybridization and data from the fossils and the artefacts. Evidence for interbreeding would clearly imply that the fossil man was human. Such evidence was found last year in Portugal. The skeleton of a four-year-old child was found which mixed both anatomically modern human traits with those of the Neandertal. The 25,000 year old skeleton had a typically modern human skull but characteristic Neandertal leg proportions and at least one characteristic muscle attachment. Duarte et al, believe that this evidence is conclusive of mixed parentage for this child. If Neandertal and modern humans had children together, then we are the same species.[19]

There are several features which are indicative of humanity, which leave traces in the fossil record. Speech is related to an area of the brain that leaves a mark on the interior of the skulls. Skulls can then be examined for this trait. Falk notes,

> "But monkeys don't have language and humans do. Are there morphological manifestations of human brains that (a) correlate with functional lateralizations including language and (b) are capable of leaving traces in the hominid fossil record? Indeed there are. Shape asymmetries of the frontal and occipital lobes, known as petalias, exist in human brains (and to a lesser degree in brains of monkeys and apes) and are statistically associated with handedness in humans. Further, a characteristic sulcal pattern associated with Broca's speech area in left frontal lobes is present in human but not in ape brains. Both humanlike petalias and the pattern of sulci associated with Broca's area have been detected on endocranial casts (endocasts) from the early part of the hominid fossil record.
>
> "The oldest evidence for Broca's area to date is from KNM-ER 1470, a H. habilis specimen from Kenya, dated at approximately two million years ago. From that date forward, brain size 'took off,' i.e., increased autocatalytically so that it nearly doubled in the genus Homo, reaching its maximum in Neanderthals. If hominids weren't using and refining language I would like to know what they were doing with their autocatalytically increasing brains (getting ready to draw pictures somehow doesn't seem like enough)."[20]

On earth today, only one being speaks--man. Mankind is able to perform this amazing feat because of Broca's area. Broca's area is what controls the motor functions of speech. Your larynx is controlled from this site. If a stroke is suffered in Broca's area, you can understand the language you hear but you are unable to talk. Thus this region is proof that the being had some speech abilities. Since Broca's area is on the outer part of the brain, it leaves an impression on the inside of the skull. Fossil skulls can then be examined for evidence of Broca's area. When this was done, it was discovered that this most characteristic of human traits is found in all fossil men for the past 2 million years. H. habilis, having Broca's area is highly suggestive that he could speak two million years ago. The forms of fossil man, which have Broca's area, include Homo habilis, Homo erectus, and Homo sapiens neanderthalensis. While none of these fossil men look like me, they have the same brain structures that I do; the same structure that allows me to speak.

If they had a language, how can we suggest that they are not human in the sense that we are human? To relegate a being for which there is evidence of language from humanity because he looks different externally, does not seem consistent with the biblical definition of man.

Another evidence of humanity, which is left in the fossil record, concerns handed-ness. Schick and Toth noted,

> "In modern human populations approximately 90 percent of people are dominantly right-handed (dextral) and about 10 percent are dominantly left-handed (sinistral). This is a very unusual pattern, and it is unique to humans. In the rest of the animal world, including nonhuman

primates, the breakdown of handedness (or pawedness) tends to be about 50 percent left-handed and 50 percent right-handed."[21]

The evidence for handedness in mankind is very ancient. Schick and Toth continue,

> "Let's look at what a right-handed tool maker typically does during hard-hammer percussion. As outlined above, a right-handed individual normally holds the hammer stone in the dominant right hand (which gives more precision and power to the flaking blows and lessens the chance of hitting one's fingers) and the core to be flaked in the more passive left hand. The left hand essentially acts like a vise to securely grasp the core during repeated blows from the hammer stone, orienting the core properly for each successive impact.
>
> "Now, what effect does this setup have upon the flaking process? If a sequence of flakes is removed from one face of a core, there is a tendency for the left hand holding the core to rotate it in a clockwise direction as the flakes are removed. One hits off a flake, rotates the cobble a little, and strikes off another to the right of the first, rotates it slightly again and flakes again, and so forth. If the core is made on a cobble or thick cortical flake, we can see this clockwise rotational bias by examining the flakes that have been produced. Successive flakes tend to have part of a flake scar on the left (where the previous flake had been struck off) and part of the cobble's cortex on the right. Thus, large samples of these flakes can tell us something about handedness: whether the cobble was being rotated in this way, as would a right-handed person, or whether it was being turned by a left-handed person, in the opposite hand and producing the opposite pattern. Experiments show that right-handed tool makers produce significantly more oriented flakes. In our experiments, (we being right-handed), a ratio of 57-43 of right-oriented flakes was produced.
>
> "This is an experimental result that can be applied directly to early Stone Age artifacts. So far, every site we've examined from the early Stone Age, including those at Koobi Fora dated from about 1.9 to 1.5 million years ago, shows exactly the same pattern. Thus it appears that by the time of early toolmaking in the archaeological record, these ancestral hominid populations may have already become preferentially right-handed. For whatever reason or reasons, right-handedness seems to be an ancient trait in humans."[22]

The same can be stated for Neanderthals. Stringer and Gamble relate,

> "Additional evidence of the importance of the front teeth in Neanderthals and their predecessors has come from other microscopic studies of the front surfaces of these teeth. In an early sample (Atapuerca) and several later Neanderthals from Europe, Iraq and Israel unidirectional scratches have been observed, which suggest that something held in the teeth was being cut with stone tools. When these tools penetrated the material in question, they left a tell-tale scratch mark on the teeth which reveals the direction of cut, indicating that the tool was usually held in the right hand. Along with data on the brain shape of Neanderthals and the stronger development of their right arms, this implies that---like modern humans---most Neanderthals were right-handed. Furthermore, there is evidence that this behaviour started early, in both senses, since the characteristic scratches are present on a child's milk canine from the middle Pleistocene site of Atapuerca. It is possible to see the importance of the front teeth as a general feature of early human behaviour which was accentuated in the Neanderthals."[23]

Thus, in addition to brain organization we share right-handedness with fossil man. Right-handedness apparently is connected with language abilities and the unequal sizes of the brain hemispheres.

Tool-making is another trait we share with fossil man, but not just tool-making in the sense that one tool is fashioned for some particular use. Some animals do modify objects and put them to use. Chimpanzees strip leaves from twigs and poke them into termite mounds. When he withdraws the twig, the chimp has collected a mouthful of termites for dinner. A mud wasp holds an unmodified pebble in its jaw to pack the earth during the construction of its nest. Some finches on the Galapagos Islands use cactus thorns to fish for insects inside of trees. The Egyptian vulture drops unmodified rocks on ostrich eggs so that the thick shell can be broken. Otters use unmodified rocks to break open abalone shells.[24]

In all these cases, the animal does not use a tool to make another tool. They use the tool to make a nest or

get food. Only mankind makes tools so that they can use it to make another tool.

When is the first evidence of tool-use to make another tool in the fossil record? The first evidence of tool use is 2.5 million years ago at Gona, Ethiopia.[25] Amazingly, the first documented use of a tool to make another tool is 1.5 million years ago at Koobi Fora. When a stone tool is used to carve or cut wood, a characteristic pattern of scratches is left on the stone tool. By studying the scratches on stone tools Lawrence Keeley at the University of Illinois showed that some of the Koobi Fora tools had been used for wood-working.[26] The first actual evidence of a tool made by another tool in the fossil record is the 400,000 year old wooden spear found at Clacton-on-Sea, England[27] and the 424,000 year old spear from Schoningen, Germany.[28] It is interesting that the first extant example of a tool-made tool, is a weapon.

Man is the only being who mutilates his dead by tool use. The first evidence for scalping in the fossil record is from Bodo, Ethiopia from 600 thousand years ago.[29] It may have been ritual or it may have been scalping. This is mankind at his best long ago.[30]

Man is also the only being that produces graphical and carved representations of himself. Art is also a characteristically human activity. In the fossil record the unfortunate fact is that art objects made from perishable materials would be quite unlikely to have been preserved. Only objects made from stone would be likely to survive. The earliest object of art that was recognized by a fossil man is the Makapansgat pebble, which dates to 3 million years ago. It is a naturally occurring stone with the face of an australopithecine appearing on it naturally. This pink pebble is made of banded iron formation, a rare Precambrian rock but it was found in a limestone cave where it could not have arrived by accident. The nearest banded iron formation is five kilometers to the northeast of the cave. Someone had to recognize this face on the rock, pick it up, and carry it at least five kilometers back to Makapansgat. This shows that Australopithecus had the ability to recognize himself in a piece of art. It is indicative of self-consciousness.

The earliest actual man-made art object is the phonolite pebble found at Olduvai Gorge in rocks dating to 1.6 million years ago.[31] It is a face that was carved on the small pebble. It is also the only example of human manufactured art that far back.

The next man-made art object is the Golan Venus that was found at Berekhat Ram in Israel, near Masada in rocks dated to 300,000 years ago. This apparently was the first example of an art form that became quite popular between 25,000-20,000 years ago. The Venus figurines were carved statues of naked females. Marshack writes,

> "Peltz reported that it was clear that 'human hands had worked a fragment of pyroclastic rock, namely an indurated tuff.'"[32]

But this was probably not the first art. Body painting probably constituted the first form of art, and for this there is plenty of evidence early in the fossil record of man. As far as I have been able to determine, there are no examples of animals that tattoo themselves, paint themselves, or scar themselves. Dickson reports,

> "Specimens of ochre have been reported from some of the oldest occupation or activity sites known from the Lower Paleolithic period in the Old World, including Bed II at Olduvai Gorge in Tanzania, Ambrona in Spain, Terra Amata in France, and Becov in Czechoslovakia. The use of ochre apparently increases during the Middle Paleolithic period in the Mousterian tradition and becomes common in the Upper Paleolithic period.
>
> "Ochre has no apparent practical or technological use until the development of iron metallurgy sometime in the second millennium before Christ when it becomes a principal ore for iron smelting. Nonetheless, many of the Paleolithic period ochre specimens show evidence of having been worked or utilized in some fashion. For example, the two lumps of ochre recovered at Olduvai Gorge show signs of having been struck directly by hammerstone blows (M. Leakey 1971). Howell states that the ochre specimen recovered at Ambrona showed evidence of shaping and trimming, although Butzer asserts this may only be natural cleavage. Still the ochre comes from the same horizon as the famous linear arrangement of elephant tusks and bones and was probably brought to the site by the hominids who are thought to have killed and butchered elephants there.
>
> "At Terra Amata, which was occupied around 300,000 BP, de Lumley reports a number of ochre specimens recovered from the two occupation layers associated with the pole structures uncovered at the site. Specimens of red, yellow, and brown were recovered and the range of color variations suggests the ochre may have been heated. De Lumley reports that the ends of some of

the specimens were worn smooth suggesting they had been used in body painting.

"Clearer evidence of ochre use comes from Becov in Czechoslovakia. This cave site, occupied ca. 250,000 B. P., yielded a specimen of red ochre that was striated on two faces with marks of abrasion together with a flat rubbing stone with a granular crystalline surface that had been abraded in the center possibly during the preparation of ochre powder. Whether or not the rubbing stone was actually used in the preparation of ochre powder is uncertain, but a wide area of the occupation floor from which the ochre lump had been recovered was stained with red ochre powder."[33]

Once again, evidence for a very characteristic human activity is found quite early in the fossil record.

But for the Christian, what is most important is the question of when mankind became spiritual. Hugh Ross suggests,

> Man is unique among all species of life. By 'spirit' the Bible means 'aware of God and capable of forming a relationship with Him.' Evidence of man's spiritual dimension would include divine worship, shown by religious relics, altars, and temples. From the Bible's perspective, decorating, burial of dead, or use of tools would not qualify as conclusive evidence of the spirit. Moreover, nonspirit creatures such as bower birds decorate their nests, elephants bury their dead, and chimpanzees use tools."
>
> "While bipedal, tool-using, large brained hominids roamed the earth at least as long ago as one million years, evidence for religious relics and altars dates back only 8,000 to 24,000 years. Thus the secular anthropological date for the first spirit creatures is in complete agreement with the biblical date."[34]

Ross further notes of some finds of Upper Paleolithic tools in the Middle Paleolithic,

> "However, the dates for these finds are well within the biblically acceptable range for the appearance of Adam and Eve -- somewhere between 10,000 and 60,000 years ago according to Bible scholars who have carefully analyzed the genealogies. Since the oldest art and fabrics date between 25,000 and 30,000 years ago, no contradiction exists between anthropology and Scripture on this issue."[35]

What is the first evidence for religious activity in the history of mankind? Amazingly, it may be the 424,000-year-old altar at Bilzingsleben Germany. The excavators, Dietrich and Ursula Mania have found a 27-foot-diameter paved area that they say was used for "special cultural activities"[36]. Gore describes this evidence,

> "But Mania's most intriguing find lies under a protective shed. As he opens the door sunlight illuminates a cluster of smooth stones and pieces of bone that he believes were arranged by humans to pave a 27-foot-wide circle. '"They intentionally paved this area for cultural activities,' says Mania. 'We found here a large anvil of quartzite set between the horns of a huge bison, near it were fractured human skulls.'"[37]

If found in a modern village, this would be enough to cause one to turn and flee for his life. Such an arrangement of objects would immediately be interpreted as evidence of religion, and a hostile religion at that. Bilzingsleben dates to around 400,000 years.

The Golan Venus 300,000 years ago is another evidence of religion. Many authorities believe that the Venus figurines were fertility figures, which implies some type of religious awareness. The Golan Venus is a crude figure of a woman. It is the oldest example of a Venus figurine which was clearly modified by human hands.[38] If the later ones were involved with religion, why not the earlier ones?

Art is often connected with religion. This is no different in the past. There are some reports of 240,000 year-old artwork being discovered in Africa.[39]

Neanderthal also gave evidence of religious activities. Barnouw relates,

> "There are other implications of religious beliefs held by Neanderthals in the collections of bear skulls found in their caves. The mere preservation of skulls need not suggest anything

religious, but in some cases special attention was given to their placement. In one cave, five bear skulls were found in niches in the cave wall. The skulls of several cave bears in a group have been found surrounded by built-up stone walls, with some skulls having little stones placed around them, while others were set out on slabs.

"All this suggests some kind of bear cult, like that practiced until quite recently by the Chippewa and other North American Indians. After a Chippewa hunter had killed a bear, he would cut off the head, which was then decorated with beads and ribbons (in the period after contact with Europeans). Some tobacco was placed before its nose. The hunter would then make a little speech, apologizing to the bear for having had to kill it. Bear skulls were preserved and hung up on trees so that dogs and wolves could not get at them. Bear ceremonialism of this and related kinds had a wide circumpolar distribution--from the Great Lakes to the Ainu of northern Japan through various Siberian tribes, such as the Ostyaks and the Orochi, to the Finns and Lapps of Scandinavia. So wide a distribution of this trait, associated as it was with other apparently very early circumpolar traits, suggests great age. It is possible, therefore, that some aspects of this bear ceremonialism go back to Middle Paleolithic times."[40]

Forty-seven thousand years ago, at Bruniquel, France, Neanderthals built an altar and sacrificed a bear. Bednarick notes,

"The cave of Bruniquel in southern France has just produced fascinating new evidence. Several hundred metres in from the cave entrance, a stone structure has been discovered. It is quadrilineal, measures four by five metres and has been constructed from pieces of stalagmite and stalactite. A burnt fragment of a bear bone found in it was radiocarbon analyzed, yielding a 'date' of greater than 47 600 years BP. This suggests that the structure is the work of Neanderthals. It is located in complete darkness, which proves that the people who ventured so deep into the large cave system had reliable lighting and had the confidence to explore such depths. Bruniquel is one of several French caves that became closed subsequent to their Pleistocene use, but were artificially opened this century."[41]

This appears to have been the ritual sacrifice of a bear. It is also the first proof that man went deep into caves long before they painted the walls.[42]

Modern man built an altar in Chauvet cave that dates to 31,000 years ago.[43] A bear skull was precariously balanced on a flat-topped stone and fire was burned just behind the skull. Chauvet et al write,

"A little further on we were deeply impressed by what we discovered. In the middle of the chamber, on a block of grey stone of regular shape that had fallen from the ceiling, the skull of a bear was placed as if on an altar. The animal's fangs projected beyond it into the air. On top of the stone there were still pieces of charcoal, the remains of a fireplace. All around, on the floor, there were more than thirty bear skulls; now covered in a frosting of amber-coloured calcite, they were purposely set out on the earth. There were no traces of skeletons. This intentional arrangement troubled us because of its solemn peculiarity." [44]

These finds make Ross' claim that spiritual mankind was not on earth earlier than 60,000 years ago tenuous to say the least. The lack of bear skeletons show that the severed heads of bears were brought into the cave for a purpose. These are not the remains of bears accidentally trapped in the cave. It also makes it unlikely that spirituality is limited to anatomically modern humans.

Even Homo erectus showed some evidence of religious activity.

"Evidence of collecting skulls is not the only sign of ritual observances. In no single H. erectus cranium known (whether from China, Java, or Africa), is the base of the cranium intact. Every one shows damage to the region around the foramen magnum (the hole in the base of the skull through which the stem of the brain passes on its way to become the spinal cord). This damage appears to have been deliberately inflicted; that this is one of the thinnest parts of the cranium is an unconvincing argument for accidental damage; indeed, even in the much thinner walled crania of Australopithecus this region is typically found intact."[45]

Who is man? Man is a creation of God. Man can speak due to Broca's area. Man is predominately right-handed. Man makes art. Man scalps his fellow man in war. Man worships things other than himself by engaging in ritual. Animals are not right-handed, do not carry around ochre, use tools to make other tools, carve sexual representations of their females, scalp other members of their species, carve spears, nor possess the brain structure for speech. But fossil man does all these things. The only reasonable conclusion in light of all this data is that humanity is quite old contrary to what many Christian leaders have taught.

Do brains make the man?

Can the difference in cranial capacity be used to demarcate the Rubicon of humanity? Unfortunately it can't. Table 16 shows the various brain sizes of these hominids.[46] As can be seen, there is no major gap in the brain capacities if A. robustus is included. However, since A. robustus is not generally believed to be on the direct line of human evolution, a gap does exist between A. africanus and H. habilis. It is a truly remarkable feature of our brains that the size does not appear to be as important to successful, normally intelligent brains as does the organization of it. While rare, even severely damaged brains are occasionally able to function in a normal manner.

Bruce Lipstadt, as a child, suffered 10 to 12 seizures a day. His mental abilities were deteriorating and his life was in danger. In 1953, Dr. Oscar Sugar, Chief of Neurosurgery at the Abraham Lincoln School of Medicine, removed the offending left half of the 5-1/2 year old's brain. His parents were told that he would not be able to talk, that he would be paralyzed on one side of his body, and, that he would have no balance. None of those things happened to Bruce. Years later Bruce and his father attended the same statistics course at DePaul University; Bruce received an A and his father, with a full brain, got a B.[47]

There was one report of a student at Sheffield University in England whose doctor noticed that his head was slightly larger than normal. The doctor referred this socially normal student with an IQ of 126 to Dr. John Lorber. Lorber ran a brain scan on the student and discovered that the student's head was literally empty with only a millimeter of brain material coating the inside of the skull. The student had been a hydrocephalic baby and nobody apparently had known it.[48] Lorber's studies have shown that approximately half of the individuals whose brains are less than 5% normal size have IQ's greater than 100.

The important point is that the size of the brain is less important than the organization of it. Mr. Lipstadt is functioning normally with a brain which can't be more than half the size of the normal human brain. A brain of that size places him within the range of the H. habilis. The student at Sheffield had an even smaller brain than the chimpanzee. We have already examined the question of what it means to be made in the image of God, and concluded that it is a spiritual image - not a physical one. As we stated, we could have looked like lizards and still been made in the image of God. While there is an emotional prejudice against admitting the humanness of creatures with such small brains as Homo habilis, it is not out of the question that they were intelligent. One can not rule out the possibility that Adam and Eve may have been a Homo habilis or even Australopithecine. Does this mean that Adam and Eve were covered with fur? Not necessarily, but once again, who cares? Some people today are born with fur. It is irrelevant to the image of God. We could have been lizards.

Before the conservative reader chooses to shut the book forever: this is not what I would prefer to believe about Adam and Eve, but it may be what the data ultimately requires. While these possibilities are quite beyond what most young-earth creationists propose, the view that Adam's brain may have been different from ours is not at all new within creationist circles. Henry Morris, discussing the difficulty of Adam's naming all the animals, suggests,

> "Although even this number would seem formidable to us today, it should be remembered that Adam was newly created, with mental activity and physical vigor corresponding to an unfallen state."[49]

Although I am sure that Dr. Morris will object to the view advocated here, it is difficult to see what could more correctly express his position than that Adam was able to work twice as fast with one third of the brainpower. Surely this would be a testimony to God's creative power.

Fossil	#	Cubic centimeter
A. africanus	6	450
A. robustus	2	515
H. habilis	3	656
Javanese H. erectus	7	883
Chinese H. erectus	5	1043
H. sapiens		1350

Table 16 Hominid Cranial Capacity

Who is man? Man is a creation of God. Man can speak because God gave him Broca's area. Man is predominantly right-handed. Man makes tools with which to make other tools. Man makes art. Man mutilates his fellow man by means of tools. Man worships things other than himself by engaging in ritual.

Animals are not capable of speech. Animals are not right-handed. Animals are unable to make tools with which to make another tool. Animals do not make art. Animals do not mutilate their fellows by means of tools. Animals are incapable of worship.

Fossil men do all the things listed for mankind. Contrary to what Christian apologists teach Neanderthal and Homo erectus engaged in behaviors that we would classify as human. Human activities are not the sole province of Homo sapiens. The only reasonable conclusion is that humanity is much older than Christian leaders teach.

One final set of facts must be laid out before we can properly suggest the various possibilities to harmonize the anthropological data. In 1976, Maurice Taieb and Donald Johanson published an article describing some primitive stone tools that had been found at Hadar, Ethiopia. Potassium-argon dates from close by suggested that the tools were 2.6 million years old. To date these are the oldest stone tools known.[50] As Johanson and Shreeve note,

> "Stone tools are not time-fragile like fossils. If we look for them and can't find them, then they probably weren't there to begin with."[51]

The first multi-tool tool kits are found in rocks 2 million years old.[52] In river deposits dated at 1.6 million years of age, a hippopotamus was found with over 100 stone tools among the bones.[53] These facts are important as the starting points for modern human technology.

With all these facts laid out, what did Adam looked like? There are two possible solutions. First, Adam was an Australopithecine. The facts in favor of this idea are that the Australopithecines appear immediately after the infilling of the Mediterranean. Australopithecines had some ability to recognize art objects as observed in the Makapansgat pebble above. The Makapansgat pebble indicates that Australopithecus had some self-consciousness three million years ago. The facts against this view are the paucity of evidence for australopithecine culture (although recently a new discovery has shown that australopithecines were toolmakers.[54]

Several issues raised by the anthropological data. Was man created only 2.6 million years ago? That is inconsistent with the Flood view we are advocating. Why no earlier technology? The general lack of tool-making knowledge would be consistent with what should be expected for a post-diluvial existence. A fact that argues against them is that in general they left little evidence of culture. Also their small brain size argues against their humanity. Unless their brains were organized more efficiently, it would be difficult to see them as similar to us. However, as Bernard Campbell points out, even brains as small as theirs can still do remarkable things compared to brains of the animals. He says,

> "While the large-brained elephant and whale have no language, human 'bird-headed' dwarfs, whose brains are no bigger than those of gorillas (400-600 cc), can talk on the level of a five year old child. Evidently, they carry the anatomical correlates of language, and they show a large brain alone is not an essential correlate of linguistic ability."[55]

The second and third possibilities for harmonizing the anthropological data with the Bible are related. The second possibility is that Adam was a habilis and the third is that Adam was an erectus. These two possibilities both depend upon the idea that after Noah and his descendants got off the ark there would not have been very many of them. The first fossil of any species is not the first member of that species. Species must become widespread to be fossilized. The fossil record shows long temporal gaps between the first and second fossil example of any species. Depending upon population growth and the habitat of early fossil man, it would be very unlikely for any of Noah's immediate descendants to have left any fossil record of their existence. Depending upon the population growth rate and the presumed habitat of the post-diluvial men (the tropical forests of Africa, which are an unlikely locale for fossilization to occur), it is possible for man's existence to have gone unnoticed and unfossilized for several million years. This view predicts that H. erectus or H. habilis existed much earlier than the currently earliest fossil example. Another point in favor of this view is that they left lots of evidence of culture in the form of tools, and their brain sizes were within the range of normally intelligent humans.

Our preferred solution is that Adam was a Homo habilis (rudolfensis). The implications are that if the Mediterranean infilling was the Noachian deluge, then either of these species existed on earth much longer ago.

This is consistent with the statistical nature of the fossil record. Right now, there is an oldest example of every fossil species we have in our museums. Next year, new discoveries will prove that some of these species lived earlier than we had thought. New discoveries will find some of these species in older rocks than those in which they had previously been found. The time gap between the new discovery and the previously oldest fossil example can be quite large. It means that the fossil species existed on earth for that time period without leaving any trace of its existence. The view we are advocating requires that Homo erectus or Homo habilis lived from the flood at 5.5 Myr ago to the time of the first fossil habilis/erectus without leaving any trace of its existence. Most Christians want to say that this is impossible. But it is not only possible; it is quite probable.

For example, until 1990, caecilians, an amphibian group, were first known from fossils in rocks dated as 100 million years old. Farish A. Jenkins, Jr. of Harvard University discovered some fossil caecilians in Jurassic rocks dated around 175 to 180 million years.[56] This is a span of 80 million years without a trace of the caecilians, but this type of behavior in the fossil record is not unusual. All this view requires is that Erectus live on earth for 3.5 myr without leaving prior evidence of its existence.

The oldest dinosaur evidence is in an unidentified track from France dated at 240 million years old.[57] The second oldest is a fossil from South America 228 million years old. The oldest evidence of dinosaurs on the North American continent is a 225-million-year-old set of turkey-sized tracks from New Mexico. The second oldest in North America is a set of 200 million year old tracks from North Carolina. For twenty-five million years dinosaurs left no evidence of their existence on the continent. Thus, we have dinosaurs in France, then no evidence for 12 million years, another gap of 3 million years, and a final gap of 25 million years. All this view requires is that Erectus live on earth for 3.5 myr without leaving prior evidence of its existence.

Until 1986 there were no known fossils of the genus Tarsius, a primitive primate. At that time fossil teeth were found in Miocene which were nearly identical to modern Tarsier.[58] Then this year at Shanghuang, China, more fossil evidence of Tarsius was found - only this time it was in Eocene rocks. The Eocene rocks are around 50 million years old. Tarsiers thus have two major gaps in their fossil record: a 30 million-year gap and a 20 million-year gap. In these gaps it is as if the tarsiers were not on earth. All this view requires is that Erectus live on earth for 3.5 myr without leaving prior evidence of its existence.

A few years ago the oldest known shark was from the Silurian rocks dated 430 million years ago. Today the oldest shark is found in the Ordovician in rocks dated 455 million years ago. Sharks lived on earth for 25 million years without leaving any trace of their existence. All this view requires is that Erectus live on earth for 3.5 myr without leaving prior evidence of its existence.

Knowing this about the fossil record, it is quite possible that Noah and Adam were Homo erectus. These hominids have shown most of the traits with which we associate "humanness." Making that assumption, their lack of appearance for the next three million years could easily be due to 1) there not being very many of them, 2) their living in the forests of Africa rather than on the East African plains, and 3) their lack of technology which made them remain as a small population for a long time. Small populations are unlikely to be fossilized unless they live in a propitious place; forests are not such places.[59]

In the last chapter we examined a novel hypothesis for the Flood which fits the Biblical record. We hypothesized that Noah and the occupants of the ark landed not in Turkey but along the northeastern African coast. First, the currents on the surface of the Mediterranean would force a limited range of landing sites from the northwest African coast north to the southwest Turkish coast. The archaeological and anthropological evidence seems to point to mankind coming out of Africa. What is being suggested is that after Noah and his family emerged from the ark in Turkey, God sent them south into tropical Africa. There the descendants lived in small societies for many eons.

The traditional view has Noah landing on Mount Ararat in Turkey and society quickly resuming a farming, technological lifestyle. Whitcomb and Morris state that they believe the Tower of Babel occurred no more than 1,000 years after the flood.[60] Whenever Babel was, it could not have been merely 1,000 years after a disaster like the flood. The technology simply would not have been available to build such structures.

The Collapse of Technology

After the death of the former world, there were only eight people left on the planet. The question of what their life - life after the death of all others - would be like strangely seems to have been ignored in almost all books about the Flood. It is a question that is possibly significant for determining the place of fossil man in the chronology of the flood and for the question of when the Flood occurred.

A Tale of Tasmania

A minor example of the collapse of technology which happens to isolated societies can be seen in the Tasmanians. Josephine Flood relates,

> "No other surviving human society has ever been isolated so long or so completely as were Tasmanian Aborigines over the last 8000 years. (The land bridge was gradually inundated between 12000 and 8000 BP-....)"[61]

Eight thousand years ago, the Tasmanians had all the technology found in Aboriginal societies of Australia. They fished, they made bone tools, they made capes of kangaroo skin. They attached stone tools to wooden handles to improve the tools' effectiveness. Then the rising sea cut off the island of Tasmania from Australia.

The island of Tasmania could only hold about 4000 people. This apparently is too few people to maintain, much less improve, the technology of a primitive society. Four thousand years ago, the Tasmanians ceased making bone tools, a skill possessed by every other society on earth. They ceased making handles for their tools and hand-held all stone tools. While there were fish all around Tasmania that would have been an excellent source of food, the Tasmanians gave up fishing and did not eat fish after 3500 years ago. When western men discovered them, they possessed exactly 24 primitive stone tools. In an infamous anthropological article their technology was compared with chimpanzee technology.[62] Tasmanians are a smart people; they are human on our level. What they lacked was interpersonal stimulation. Technology requires a large population and lots of intellectual stimulation. Small populations have none of that and they lose their technology. This is something that would apply after Noah's Flood.

Consider what you would do if you were told that only you and seven other people would survive a global catastrophe. Everything that you are familiar with would be destroyed and your little band of eight would be required to be self-sufficient. However, you will be allowed to take one item of technology with you. What would be the most important technology?

We will assume that you have landed in what once was Texas and will consider several questions. The most important of these questions is what would the implements of technology mean to you and your descendants in a few years? Also, how would you replace them when they wear out as all things do? We will follow the interdependence of each of our modern technologies with all the other technologies and show that eventually all chains of reasoning lead to one inescapable conclusion. Within a generation or two, your descendants would be living as people did before the Stone Age. As we go through each this list of question, remember that each question that you have to answer 'No' to is an indication of how badly your life would be if you were in Noah's shoes. It is amazing that 20th century people are so arrogant that even after saying 'no' to most of the following questions, they still think that they can make it in the wild after a global catastrophe. What 20th century people don't remember is that when Europeans educated Native American children during the last century, the children returned to the tribes with none of the skills they needed to survive in the wild. Native Americans complained that our education made their children useless--and they were correct.

As I look around the room I am in, the things most important to me, things that entertain me will be useless in such a situation. The computer, which I enjoy so much, would be a silent lump of silicon, plastic and metal in a world without electricity. The radio and TV, likewise, will sit silent and dark even if there were electricity, since there will be no transmissions. The hundreds of books that line the walls will be of little value. Without protection from the elements, they will deteriorate within a year. Obviously, objects of entertainment must be forgotten.

Let's get practical. The nights will be cold. So how about a heater? But what fuel will you use? All heaters will be useless as soon as their energy source is depleted. How about kerosene? It is distilled from petroleum and there is petroleum in Texas. Maybe you can extract some of it from the ground. Now you have a plan! You can continue to remain warm as long as you find a supply of oil and the heater stays in working order. After all the Chinese had drilled holes in rocks up to 450 feet deep by 200 B. C.

Production of oil, in even the most primitive fashion, you will need several hundred feet of rope, pipe and at least one long iron rod. The cable is tied to the rod and the rod is dropped onto the rock to break it into little pieces. The pieces are then scooped out of the hole and the rod is again dropped into the hole. One needs a machine to lift and drop the rod, especially as the hole gets deeper, because the weight of the rod and cable quickly becomes greater than any 10 people can lift. The pipe is used to produce the oil and direct the flow to the proper location. However, there is no steel pipe since there is no iron industry. If you have the luck of the modern oil industry, you have a 1 in 8 chance of finding oil or gas after several months of drilling.

To produce the iron, you need iron ore and coal. Do you know what iron ore looks like and where to find it? Most people don't. One of the best iron ore deposits in the world was in Michigan in the Precambrian Mesabi formation. The ore is found in a siliceous rock with a concentrated level of iron oxide. So, now that you know where the iron ore is, you will have to travel nearly 1,000 miles to get it. There are two low-grade iron ore deposits in Texas, but recognizing them will be difficult. Assuming you make the trek to either of these deposits, how are you going to mine this very hard, siliceous rock? You have no dynamite, rock drills or saws. Maybe you could make dynamite? Probably not, and if you had a rock drill, you would use it to drill for oil rather than going through this silliness. What about gunpowder? It can be made from primitive materials and it might be usable to blast the iron ore out of the rock. But, unfortunately, you do not know the recipe. Gunpowder is made from saltpeter (potassium nitrate), sulfur and charcoal. Do you know what saltpeter looks like? I do not.

Do you know where there is any coal, the other ingredient needed for iron and steel? From northern Michigan, you need to travel at least into southern Illinois, all on foot, somehow carting the heavy iron ore with you. After all there are no trains or trucks. In that region, you need to find an outcrop of coal, collect it, and build yourself a furnace. Assuming that you can do this, and have successfully started the coal-iron ore mixture burning, you sit back and wait for the molten iron ore to pour out. Unfortunately, nothing happens. After the fire goes out you look in the furnace and find that all you succeeded in doing was making iron ore hot, but no iron was produced. All this work for nothing! What you didn't know was that, in order to get the temperature high enough to separate the iron from the oxide and the silica, you needed a bellows to pump air into the furnace. This is quite a lot of work for you to do. Even assuming the miraculous and you achieve your goal of making iron, how do you then shape it into cable and pipe? No, you will not be making any iron products any time soon. And, as soon as the knowledge you have dies out, your children will be even less likely to attempt this task. After all, they will never have seen iron and will have little incentive to think that if they heat rocks, metals will pour out of them. Better find another way to keep warm.

Let's forget kerosene and take a wind-powered turbine for generating electricity. All right, you can take two items of technology. A generator is of no value for warmth without an electric heater. What a good idea! Except that now you can only keep warm on cold nights that are also windy. No electricity - no heat. Eventually, the turbine or the heater will break. If something as small as a ball bearing were to break, the turbine, and then the heater, would be useless. Maybe you can repair the ball bearing. Fine, but that requires steel. There is none of that available, and after seeing what is necessary for iron production, you are not eager to try. Once again, even if you are able to manufacture iron, how do you mill it into a spherical shape of the proper size? Obviously, to repair the turbine is impossible. Better look for a lower tech solution to the problem.

Maybe a blanket will have to do. But after a few years, the blanket will have rotted and will need replacing. It will need replacing sooner if you allow it to get wet over and over again. Besides only one of your children can inherit the blanket. They all will need blankets, so maybe you need to take a loom to make cloth. This is a good idea since you and all your children will need clothes. A loom will be a very useful item. But where will you get the cotton? Maybe you can grow it. This takes time away from growing food. Take a loom, find some wild cotton, plant the seeds and you and all your descendants can keep warm. Sorry, cotton does not grow wild! It is so thoroughly domesticated that it will not live in the wild. Cotton is a product of mankind's biotechnology, albeit a very old one.[63] Since you are not allowed to take more than one modern technology, cotton, cotton blankets, clothes etc. are out.

Can you make a loom? Do you know how to construct a loom? Do you have the tools to chop the tree down? Do you have the tools to shape the wood? Do you know how to make stone tools with which to chop the trees? Are you aware that stone tool making is very dangerous and can cost you the use of your hands if it is not done properly? John Whittaker, a flintknapping expert, severed two tendons in his hand with one tiny cut, putting him out of action for almost two years.[64]

You forgot something. A loom is of no value without a spindle to spin the thread. So, instead of one technological item to produce a blanket, you need three. Actually, make that four, if you consider the need for a plow to plant the cotton seed; five if you consider the yoke with which to hook up the domesticated cow, which is going to pull the plow. But then again, domesticated animals are also a product of our technology and there are none of those in this new world you find yourself in. You will need to domesticate new ones. Remember that domesticating a wild animal is more than merely capturing it. Centuries of breeding the wild temperaments out are required to make the animals docile enough to use effectively. Take cattle, for instance. The effects of domestication on animals are impressive. Asimov states,

> "We have clear notions of what constitutes an 'improvement of breed' in domestic animals. If we want a cow that is a good milker, we interbreed bulls and cows that have descended from good

milkers, and pick the best of the offspring (in that one respect) for future interbreeding. In the end we build up milk specialists that are scarcely anything more than living factories, designed to turn grass into butterfat.

"Fine! But what else have we bred into the cattle while we have been concentrating on the milk? We do not much care; we just want the milk. Our tame cattle are now too stupid and placid to protect their calves or even themselves against wild beasts. The thoroughbred race horse is a magnificent speed-machine, but is a highly neurotic creature that requires more and better care than a human baby."[65]

Well, if you can't clothe yourself with cotton cloth, what about using animal skins? Kill an animal and use the hide for clothing. Sounds reasonable until you realize that there is more to it than just killing the animal. Once the animal is dead, how do you remove the hide? How do you protect the carcass from scavengers until you can eat the meat and salvage the skin? You can hardly perform this task without a knife of some sort but you don't have one. Maybe you can make a stone knife, but what kind of rock will you use, and how will you shape it into a usable form? Do you know what kind of rock will make a good stone knife? How will you shape it into a usable form? Do you know what pressure flaking is and how to do it? Do you know the angle at which to hit a stone to make it produce flakes? Do you know how to protect yourself while making stone tools? Even if you can do this, unless you know how to preserve and tan the hide, it will quickly rot, leaving you little to wear. Wearing a rotting skin around your loins may make you a tempting morsel for scavengers such as wild dogs, wolves, lions, and bears. You and your descendants will soon be reduced to the most wretched form of existence.

Maybe you can solve this dilemma by bringing a metal plow with you on the ark. If you bring a metal plow, there are still problems. A metal plow will rust out within 50 years. What will your children replace it with? They will not have any better ability to make iron than you do. Is it really reasonable to take a metal plow when only one of your children can inherit it and the others must somehow do without it? Eventually, the metal plow becomes useless to your children's survival because it is a rusted pile of junk. Somehow a loom and a plow don't quite seem as useful as they once did.

Maybe you had better forget about keeping warm and concentrate on something more basic - food. What are you going to eat? You could take a plow anyway and plant a few crops, but what will you grow? Wheat? Well, all varieties of wheat are a product of man-made technology, and since you have chosen a plow for your modern technology, you can't also take wheat. Bread and pasta-making varieties of wheat do not grow anywhere as a wild plant. It has been so thoroughly domesticated that, without mankind's yearly intervention, wheat would be extinct. Wild wheat is a poor material for bread making. Feldman and Sears note that,

"Spikelets of wild wheat lie strewn on the ground following the fragmentation of the spikes at maturity. The main difference between the wild wheats and their cultivated derivatives is that on ripening the spikes of the wild species tend to break into their component spikelets and fall to the ground. Some of the spikelets seen in this photograph have partially buried themselves in the soil, through the action of their awns (their elongated bristlelike terminal processes) in response to wetting; the enclosed seeds are thereby ensured favorable conditions for germination and survival. Although shattering at maturity is essential to the wild wheat as its primary seed-dispersal mechanism, it must have been a major nuisance to the ancient harvesters of wheat. It is therefore not surprising that the early wheat growers selected nonshattering mutants when these appeared, thereby converting the wild wheat into a cultivated one no longer capable of surviving without man's help." [66]

How about corn? Sorry, like wheat, corn also is a modern technology and since you chose to take a plow, corn is not an option. If you don't believe that corn is a man-made invention, consider this. It can't reproduce on its own. Mangelsdorf states,

"Corn as we know it is a thoroughly domesticated plant. It is the most efficient of all grasses at producing grain, but it is unable to survive without human help because it has no way of spreading its seed. The kernels on an ear of corn cling tightly to the rigid cob, and if the ear were simply allowed to drop to the ground, so many competing seedlings would emerge that in all likelihood none would grow to maturity. The ear in its hundreds of modern varieties was created by human beings for human purposes through centuries of selective breeding; it has no counterpart anywhere

in the wild, or for that matter among other cultivated plants. Yet corn must originally have evolved from a wild plant. Which plant?"[67]

Rice is the only major grain plant that grows in the wild, but do you know what it looks like? I don't. And even if I did, I don't know how to cultivate it. How do I make the rice paddies? When do I plant the grain; when to I transplant it? When do I harvest it? Frankly, my first crop would be a disaster! If that first crop is a disaster, it is quite likely that my family will die.

Maybe you had better take wheat or corn seeds rather than a plow. That would be a better decision but still not a great one. Several obstacles stand in the way of making a crop from your planting. First, without a plow, planting the crop will be more time-consuming and the weeds will grow back more quickly, choking the young plants. Secondly, much time and effort must be extended to ward off insect pests and weeds. Like the domesticated cattle of today, the modern agricultural plants are too weak to survive without a lot of tender loving care. They require pesticides and fertilizers or they will die. Thus, the third obstacle is the amount of time necessary to care for the plants. Without pesticides, the insect pests will be extremely difficult to control unless you know how find the natural predators of the insect pests. Since you can't go to the store and buy 'good insects', your crop is at serious risk. Since it takes months for the plants to mature, you have two choices: starve before the crop can be harvested, or go hunting for food and let the crop take care of itself, which is to say that the crop will most likely die.

Couldn't you divide the labor and have your wife care for the crop while you are hunting? That all depends upon how good a hunter you are. If you can make a bow and arrows, or a spear, and are a good enough shot, you might be able to bring home enough food for this division of labor to work out. But if you are unable to do that, then both you and your wife will have to scrounge through the region looking for edible fruits, vegetables, nuts and roots. The bushmen of the Kalahari Desert live a hunting and gathering type of existence.

> "They travel together in bands, each consisting of 5 to 16 families united by bonds of kinship and friendship. Each band has a recognized territory of 300 to 400 square miles, selected for its resources of food plants (which contribute the main part of the diet), wet-season waterholes (for drinking water during the six to eight weeks when sufficient rainwater gathers in pools), trees (for shade, shelter, firewood, and wood for making artifacts), and areas of grazing to attract and sustain herds of game animals. Subsistence is based on 34 species of edible plants, of which eight are staples in their various seasons. This diet is supplemented by the meat of antelope and other herbivorous mammals, by tortoises and other reptiles, and by the flesh and eggs of all but raptorial and scavenging birds. Plant-gathering is mostly done by the women ranging within five miles of the camp, while men hunt over a much larger area of the territory. The main hunting weapon is a light bow shooting flimsy, unfletched, poisoned arrows. The range is only 25 yards, and great skill is needed to stalk the quarry within this distance."[68]

Are you that skilled of a craftsman that you can make a bow and arrows that actually work? How difficult can that be? Do you know what "unfletched" means? Are you aware that only certain types of wood make excellent bows? All other woods can be fashioned into a bow, but it will not be a very good one. The two best types of wood for making a bow are the osage orange, or Bois d'Arc tree, and the yew.[69] Are you aware that the wood must be dried for up to three years, or the bow will not work correctly as it ages?[70] Jim Hamm states,

> "With yew, the longbow makers of Great Britain aged a stave for seven years. Old-time bowyers in this country maintained that a four year seasoning was adequate."[71]

Assuming that you knew all of this, which would be extremely unlikely, how are you going to cut and shape the wood into the proper bow form? Remember that you have no saws, files, and maybe not even a knife. And even if you have a knife, eventually your children will need to be able to make bows and arrows without the modern knife since only one of them can inherit it and the others must make do on their own. What are you going to use for bowstring? Are you aware that it is sinew that is most often used for strings in primitive bows? Do you even know how to find the sinew in a dead animal?

More than this, do you know the techniques necessary to produce a usable arrow? There are several important aspects to the problem of making an arrow. A crooked arrow will not shoot straight. Do you know where to find and when to cut arrow shaft-wood? How do you straighten them? Today, in making an arrow, a piece of

wood is turned into a straight, columnal shape. But primitive man had no lathe and had to use stone tools to make the arrow true. How do you keep the arrow tip pointed in the right direction during flight? How do you attach a stone tool to the shaft? More importantly, how do you make a stone arrowhead that is symmetrical? Do you know what pressure flaking is? If your answer to any of these questions is "I don't know,", then it can safely be asserted that you are going to have problems hunting game.

Assuming you are able to make an arrow or a bow, are you able to stalk a wild animal to within a few feet of it? It is probable that your arrow's accuracy will not initially be as good as the arrows of the bushmen, so you will have to be even closer to the game than 25 yards. Finally, are you able to shoot the homemade bow and arrow with enough skill to kill an animal? The bushmen use poisoned arrows, which increases the effectiveness of the strike. A wound will eventually kill the animal. But where are you going to get poison?

This whole question of feeding yourself is quite important. If you can't successfully feed yourself, you will die. If you are not a good enough hunter, then you will have to eat only vegetable matter. But that raises another problem which makes your chance for survival even less. While the hunter-gatherer may get 66% of calories from vegetables, the third they get from meat is very important. Vegetarian diets do not provide the concentrated energy necessary for the hard life that the hunter-gatherer is going to face. And, unless a person carefully chooses his vegetarian diet, he will not get the proper mix of amino acids and may die. The difference between a meat and a vegetarian diet is shown by a discussion of how horses would have to travel to get to the ark. Custance notes,

> "One reads of the speed achieved by certain animals such as deer and antelope, etc., and imagines accordingly that they could easily make the trip [to the ark-GRM]. But this disregards one important fact, namely, that such creatures are herbivorous. The importance of this observation is that those animals must spend an enormous amount of time browsing in order to gain enough energy for ordinary living. In some cases this may even amount to 80% of their waking hours. Such a circumstance leaves them little time for making long journeys through unfamiliar territory, and it accounts for the fact that a man can outrun a horse - given time - as has been demonstrated on many occasions. In spite of its strength the horse must stop to eat far more frequently than the man who eats meat."[72]

The whole point of this section is that the technology requires specialists; without the specialists, civilization may sink to extremely low standards of living. The present technological knowledge has replaced the ancient knowledge and may be of little use to a stranded band of survivors. What good is knowledge of metalwork when there is not enough food to live another two weeks? The need for stone tools is quite obvious from the foregoing, yet in each culture, after the invention of metal smelting, the practical knowledge of stoneworking was lost. Metal makes superior arrowheads, harvesting implements and knives. Once mankind had the ability to work in metal, why would he continue to make stone tools? The history of civilization shows that stone tools disappeared as soon as the knowledge of metal work became widespread in the culture.

If the reader finds that hard to accept, then realize that people only 1000 years ago were regularly able to memorize thousands of verses of poetry and recite it. But after the invention of the printing press, people could look up facts in books up so they quit working so hard at memorizing. New technologies replaced old ways. Even today, we are seeing a revolution in the way society handles its technology. From the 1930's to the 1970's, phonograph records were the delivery system for music. But with the advent of cassette tapes, and now compact disks, the information encoded on the LP's is quickly becoming inaccessible. Record players, on which to play a phonograph, are becoming rare. When I was being trained as a physicist, every student was required to know how to use a slide rule. There were at least two types of slide rules, the more common straight variety and the rarer circular style. Electronic calculators have eliminated the need to know how to use the old technology and now children, when seeing one, look at it with the awe due an artifact out of the Stone Age. Calculators are also eliminating the need to memorize the mathematical tables. Just 20 years ago, the most important qualification for a store clerk was the ability to accurately add and subtract, so that the correct change could be returned to the customer. Modern cash registers tell the clerk what the correct change should be. Clerks no longer need to be able to subtract accurately. As technology progresses, new skills are learned and old skills are dropped.

What applicability does this have to the survivors of the Flood? Genesis 4:22 notes that the society prior to the flood was a metalliferous society. Tubal-cain was manufacturing tools out of bronze and iron. Because of this it is unlikely that Noah knew how to make stone tools. He might have known how to use a bow and arrow but, due to technological replacement and specialization, he might not have known how to make a bow, arrows, stone arrowheads, stone axes, or any other such tools. Neither was it a necessity in the pre-diluvial world for Noah or his

wives to have known how to spin yarn, or weave fabric, or even how to make a loom or spindle. Technological specialists in the pre-diluvial world would have been all that was needed for the society as a whole to have access to cloth. The assumption, which seems quite prevalent in discussions of Noah, is that his technology was so easily mastered that he and his family could quickly recover a moderate level of technological sophistication and rapidly regain an agricultural society. This is a 20th century arrogance that has no respect for the level of technology described in the Bible. Biblical scholars of a previous generation taught such a view. P. J. Wiseman says,

> "No more surprising fact has been discovered by recent excavation than the suddenness with which civilization appeared in the world. . . Instead of the infinitely slow development anticipated, it has become obvious that art, and we may say 'science', suddenly burst upon the world. For instance, H. G. Wells acknowledges that the oldest stone building known to the world is the Sakkara Pyramid. Yet as Dr. Bressted points out, 'From the earliest piece stone masonry to the construction of the Great Pyramid less than a century and a half elapsed.'
>
> "Writing of this pyramid, Sir Flinders Petrie stated that, 'The accuracy of construction is evidence of high purpose and great capability and training. In the earliest pyramid the precision of the whole mass is such that the error would be exceeded by that of a metal measure on a mild or a cold day: the error of leveling is less than can be seen with the naked eye. The conclusion seems inevitable that 3,000 B. C. was the heyday of Egyptian art.'
>
> "Dr. Hall in referring to this sudden development says 'It is easy to say that this remarkable outburst of architectural capacity must argue a long previous apprenticeship and period of development: but in this case we have not got his long period.'
>
> "In the face of these facts the slow progress of early man is a doubtful assumption, and the idea that an infinitely prolonged period elapsed before civilization appeared cannot be maintained."[73]

This viewpoint is quite simply wrong. With the revolution in Carbon-14 dating, which took place in the late 1960's and the 1970's, it has been proven that civilization didn't appear full-blown instantaneously. The oldest free-standing buildings were built in 3,500 B. C. on the Island of Malta, and the oldest European Megalithic monuments were built as long ago as 4,000 BC. As long ago as 4,800 B. C. at Kerkado, in Brittany, men were building passage graves.[74] A baked brick wall has been found in Atlit-Yam, a submerged neolithic settlement off the coast of Israel. The village dates from around 6000 BC.[75] Thus, from the earliest stone work until the building of the pyramids, over 3,000 years elapsed. Why did it take so long?

The reason is simple. Certain skills and technologies are prerequisite for other technologies. Without the basal technologies, everything else is not available. Metal work is prerequisite for electrical generation and distribution. A bellows is prerequisite for iron smelting. Agriculture seems to be a prerequisite for metal work, since only with an assured source of food does mankind have enough time and food to feed the metalworkers, the miners, the smelters, the transporters and the artificers. Metal technology does not contribute directly to the feeding of society, so only in societies where there is an excess of food can metal technology be carried on. No hunter-gatherer society ever developed metal mining and manufacturing because there is not enough food to allow those activities to be accomplished. In order for mankind to advance, each prerequisite must first be discovered and then disseminated to other groups. Since no people or region has a monopoly on discovery, the more widely the prerequisite technology is spread, the more likely it is that someone else will build upon it and further the technical capabilities of mankind.

Thus, one needs to take a hard look at the living standard that the immediate descendants of Noah would have had to endure. It is extremely unlikely that Noah, whatever his society's technical state, would be totally successful at passing that knowledge on to his descendants. The technological level would fall precipitously until mankind was at a mere subsistence level, hunting game and gathering edible vegetable matter. The endless hunt for food, as all hunter-gatherers experience, would leave little time for invention. The extreme poverty of their lifestyle and the lack of intellectual stimulation would have an effect on their intellectual capabilities. One only needs to ponder what poverty does to modern children to know that this is a real effect. The only clothing available would be the skins of animals if, as noted above, they knew how to preserve them. But the brutal fact is that most hunter-gatherers live without any clothes unless the temperature requires it, as is the case for the Eskimos.

Technology immediately after Noah got off the ark probably consisted of nothing more than wooden spears, clubs and rocks. Even the art of making stone implements was probably out of reach. Why? The investment in time for the manufacture of stone implements is quite high, even for an expert. Jim Hamm reports that even expert

native Americans did not use stone arrowheads as often as we think. He says,

> "In the 1930's, in a cave in the Gila River area of New Mexico, a cache of several thousand reed arrows was found. Less than a dozen of the arrows had stone points, the rest were hardwood blunts."
>
> "A blunt can be created in two ways. The shaft, or foreshaft in the case of a reed arrow, can be sharpened so it will penetrate then hardened over coals. This is the way most of the arrows found in the cave were done. Another way is to leave a bulb of wood on the front of the arrow. The bulb, up to 3/4" diameter, can be flattened on the front or rounded. This method prevents the arrow from penetrating but instead delivers tremendous shocking power to small game. Both types of blunts were found throughout the country.
>
> "Before the advent of steel, virtually all big-game arrows were tipped with obsidian or flint. Man has kept himself fed on this continent for the last fifteen thousand years with flint spears, dart points, and later arrowheads, so they are clearly effective. In my experience, flint points are just as good as steel when it comes to penetration and sharpness. The drawback to flint is that it is brittle, if you miss a target or hit a bone the point is destroyed. They are also time-consuming to make. What with quarrying the stone, reducing it to blanks with a hammerstone, heat treating, the actual pressure flaking with a deer antler, and allowing for occasional breakage, there are at least a couple of hours represented in each point."[76]

The implications of these facts are amazing. If Noah and his family simply had the technology of making wooden spears and wooden arrows, they would leave very little trace of their existence in the geological record! Any wooden artifacts that they left would rot away, scattering their molecules throughout the biosphere. The oldest wooden object is a spear point found in Germany from sediments dated 424,000 years ago. If Noah's family or even his near descendants had had the ability to make stone tools, there would be evidence of their existence in the form of the stone points.

Immediately after the flood, 5.5 million years ago, Noah's descendants would have moved up the Nile and into the tropical region of Africa for two reasons. They would most likely not have been able to clothe themselves, so they needed to be in warmer climates; and game and readily available fruit was more plentiful there.

Re-development of Technology

Life as we have depicted it after the Flood was certainly a miserable one by today's standards. Without stone tools, bows and arrows, and other rudimentary technologies, man would not reproduce rapidly, nor would he be able to occupy a large area. His diet would be predominately vegetarian. This is not unusual for a hunter-gatherer society. The Modern hunter-gatherer's diet can consist of 60-80 percent vegetable material.[77] Without the proper tools, the meat portion of the diet could decrease even more. However, vital proteins could be obtained from insects.

Mankind lived in central West Africa leaving little trace of themselves for the next 3 million years. In societies like these, inventiveness is not a prized commodity. Failure in innovation brings such a high cost in death that everyone is encouraged to live in the traditional fashion. The old methods have worked and the new methods are not certain. Initially, natural objects like bones, sticks, stones, shells and antlers were used as tools. These objects decay away relatively rapidly, giving little chance for preservation and even if preserved, without modification they would not be recognized as having been a tool. Eventually, some genius discovered a way to shape certain stones. This is no simple innovation; it is the very basis of all subsequent technology. Most rocks do not form arrowheads or sharpened surfaces when struck. Coarse sandstone, shale, limestone, and the like are not good materials from which to form a cutter or point. Among the earliest stone tools are ones made from lava, quartz and quartzite.[78] Flint is the best material for making tools but it was not always available.

With the invention of tools, Homo erectus was essentially able to conquer the world. From initial occurrences in East Africa 1.7 million years ago (and probably 2.6 million years ago, if they were the maker of the original tools), H. erectus spread to Georgia just north of Turkey by 1.4 million years ago,[79] to Northern China and Europe by 500,000 years ago.

A recent re-dating of H. erectus fossils from Java may lend support to the view being advocated here.[11] The Java Homo erectus have yielded dates of 1.8 million years which is actually slightly earlier than the earliest African erectus. Since it presumably would take time for migration from Africa, the discovery implies that Homo

erectus must have evolved much earlier than previously thought. G. Philip Rightmire suggests that H. erectus's ancestor must have been evolving contemporaneously with various Australopithecines.[11] In other words, he would have been around long before he left fossils of himself. This is precisely what we are advocating here. Stone tools from Pakistan lend support to this thesis.[80]

Technologically, man improved his lot in life a quantum step by the invention of stone tools. He could now kill animals. He could now prepare skins for clothing. He could now make tents from those skins. He could now make bags to store food and stones in. But he could not conquer the colder climes until three developments occurred. To conquer the colder climates man required clothing, tents, food storage for winter famines, and fire. This had to have occurred as early as 1.6 million years ago because H. erectus lived in European Georgia where winter temperatures are quite cold.

YEAR	Event
B. C.	
6750	pigs domesticated at Jarmo Iraq
6000	cattle domesticated Argissa Nea Nikomedia
6000	smelting copper
6000	peppers, avocado amaranths grown in America
5400	first canoe paddle
5000	Egyptians use balances for weighing
5000	Egyptians begin irrigation
5000	smelting copper
5000	earliest ziggurat at Eridu
4400	earliest dugout canoe
4000	cattle domesticated
4000	potter's wheel
4000	megalithic monuments in Brittany
3500	bread making originates in Egypt
3500	corn domesticated in America
3126	Menes unites Upper and Lower Egypt
3000	bronze manufacture
3000	cuneiform writing in Sumer
2770	earliest historically recorded astronomical event
2700	horse domesticated in Ukraine
2300	bits and bridles
2000	oldest chariot
1953, May 5	Chinese calendar starting point.

Table 17 Significant Technological Advances

The pace of technological change in the Lower Paleozoic was so slow that a new discovery could diffuse throughout the inhabited extent of the world before another invention occurred. This made for a nearly uniform global culture. Later a faster pace of discovery, which outran diffusion, destroyed the global material culture. Only in this century with extremely fast diffusion is a global material culture developing again. Jacquetta Hawkes writes,

> "Until now change had been so immensely slow that traditions could spread over half the globe, providing a universal culture to which we are only beginning to return today. Thus the most characteristic Lower Palaeolithic tool, known as a hand-axe, was made in identical forms in England, Kenya, South Africa and India."[81]

Richard Klein notes further,

> "Before the beginning of the later Pleistocene some 40,000 years ago, vast areas were characterized by remarkably uniform artifact assemblages that differed from one another mainly in the proportions they included of the different kinds of tools common to them all. Furthermore, the artifacts did not change much over the course of time; basic assemblage types lasted tens or even hundreds of thousands of years. During the later Pleistocene, however, the pattern changed."[82]

This pattern of global cultural stasis will become important later when we discuss the possible modes of transmission of the ancient legends.

As the Upper Paleolithic period (less than 40,000 years ago) approached, the rate of discovery and innovation increased. This allowed man to spread even farther than he had. The first crude grain milling equipment was found in sediments dated at 130,000 years.[83] While this is not evidence of farming, it is evidence that man was becoming dependent upon grain as a major source of his food.[84] By 60,000 years ago, the first men had migrated to Australia. This required boats and navigational skills. Man was possibly crossing the Atlantic 20,000 years ago.[85] By 30,000 years ago, men were painting pictures in European caves, and getting ready to cross the Bering Strait into North America.[86]

Technology kept advancing. The first evidence of clothing is among the Neanderthals at Hortus, France where apparently the remains of a cape were found. The site dated at 50,000 years ago.[87] The oldest buttons were from Russia. The pattern of soil discoloration, and a string of beads encircling the body and parallel to it, indicate that they were either sewn on as decorations or as fasteners. Bone needles to sew those clothes were first found in

many sites dating from 16-17,000 B. C. Without warm clothing, man was not going to be able to occupy the cold, far north. This technological advance allowed man to spread even farther.

But even at this late date, mankind was still a hunter-gatherer. Mankind probably had the bow and arrow, although the oldest one known is from 8,500 B. C. [88] They may not have had any fishing tackle since the earliest fish hooks are made of bone and come from strata dated at 12,000 B. C.[88] This way of life severely limits the population, since 15 square miles are needed to support a family. It also severely limits the leisure time a person has for reflection and invention. The constant need to be hunting suppresses the time available for experimentation. However, by 20,000 years ago mankind had enough inventions at his disposal for an explosion of inventiveness to sweep over the world - an explosion that we are still experiencing today.

As Kenneth Oakley pointed out, man's progress proceeded in step with his improving ability to cut objects to the desired shape.[89] Between 10,000 and 11,000 years ago, two cutting innovations significantly altered life on this planet. The first was the invention of the flint sickle. This simple device was used to harvest grain. Apparently it was used first with wild grains. But shortly after, man began to plant the grain purposefully. This led to the agricultural revolution several millennia later. The second invention was the use of native copper to make cutting devices.[90] Originally, copper was not used for just any tool but was restricted to weapons then the use of metals began to proliferate. At the very beginning of our technological advancement, brand new technologies were utilized first for their weapons potential. In 12,000 years, nothing has changed.

At the same time, 10,000 B. C., the beginning agricultural revolution had given mankind enough surplus food to make possible the founding of the first known city, Mureybet, Syria.[91] It was here, starting in 8,000 B. C., that we find the first evidence of wheat and barley being grown at Jericho and Abu Hureyra.[92] Eventually the town would build a wall around itself with strong, stone towers set in the wall at intervals.[93] This tradition of building walls continued until the invention of gunpowder made the wall a useless defense.

By 9,000 B. C., sheep were domesticated in the middle east.[94] At the same time, in the New World, some unidentified Native American placed a basket in a Utah cave. This basket would be found millennia later and it is the oldest surviving basket.[95] Between 7,000 and 8,000 BC, dogs were domesticated in England,[96] pottery was invented,[93] cloth was first woven,[97] and agriculture began in both Middle America and China.[94]

Table 17 lists many other significant technological advances in the order that they occurred. The important thing to realize is that each advance depended on previous technical developments. Without stone tool technology, the flint sickle could not have been made. Without the ability to harvest lots of grain, there would have been no need for a plow and there would have been no empires. Calendars were only needed and invented after irrigation began and there was a need to know when the river would flood and when it wouldn't. Writing was not invented until there was a need to keep track of all the grain that was being grown. But writing was not a prerequisite for an agriculturally based empire (The Incas never invented it). The chariot was invented only after the horse was domesticated.

For young-earth creationists to suggest that civilization could rapidly recover from the devastation of the flood totally underestimates the magnitude of the task. Each invention required previous inventions. Someone had to figure out how to make a bow and arrow. Then someone needed to figure out how to make stone implements. This would take time - lots of it.

The Tower of Babel

The Tower of Babel is the last major event we will discuss in this book. The account of this event is placed in a curious location. It is after the genealogy in chapter 10. This would seem to imply that it occurred later in the history of mankind. As we mentioned in the first chapter, many young-earth creationists believe that this occurred less than 1,000 years after the flood. Our examination of the technology revealed how erroneous that view is. But when did this event occur? We will examine a novel possibility.

Throughout the Bible, God first chose a nation to be the one to bring the Messiah into the world. Then He chose a tribe, followed by a family, followed by the selection of a single female. This winnowing may have also taken a slightly different form in prehistory. It may be that God chose our ancestors, those we call Homo sapiens, to be the bringer of the Messiah.

Although a few skulls with tendencies towards Homo sapiens had been found in strata dating as far back as 500,000 years, no provably modern human remains have been found in that time. The oldest modern humans are found in three fairly widely separated places: Qafzeh cave, Israel; Omo-Kibish, Ethiopia; and Klasies River mouth caves in South Africa.[98] Starting from these three places around 100,000 years ago, modern man apparently conquered the world by replacement with some limited intermingling with local populations. With just enough

interbreeding with the erectus, who as we noted was human, the genealogies in Genesis 10 would still be true. But predominantly the process was one of replacement. Diane M. Waddle reports,

> "The persistence of specific morphological features within regions over the past million years supports regional continuity whereas, the identification of anatomically modern fossil specimens from Africa and the Levant 50-60,000 years before they are found elsewhere, provides support for a single origin. I give here the first quantitative test of fossil evidence for each of these models. Results support a single African and/or Levantine origin for modern man."[99]

Modern man evolved from Homo erectus around 100,000 years ago. Nevertheless, he is still a child of Adam. This change in form or race from H. erectus would not make us different from Adam any more than being European, African or Asian does. Homo sapiens is theologically merely a new race from H. erectus which totally replaced him. Babel would have had to occur before H. sapiens spread across the land. Just after 90,000 years ago H. sapiens was found from South Africa to the Middle East. There is no requirement that the tower actually be extremely high only that it is made of mud bricks.

If mankind lived in small bands in west central Africa for three million years, one fact would be certain. Everyone would be related to each other and to each of Noah's sons and their wives. Genetically there could not be a clear distinction between the descendants of Ham or Shem or Japheth. To ensure that this will happen requires only that children not marry their siblings. Figure 31 shows the results of all possible intermarriages. In Shem's generation, half of all the parents in the genealogy are Noah and his wife (N-W). The other half of the parents are the parents of Shem, Ham and Japheth's in-laws. In the next generation (child), half of all the grandparent positions are taken up by Noah and his wife with the rest of the grandparents being the in-laws (A-B,C-D,E-F). As we now move into the generation which had to choose mates from among the tribe (Grandchild), if they always chose a cousin, then this generation would be descended from two of the patriarchs, either Shem-Ham, Shem-Japheth or Ham-Japheth. With the great-grandchildren (GGchild) most cousin marriages will produce children who can trace their ancestry to all of the patriarchs. Thus, within three generations we have all people being descended from all patriarchs. I am as much a descendent of Ham and Shem as of Japheth. Mathematically this conclusion is inescapable unless you believe that God only allowed sibling marriages, something that He forbade in Leviticus 18:9-11.

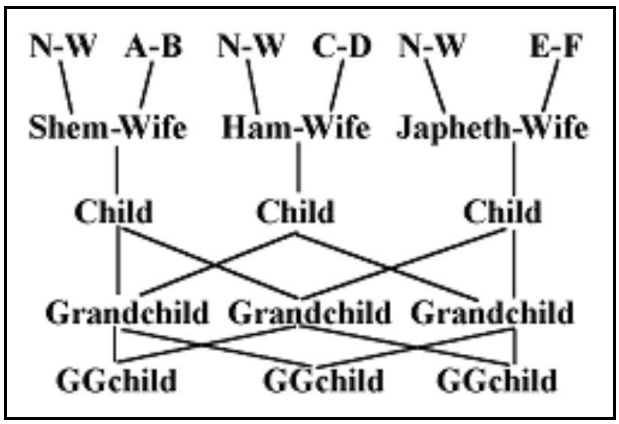

Figure 31 Genealogical Relationships of Noah's Descendants.

Does this mean that the Table of Nations in Genesis 10 has no relevance to reality? Genetically it has no relevance whatsoever. All of mankind is clearly of one family and one flesh. The racial differences so obvious today must have arisen many, many generations after the flood, when the population was much larger. But culturally, we were not and still are not of one family. One can surmise that, like many societies, inheritance followed the male line and thus those "descended" from Japheth were those whose male lines were linked to him. Those "descended" from Shem and Ham respectively would be those whose male lines led back to them. The culture in each of these lines would have gradually diverged to eventually produce the radically different societies we see today. Thus what the Table of Nations must be referring to are the cultural descendants.

What this view inexorably leads to is the view that early man was related to one of three groups. Millions of years later, in Africa once again, three tribes who intermarried regularly, began to harbor a new mutation. To them it might have been a less than welcome mutation, but the people afflicted with the mutation had larger brains, and were what we call Homo sapiens. This mutation became the dominant physical feature of these three tribes, one culturally descended from Shem, one from Ham and one from Japheth.

It was these three groups speaking the same language that participated in the incident at the Tower of Babel. Due to the necessity of the Tower of Babel occurring before modern man became widespread, it must have occurred somewhere around 100,000 years ago. This event being only in the past 100,000 years allows for an understanding of why at least some of the names associated with the three sons of Noah were carried down to the

present time. One of the Greek gods was named Iapetus, the Hebrews remembered Japheth, and the ancient Indians are reported to have had a Sanskrit title which transliterates as "Djapatischta" and means "Chief of the Tribe".[100] This last word would appear to be a corruption of Japheth.

This view also has the ability to explain the major histocompatibility complex (MHC) mentioned in chapter 4. If you remember, the number of alleles for a given trait is far too great for there to have been only 8 people on earth 6,000 years ago. Klein, Takahata and Ayala report,

> "The MHC data imply that the early hominid line split, at some stage, into at least two populations - one of which led to modern H. sapiens. The population that evolved into H. sapiens consisted of at least 500 but more likely 10,000 breeding individuals, who carried most of the MHC alleles and allelic lineages now found in the human population. Although this large ancestral population may have divided into smaller groups, these groups communicated with one another, exchanging genes continuously, thus guarding the great treasure trove of MHC polymorphism from loss by random fluctuation in gene frequencies."[101]

The hypothesis presented here is both consistent with the Biblical information and the genetic, paleontologic and historical data. Christians should seriously consider this possibility.

Modern man was much more inventive and creative than his predecessors. For having ruled the world for two million years, Homo erectus had produced little to show for their effort. A newly evolved group displaying creativeness unlike their contemporaries would finally be able to fulfill God's command to fill the earth and subdue it. If modern man were destined by God to finally fulfill the command, their refusal to spread over the world would be viewed as nothing short of rebellion. Just as the preflood world refused to spread around the world, so did the first modern humans. The refusal in the preflood peoples to spread had nearly wiped out humanity. A similar catastrophe could possibly wipe out the early, localized, modern humans. For this reason as well God wanted them to spread.

It is clear from the Biblical record that God recognized the intelligence of this new, mutant form. Genesis 11:6 clearly states,

> "The LORD said, "If as one people speaking the same language they have begun to do this, then nothing they plan to do will be impossible for them." (NIV)

This implies that mankind can do what ever they want to do. To accomplish His purpose and delay their ability to do whatever they wanted, God confused the language.

Babel probably occurred somewhere between South Africa and the Middle East. This is proposed for two reasons. First, this was the location of the earliest modern men. Secondly, the traditional association of Babel with Babylon is probably due to a phonetic similarity and nothing more. In Hebrew Babel means confusion.[102] In the Assyrian language, the term "Bab-Il" means "The Gate of God."[103] The confusion is really not surprising since it would be highly unlikely for the Babylonians to refer to themselves as confused. The phonetic mix-up may indeed have led the ancient Hebrews to believe that Babel was Babylon, but that too would not be surprising.

There is evidence that mankind formerly spoke one language. Merrit Ruhlen documents the evidence of a former single language throughout the world. He shows that the word for 'water', 'finger', ?two?, 'uncle/brother' etc are phonetically similar in almost all language families around the world.[104] Placing a time on when this single language was spoken is impossible but it existed more than 10,000 years ago.

Objections

The most obvious objection to the views expressed in this chapter will be the question of transmission of the information from Noah to Moses. Whitcomb and Morris state,

> "Now the problem, simply stated, is this: How could certain details of the story of the great Flood have been more or less accurately handed down from one primitive stone-age culture to another, purely by oral tradition, for nearly 100,000 years, to be finally incorporated into the Gilgamesh Epic? That such could have happened for four or five thousand years is conceivable. That it could have happened over a period of nearly 100,000 years is quite inconceivable. The Gilgamesh Epic alone,

rightly considered, administers a fatal blow to the concept of a 100,000 B. C. Flood."[105]

Obviously, no definitive answer can be given to the question concerning whether or not oral tradition could transmit the information of the flood, of the creation and of Babel for millions of years. We have no documented written record of transmission earlier than 5,000 years ago. The longest oral transmission that it is even possible to prove would be no longer than this. Reasonable extrapolations allow for possible transmission of around 15,000 years, but no proof. The easiest solution to the problem is that God revealed the data to Moses. No oral transmission would be necessary. But for those who will not find that answer satisfactory we will advance a few possibilities.

There are Australian aboriginal oral traditions concerning an island that was once attached to the mainland. The sea level was much lower than its present level over 10,000 years ago.[106] There are also reports of Eskimos in Greenland describing an animal with hair, four legs and a tail at each end (i.e., a true tail and trunk).[107] I have been unable to find any mention of mammoths having lived in Greenland but, considering the mobility of the Eskimos, the tradition may not have come from a time when that group lived in Greenland. Mammoths are not found in North America after 9500 B.C.[108]

In Australia, Europeans found tribes worshipping the Rainbow Serpent. Some of the paintings of the Rainbow Serpent have been dated to 9000 years ago. Australians had no writing so their religion and religious traditions have definitely been handed down orally for that long.

Another example of a long-term oral tradition concerns the bear cults of the circum-polar regions. Modern circum-polar peoples worship the bear. Yearly they would sacrifice a bear after having raised it from a cub. On the day of his death, they would taunt the bear, and then with sticks beat him. Finally they would kill him and take the skull to a sacred place and leave it in a pile. Ten thousand years ago, at Mas d'Azil, a plaque was found with a drawing of what appears to be an identical bear ceremony.[109] Eighteen thousand years ago, at Trois Frere, a bear is drawn on the wall showing him wounded and bleeding from the snout. He appears to be being stoned. This is similar to the way that the Ainu dispatch their bears.[110] And 47,000 years ago, Neanderthals sacrificed a bear deep in the cave of Bruniquel. They build a rectangular pit to burn the bear.[111] At Regourdou, France, 80,000 years ago, another sacrificial bear was found. Shreeve writes,

> "Ten years earlier, another French archaeologist discovered at the 80,000-year-old site of Regourdou what seemed to have been the scene of a bear cult. The carefully arranged bones of a brown bear had been placed in a stone-lined pit, along with the skeleton of a young adult Neandertal.[112]

This shows that the worship of the bear was passed down for 80,000 years.

Recently, I found a Celtic religious symbol carved into the passage grave at Larmor-Barden, Morbihan, France, dating to around 4000 years ago.[113] This same symbol appears on the 54,000 year old Quneitra plaque from Israel.[114]

While these cases are interesting, they do not constitute proof that oral information can be transmitted for millions of years. There is only one data point that indicates that the same information can be passed on, father to son, over such periods and that is from the construction of the Paleolithic handaxe.

For over a million year's duration the Acheulean handaxe was the standard cutting tool of the Paleolithic world. The information on how to construct this tool had to be passed on from father to son for this length of time. To pass on the cultural information in so static a society would not be any more difficult. Johanson and Shreeve wrote,

> "Whatever they were used for, clearly the hand axes and other Acheulean tools were doing it efficiently. Compared to the longevity of the hand ax, the invention of the automobile-or for that matter the wheel itself-strikes me as a sort of cultural whimsy, a fleeting bit of gadgetry. Thousands of generations separated me from the individual who had knocked this flake of rock off a boulder and fashioned its shape. But I, a user of garage-door openers, power saws, and electric blenders, could instantly recognize it as a tool, potent with human purpose. Gently, idly, I tapped the blunted point against my palm. For a moment a few thousand generations didn't seem like much time at all. I could count them off in less than an hour with gentle taps of the tool in the palm of my hand--parent to child, parent to child. There was something very reassuring, almost liberating about that thought. I smiled to myself and put the hand ax back on the ledge where I had

found it."[115]

The transmission of technological information from father to son over such a long time is probably the best example (possibly the only example) of information being transmitted over such a long time. It speaks highly of the accuracy of transmission as well as to the incredible lack of inventiveness on the part of the Homo erectus. Remember that inventiveness is not associated with the image of God. Tasmanians of the last century were not inventive yet they were fully human. One could object that the shape of the hand ax was limited by functional constraints, and thus this does not represent a valid case of information transmission. This is not true. In the later Paleolithic, objects functionally superior with numerous different shapes from the hand ax were manufactured by various groups around the world. The information necessary to form just the particular Acheulean form had to have been transmitted by word and example. But if technological information can be transmitted for such a time, there is no limit on the cultural myths being transmitted either.

Another objection Whitcomb and Morris raise is that the genealogy in Genesis 11 disallows the extension of the prehistoric chronology that we have proposed here. Their contention is that the decrease in life span is relatively gentle prior to Peleg and gentle after Peleg but that there is a sudden drop in the life span at Peleg. This is proof, they say, that there are no gaps in the genealogy except here.[116] Mathematically, they are wrong. First, their analysis assume that the decrease in life span was linear, e.g., a straight line. The decrease in life span may not have been linear. The Bible certainly does not state that there was a linear decrease in life span. Secondly, even if the decrease was linear, the sudden drop in life span at Peleg does not prove that it was the only gap; it would only prove that it was the largest gap. There could be four thousand generations skipped between Peleg and his father and only one thousand between each of the other patriarchs. Such a pattern of gaps would also produce the pattern of ages seen in Genesis 11. Thus Whitcomb and Morris' suggestion that the pattern of ages rules out a long extension of the chronology is simply unproven.

Hugh Ross believes that the genealogies can not be extended beyond 60,000 years.[117] He merely states this position as a self-imposed assumption. He never actually presents evidence from the Scripture for why the genealogies are thus limited. He never cites a single article from theological journals for someone who made this limitation. Thus his suggestion remains mere assertion.

Conclusion

The above theory is consistent with the scientific data. The above theory is not contradicted by known theological limitations. Information can be transmitted over millions of years. The data clearly shows that mankind has been on earth for millions of years. Christianity must come to grips with that data.

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THE TALE'S END

We now come to the end of the story of life's origin and the harmonization with the Bible. Throughout this book we have defended the five most important Biblical doctrines: the historical six-days of creation, a historical Adam and Eve, a historical Fall, a historical Flood that destroyed all humanity, and a historical Tower of Babel. Throughout this effort we have incorporated the scientific data and have shown that with certain reasonable interpretations of the Bible there is no conflict. This is certainly not to say that this view is absolutely true. Even if it is judged that the harmonization is successful, that is no guarantee that this is what actually happened. Any investigator dealing with the past must face this limitation upon human knowledge.

The views presented above should be given serious consideration if only because there is a chance to bring Biblical interpretation and science together. The effort should be judged on whether or not it achieves that objective and not upon whether or not the views are different from traditional Biblical interpretations. Similarly, even though the post-flood interpretation of the anthropological data differs from the standard view, the effort should be judged solely upon whether the interpretation presented here is viable. It should not be rejected because it is different.

The views contained here make certain predictions about what sort of fossils might be found at the base of the Pliocene strata in the Mediterranean basin. While it will be difficult to ever confirm the view, in principle, it is verifiable and falsifiable. Supporting evidence might come from West Africa if Homo habilis were to be found there in strata that dated older. Do I expect modern anthropology to go searching there? No. But perhaps some accidental discovery will draw attention to that area.

Since the first edition of this book, one significant discovery has been made which does fit only into this view of how to harmonize science and Scripture. A possible Homo habilis was discovered at Longgupo, China dated at nearly 2 million years old.[1] If true, the wide dispersion of the earliest creature showing evidence of having a language, means that he was around much earlier than 2 million years. This view would predict that a member of our genus, Homo, will eventually be found further back in time toward the 5.5 million year mark.

It is certain that many Christians will not find these musings convincing. The prejudice against evolution among conservative Christians runs so deep that I fear most do not even know why the conflict arose in the first place. During recent conversation I had with a friend, I asked why Christianity was contrary to evolution? My friend was unable to come up with one reason. Another Christian friend just could not see any rationale for God creating the world via evolution. Statements like these make me certain that some will reject the view without really giving it serious consideration. Indeed, after several years of discussing these issues on the Internet, it is obvious that conservative Christians, in general, have no interest in what science says about their Biblical interpretations.

Since this is the 3rd edition of this book it is clear that prominent young-earth creationists are appalled by my change of position. Instead of trying to understand why a new view is needed, prominent young-earth creationists would rather call names than deal with the issues. Woodmorappe calls this author a 'compromising evangelical' but doesn't really deal with the problems I have raised. Henry Morris writes,

> "If such equivocations continue, the Flood itself will eventually be used only to account for the marine strata of the Cambrian and Ordovician 'periods.' Sooner or later difficulties will be found even in these, and the Flood will once again (as so often in the past) be explained away as only a tranquil flood or a local flood. Some (e.g. Davis Young, Glen Morton) have already gone this whole route, starting out not too many years ago as full-fledged Flood geologists but then allowing supposed geological difficulties gradually to relegate the Flood to only a trivial part , if any, of the geologic column."[2]

Russell Humphreys has called this author an apostate[3] and Carl Froede said this author's father was Satan.[4] This is the reaction given to anyone who criticizes young-earth creationism.

Throughout this book we have gone to great pains to show why a new harmonization between Scripture and science is needed. We have seen accounts of many people who lost their faith because they could not find resolution to these issues. We have seen one man, Hugh Miller, who committed suicide after struggling with these issues. We can not afford another generation of people leaving the faith.

Christians rejecting the views presented here should consider the following. During World War II, as D-day approached, the Allied generals were trying to decide which troops would be the first to go ashore at Normandy. Some argued that the most experienced troops should be the first to land. They argued that they would know what to expect and how to deal with the Germans. Besides to throw young inexperienced troops at the Germans would

lead to unacceptable loss of life. Eisenhower overruled them and ordered raw recruits to land first and face the withering fire. He reasoned that veteran soldiers were too cautious to be able to accomplish the task of taking the beaches. Only those who had never experienced war would be brash enough to climb the cliffs of Normandy. As a result of this decision a high proportion of those who landed on the beaches first were slain.

While such a decision may be necessary in war, it is unethical for Christians to do this with our young and inexperienced children. To teach them a theology that is wrong about science and wrong about what the Scripture says, and then send them out to face the withering fire of our critics with guns that only fire blanks seems not only futile but destructive of their spiritual lives. At least the young soldiers approaching the Normandy beaches knew that they were going into a dangerous situation. Conservative Christians are telling their children that there are no intellectual dangers, that the theological interpretation is sound and that the evolutionist is barely hanging on to his views against a fusillade of scientific evidence blowing against him. The beaches are empty and inviting.. Our children who go into science quickly discover that the scientific bullets fly against their theological interpretations. Can anyone truly say that this is an ethical and wise way to improve our children's spiritual lives?

One reaction to the book is quite predictable. Those who are prominent in the young-earth creationist movement will be quite appalled. Judging by the reaction to Davis Young's book, Creation and the Flood, it is certain that any criticism of the Whitcomb and Morris' book, The Genesis Flood, will receive a reception like the one that Morris wrote in 1978,

> "The only creationist book to which Young refers in any significant degree (and which he attacks vigorously) is The Genesis Flood. He has practically ignored the numerous more recent books of this writer, as well as those of other creationists, not to mention the many relevant articles in the Creation Research Society Quarterly."[5]

Should this criticism be made of this book, I would suggest that if The Genesis Flood, is so out of date, as the above quote implies, then maybe it is time for it to be removed or revised. To continue to sell a book that is out of date and then use that fact as a defense from criticism of the book seems duplicitous. But then in 1984, Morris vigorously defended the accuracy of his old book by saying,

> "The book The Genesis Flood can be referred to for much more extensive treatment of many of the topics surveyed in these four chapters. Many scholars believe it was this book that catalyzed the modern revival of creationism. Even though it was published in 1961 and is in need of updating, its basic position and data are sound, with little need of correction. The case for creationism and Flood geology is broader and stronger than it was in 1961, but there is very little change required otherwise."[6]

Secondly, a review of the references show that I have referenced many more recent books of Morris and other creationists as well as several articles out of the CRSQ and the Impact Series. Finally, when the more recent books say nothing new in a scientific sense, then it seems quite reasonable to criticize the first, most comprehensive book, the one Morris so eagerly defended in 1984.

Finally, my truest hope with this work is that the contentious issue of creation vs. evolution can cease to be a stumbling block both to those within and without the faith. Those Christians who do not approve of the views expressed in this book should be sure that their objections are based either on a sound exegetical basis or a sound scientific basis. Our prejudice against evolution should not be the sole basis for rejection. By failing to provide a successful harmonization, Christians are falling into the hands of atheists who use the lack of harmonization between the Bible and science as proof that Christianity can't be true. By tying the infallible word of God to the false science young-earth creationists advocate, they are making God's word as fallible as their ideas.

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