

THE EARTH

Origins And Early History

Dr. Clyde L. Webster, Jr.

Developed by
The Office of Education
North American Division
General Conference of Seventh-day Adventists

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INTRODUCTION

In 1983 the North American Division Office of Education in cooperation with Geoscience Research Institute initiated the development of a resource for the academy biology class on topics related to creation and evolution. A steering/writing committee was appointed composed of two members of the Geoscience Research Institute, six biology teachers from the North Pacific and Pacific union conferences, and one associate each from the North Pacific and Pacific union offices of education.

The initial draft of the supplement was completed by the committee in the fall of 1985. That draft of the student text with an evaluation form was submitted to 27 academy biology teachers throughout the North American Division. Fifteen evaluation forms were returned. In January 1986 Clyde L. Webster, Jr., of the GRI staff, was appointed as writer to revise the text based on the results of the questionnaire and the recommendations of the Geoscience Research Institute staff. Three chapters of the manuscript with the basic outline of the other chapters were presented for review by those attending the Geoscience Field Conference held at Brian Head, Utah, July 14-23, 1987. The final draft was completed in May 1988, having been reviewed and accepted by the Geoscience Research Institute staff.

This book is prepared primarily as a supplement for the academy biology course. It provides material that supports belief in the scriptural record of the origin of life and events in early earth history. It will assist the students in their quest to gain an understanding of and basis for the belief that all things were created and are the purposive act of an all-powerful, but loving God who is the Master Designer, Creator, and Sustainer of the vast universe.

The material has been written for the high school student in a style that encourages ease of reading and facilitates comprehension. It is not intended to be an exhaustive reference to support belief in special creation, but a handbook or ready resource as the student examines and evaluates the arguments for and against evolution and for and against creation. The student is reminded that our God is a real and personal God who has given each person a mind with which to weigh evidence whether scriptural, scientific, or experiential, and that He has promised His Holy Spirit to direct each one into truth—but each one must make the choice.

A teacher resource manual has been prepared to accompany the student text. It includes supplementary material, objectives, suggested laboratory activities and projects, and source material for the teacher.

THE NATURE OF SCIENCE

VOCABULARY

assumption, divine intervention, hypothesis, model, scientific method, theory

The success of science, especially since 1900, can be demonstrated simply by looking at the everyday things we take for granted. The food we eat, the clothes we wear, the television we watch, and the calculator we use to do our homework—all of these marvels attest to the brilliant success of science.

With success comes confidence, confidence that whatever science sets out to do, **it can**, and confidence that whatever science says **is true**. For the most part everything that science sets out to do, given enough time and money, can be done. However, **caution** should be exercised in order to keep science in proper perspective by taking note of its strengths and limitations.

The history and development of science is intriguing and informative. For example: The Egyptians successfully measured the radius of the earth in 250 B.C. Another fact: In 1541 Copernicus estimated the length of the year to be 365 days 6 hours 9 minutes and 40 seconds. This value is only 30 seconds greater than today's accepted value! How can this be?

The road to success in any scientific endeavor is the same. First systematic observation, followed by analysis of the collected data for trends, and then using the observed trends to predict future events. More formally, the scientific method is defined by the following steps:

1. Define the problem. (i.e., ask the question).
2. Collect information on the problem.
3. Form a **hypothesis** (a hypothesis is a trial answer or working explanation).
4. Experiment to test the hypothesis.
5. Observe and record data from the experiment.
6. Draw conclusions.
7. If the hypothesis continues to be supported by experimentation, propose a theory.
8. Use the theory to predict new facts.

The strength of science exists in its ability to make observations of the physical world and predict future events. Herein also lies one of the greatest limitations of science. If the observations are limited only to incomplete evidence of past events **and** it is impossible to conduct appropriate experimentation in order to test the hypothesis, the strength of the scientific method has been neutralized and one is left with little more than speculation.

When these limitations of observation and experimentation exist, the scientist is compelled to make simplifying assumptions and develop a model based upon approximately similar processes that **can** be studied. By creating a model based upon the

assumptions necessary to study the past events the scientist hopes to move away from speculation and closer to reality.

Assumptions are not wild guesses. We make assumptions every day of our lives. Assumptions are based upon our personal experiences and philosophies. For example: We assume the light will come on when we flip the switch. If it doesn't, we assume the bulb is burned out. If the bulb is good, we assume the lamp is unplugged, and so on. When confronted with a new situation or problem we will look for something familiar from which to begin our inquiry.

In moving from the known and testable to the unknown and untestable we automatically turn to natural observable process for insight. Very seldom, if ever, do we automatically turn to the supernatural or divine for answers. To do so for every unanswered question would by definition be unscientific and could lead to a return to the Dark Ages if carried to excess. This does not, however, exclude divine processes from occurring, nor does it render unscientific research which carefully includes divine intervention! Whether one chooses to include or exclude divine intervention depends almost entirely upon one's personal philosophy and convictions.

The conclusions drawn from research, especially in the untestable areas, are heavily influenced by the assumptions used to conduct the studies. Logically, it is reasonable to maintain that the conclusions drawn and the theories proposed from such research are also influenced by one's personal philosophies and convictions.

A great potential for misunderstanding exists when scientist, and laymen of differing philosophies and convictions fail to recognize that these hypotheses and theories are based upon assumptions and simplified models, and do not accurately represent reality. These reflections may include a bias derived from the personal viewpoints of the investigator.

In your conquest for knowledge and truth, do not force all answers to come from a single source. Where multiple sources exist, examine the differences and then strive to find the harmony between them. Truth has many faces, comes from many places, and will withstand the tests of time.

PICTURE CAPTIONS (pictures omitted from this online copy)

The Egyptians successfully measured the radius of the earth in 250 B.C.

We assume the light will come on when we flip the switch.

These hypotheses and theories are based upon assumptions and simplified models, and are only reflections of reality.

CHAPTER 2

BEGINNINGS

VOCABULARY

chemically rich, fixity of species, fossils, geologic column, macro evolutionists, mermen, mutation, natural selection, naturalistic evolution, niche, organic matter, primordial, progressive creation, radiometric dating, special creation, spontaneous generation, survival of the fittest

Stories that begin with “**In the beginning...**” hold more intrigue, suspense, and high drama than those that begin with “Once upon a time...” Regardless of one’s position in life, the fascination of **beginnings** is ever present and often carries with it high emotional charge.

One of the most intriguing and emotionally charged beginnings is the **beginning of life**. With the questions of how and where life began come concerns as to how, why, and where life will end. Often one’s choice of belief concerning beginnings can influence one’s perspective on endings.

In general, the theories pertaining to the beginning of life can be categorized under one of two major headings: natural or supernatural. The theories are then further catalogued according to their relative methods of development.

When an individual strives to use only the laws and processes currently known to govern the universe and this world in particular, without calling upon some known or unknown higher power or source, the only theory that appears workable is the theory of naturalistic evolution. There are many versions of evolution, but they generally subscribe to the following:

1. Initial life originated from nonliving materials. This initial event took place sometime in the far-distant past, usually in a chemically rich pond or ocean.
2. All present life forms have descended from one single source of life.
3. Life is seen as undergoing continual changes in physical form and function because of external forces and random genetic mutations.
4. Life is a continual struggle, weeding out the weak and ill-adapted individuals.
5. Every possible source for food and living area is exploited.
6. As life evolves from one form to another, new organs are developed that allow the organism to compete more successfully in its present niche or enter a new niche.
7. The time required for the evolutionary processes to develop to today’s present status is on the order of 3.5 billion (3,500,000,000) years.

Many believe evolution to be the product of scientific thought over the past two centuries. However, much of evolutionary thought is readily traceable to the ancient Greek philosophers and writers. For example, Anaximander (c. 611-547 B.C.) imagined modern man as being derived from fishlike mermen. He perceived that these creatures

eventually emerged from the water and adapted to dry land.¹ Empedocles (c. 490-430 B.C.) not only believed in spontaneous generation of life forms but also suggested that the processes of “natural selection” (i.e., the survival of the fittest) were in operation throughout all of nature.² And Aristotle (c. 384-322 B.C.) suggested that nature operated and continued to exist through its own set of laws, and that these laws of operation were independent of supernatural forces.³ This release of nature from the capricious control of higher powers was all that was needed for the roots of modern science to develop. It was also Aristotle who proposed the concept of fixity of species. This concept, incorporated into Christian thought by Augustine (c. A.D. 354-430), would later become a major factor in discrediting the Genesis account of the origin of life.

Significant differences exist between the Greek and Roman theories and those proposed by Darwin and other modern evolutionists. Whereas Darwin and others attempt to explain the origin of life in terms of natural processes and long periods of time, the ancients accepted some form of primitive creation of an unlimited number of body parts, with the formation of new species resulting from various parts coming together either randomly or at the whims of gods. Whereas Darwin and others attempt to show a progression of life from one form to another, the ancients assumed that, once formed, a species remained basically unchanged throughout time. Whereas Darwin and others see “natural selection” as being a driving force for change, the ancients saw “natural selection” as only a means of preserving the species. In spite of these and other differences, the basic concepts of evolution have existed within the higher levels of thought and reason for a long time.

Opposite the theory of naturalistic evolution is the theory of special creation. Special creation generally uses the Bible for its basic concepts. The differing theories of special creation are derived from the various interpretations of the Bible. However, nonbiblical theories of creation do exist.

Biblical creationism normally subscribes to the following:

1. God spoke into existence the physical matter of the universe and called into existence the ancestors of today’s living creatures.
2. God’s creative works were manifested during the limited time span of six 24-hour days. Some include the creation of the entire universe during this time span, while others include only the creation of the living organic matter (biosphere) of the earth.
3. While living forms do change, such change is limited and not progressive.
4. With the spiritual fall of man, new forces begin to operate in nature. These forces caused decay and a drifting away from the original perfect creation of God. These forces are still active today.
5. The surface of the earth was dramatically altered through a global catastrophe known as the Genesis flood. Many species of plants and animals were forever destroyed from the face of the earth at that time.

¹ Giorgio De. Santillana, *The Origins of Scientific Thought: From Anaximander to Proclus, 600B.C.-A.D.500* (New York: New American Library, 1970).

² Ibid.

³ Ibid.

6. Today's world is only a distorted reflection of the original creation. Because of this distortion and decay the records of the past may not be totally reliable or readily interpreted.
7. Only through the insight of supernatural revelation can the true record of the earth's past history be understood.
8. God's infinite power continues to sustain and control the universe.

Many groups greatly modify or completely reject points 2, 5, 6, and 7. Rejection or modification of these points will be dependent upon the investigator's interpretation of the Bible.

A conservative Christian model would start "**In the beginning God...**" God's infinite power would be the source of all matter and life. Through His power, He chose to create the universe, the earth, and all its inhabitants within six literal 24-hour days. At a later time He chose to destroy the surface of the earth and its inhabitants with a global flood. All of these phenomena are assumed to have occurred within the past few thousand years.

A more moderate yet still conservative Christian model would divide God's creative accomplishments into two separate events. First was the creation of the primordial nonliving matter of the earth and its solar system approximately 4.5 billion years ago. Sometime later after this primordial creation, God then chose to create all of the living systems within six literal 24-hour days. He also destroyed the surface of the earth and its inhabitants with a global flood (these last two events occurring within the past few thousand years). Unfortunately, Greek philosophy and modern science tend to disagree with such interpretations of Scripture. The time question will be discussed in a later chapter.

Both the macro evolutionists and the special creationists could be classified as literalists. In other words, these groups adhere to the literal interpretations of science or Scripture. A second group that exists could be classified as reconciliationists. In other words, members of this group attempt to reconcile (bring together peaceably) the interpretations of science with those of Scripture. While the possibilities for variation within this group are very large, attempts at reconciliation fall into two categories. Either science is held as the dominant interpretation or Scripture is held as the dominant interpretation. Two of the most popular theories within the first category are theistic evolution and progressive creation.⁴

Theistic evolution is basically macroevolution with the addition of God. God initially creates the simplest life form and then directs the progress of evolution from simple to complex. In this theory, science is the dominant interpretation.

Progressive creation is also known as the day-age theory. In this theory God performs multiple creations over long periods of time. Each creation event included more complex life forms, with present life forms coming into existence within the past million years or so. While Scripture appears to be the dominant factor in this concept, science still determines how Scripture is to be understood.

⁴ An excellent review article discussing several theories of origins and their implications can be found in the journal *Origins*. Ariel A. Roth, 1980. "Implications of Various Interpretations of the Fossil Record," *Origins*, No. 1 (1980).

Attempts at reconciliation between the areas of science and Scripture are not new. The Jewish scholar Philo of Alexandria (c. 20 B.C.-A.D. 40) was one of the first to attempt to reconcile the Greek philosophies with the Hebrew Old Testament. In his attempt Philo treated the Old Testament writings as religious allegory.⁵ One of the most influential ancient scholars of scriptural allegory was Origen (c. A.D. 185-254). His methods directed Western Christian thought for more than a thousand years. Under Origen's influence, Christian scholars began to interpret symbolically the numbers, animals, plants, and other objects and events in Scripture. The historical, literal search for truth was almost forgotten as scholar after scholar sought for new symbolic meaning within Scripture. "To help in the interpretation of Biblical allegory, Christians employed the science and philosophy of the ancient Greeks, Egyptians, and Mesopotamians. It brought much new knowledge to the Western world, but is also put into wider circulation many concepts antithetical to Christian doctrines and beliefs. Some of the pagan concepts would help to lay the intellectual foundation for the theory of evolution even though they themselves may not have been basically evolutionary in intent."⁶

Throughout history, including the present, as mankind's data base for intellectual reasoning has increased, the need for revelation has decreased. With today's technology, and human reasoning at an all-time high, the most appealing theory to many concerning the origin of life is some form of evolution. The successes of science (regardless of the area) tend to strengthen the belief that evolution is the correct theory of origins. The serious problems with evolutionary theories are minimized by or are unknown to the general populace. Even those individuals who are aware of the problems believe that in time all questions will be answered. However, does this remove all possibilities of God using "natural" laws?

One of the most serious problems with evolution is its inability to account for the spontaneous generation of even the simplest form of life. From a biochemical point of view, the odds against the spontaneous generation of a simple protein are so immense that spontaneous generation of more complex material is virtually impossible. Science is also unable to account for the spontaneous generation of the complex interrelated systems necessary for life arising strictly from the natural laws of random processes.

Other important unanswered questions arising from evolution pertain to the origin of man's higher characteristics such as consciousness, free will, aesthetic taste, morality, and love. Not only can science not account for the origin of these characteristics, it cannot give reasons that they should even exist.

The theories of progressive creation and theistic evolution suffer from the fact that they are not well supported from either science or Scripture. They are both inadequate compromises attempted to bridge the interpretations of science and Scripture.

The most serious problem with any Scripture-based creation theory is the disagreement with the long ages proposed by scientific interpretations, especially radiometric dating. Scripturally, there is no direct or indirect method by which the large

⁵ An allegory is similar to a parable in that it usually uses fictitious symbols or characters to represent a moral attitude or religious principle. An example would be the sower and the seed of Luke 8:11-15. The literal translation of these texts would pertain to farming, however, and the allegorical translation describes the spreading of the gospel.

⁶ Gerald W. Wheeler, *The Two-tailed Dinosaur: Why Science and Religion Conflict Over the Origin of Life* (Nashville: Southern Publishing Association, 1975), p. 34.

radiometric ages found in the geologic column in association with fossils can be accounted for. This is a dilemma the creationist, by faith, must live with.

The dilemma of the time problems for Scripture-based creation theories is offset by the number of areas concerning origins that find excellent correlation with Scripture. Some of these areas include evidence for design at all levels of life, first origin of life and basic plan and animal types, and the origin of consciousness, free will aesthetic taste in music and art, morality and love. Also, reasons and methods can be presented from Scripture that attempt to account for many of the features one observes on the surface of the earth, including the preservation of fossils and origin of vast formations covering large areas of the earth's surface.

When studying origins, it is helpful to keep two scriptural texts in mind. They are 1 Corinthians 1:21 and 1 Thessalonians 5:21. These texts admonish the student (1) to remember that wisdom (science) alone cannot lead one to a knowledge of God and (2) to prove all things and hold on to that which is correct. This is a challenge for all students regardless of their walk in life.

PICTURE CAPTIONS (pictures omitted from this online copy)

The time required for the evolutionary processes to develop is about 3.5 billion years.

The ancients accepted some form of primitive creation, with the formation of new species resulting from various parts coming together. Does this remove all possibilities of God using "natural" laws?

The most serious problem with any Scripture-based creation theory is the disagreement with the long ages proposed by scientific interpretations.

Some of these areas include evidence for design at all levels of life.

CHAPTER 3

HOW OLD IS THE EARTH?

VOCABULARY

apparent age, archeology, daughter product, ejecta (volcanic), fiat creation, half-life, inorganic, isotope, lunar, meteorite, principle of uniformity, radioactive decay, radiometric age, radiometric dating, salinity, sedimentation

History is a simple word with a lot of meaning. Tennyson once described history as “the eternal landscape of the past.” Through the various aspects of history we can study the past events of a person, a family, a nation, or a civilization. In researching the past events we rely heavily upon the written record. But there is a limit as to how far back in time the written record extends.

Among the oldest written historical records are the Palermo Stone from Cairo, Egypt (c. 2400 B.C.) and the Elba Tablets from Tell Mardikh, Syria, (c. 2300 B.C.). The Ebla Tablets not only contain king lists, giving the history of the people and region, they also include accounts of a creation and a flood. And yet there is evidence of civilization extending beyond 2400 B.C. Beyond the written record we must rely upon the archeological record.

Archeology is important in establishing the record of development of a civilization. However, dates obtained from archeology alone are not very reliable. Artifacts from an archeological site are often dated using carbon-14 or other radiometric methods. Some concerns about radiometric dating are discussed later in this chapter.

The only records available that span the entire history of life on this planet are the Holy Bible and some other religious writings. The first five books of the Bible, written by Moses, were written sometime during the fifteenth century B.C. Because of our personal faith relationship with Jesus Christ, we accept the Scriptures are written by holy men of God as they were moved by the Holy Spirit.⁷

Accepting Scripture are reliable information, we can use the data given in Genesis 1:11 to calculate the chronology of life on Planet Earth. The Bible exists in slightly different versions, which give different ages for the patriarchs. The total time since Creation varies among these versions from about 6,000 years to 7,700 years. Since we are not certain of the exact number of years, we often use the expression “less than 10,000 years.” In order to standardize our calculations, we will use the chronological data from the Septuagint (LXX). The Septuagint is a translation of the Hebrew Pentateuch (first five books of the Old Testament) into Greek, originally made in Alexandria, Egypt, in the third century B.C. Data from the Septuagint may be used to place Creation week at 5665 B.C. and the Flood at 3403 B.C. From this data we can conclude that life has been on this planet for approximately 7,700 years. This time span is somewhat short of the billions of years proposed by standard science!

⁷ See 2 Peter 1:21.

With such a large difference in ages—almost 10,000 versus 4,560,000,000—the first question that pops into one’s mind is “How does science tell time?”

Imagine yourself stranded on an island with no means of telling time. You knew the date when you arrived but nothing more. How would you know how long you had been on the island? “Simple,” you say, “I would just start counting the number of times the sun set, and that would give me the total number of days that I have been on the island.” And you would be correct!

While walking around the island, you happen upon an old empty treasure chest half buried in the sand. With nothing else to do, you begin to study the chest in order to determine how long it has been buried on the island. Through long and careful observation, you notice that each day the high tides remove exactly 1.00 millimeter of sand from around the old chest. Knowing this data, you now begin to measure the height of sand that remains around the old chest. You reason that once you know how much sand remains around the old chest, you can simply calculate how much sand was required to cover the old chest, and from there how long the chest had been buried.

Unknowingly, you have been applying the **principle of uniformity** in your study. This principle, given its first modern formal pronouncement by the Scottish geologist James Hutton in 1785, maintains that **“the present is the key to the past.”** According to this principle, given sufficient time, processes now at work would account for all the geologic features of the globe.

Feeling the triumph of success at determining how long the chest had been buried, you move on down the beach looking for further challenges. All goes well until a typhoon blows in and turns your world of investigation inside out. In less than 24 hours’ time the storm uncovers three more old chests right near the one you were working on!

What was wrong with your study techniques? Nothing! Under the initial assumptions made, your study was correct. However, as the storm pointed out, your assumptions were not complete! By using a limited range of the present as the key to the past, you were unable to account for the actions of storms.

Determining the age of past events from present processes is very complicated. Numerous assumptions are made in order to define and simplify the system under study. Care is exercised to ensure that all “storms” are accounted for in the study. However, many “storms” can go unnoticed until someone seeks an answer that is not covered by the previous assumptions.

In order to determine the age of the earth, several elaborate models based on uniformitarian principles have been proposed and studied.⁸ Models based on the rates of erosion and/or sedimentation have been studied in detail. Other detailed studies include the rate of cooling of the earth, rate of build-up of the ocean salinity, rate of production of volcanic ejecta, and growth of human population. As the number of studies increase, so have the number of conflicting ages for the earth increased! One reason for these conflicting ages is the failure of the assumptions to account for all of the “storms.” No methods based on uniformitarian principles came close to giving consistent results until radiometric dating techniques were developed.

In order to better understand radiometric dating, let us pause a moment and look at the radioactive decay processes.

⁸ For an excellent review article on some of these methods, see A.A. Roth, “Some Questions About Geochronology.” *Origins* 13 (1986): 64-85.

An element is said to be radioactive if it is capable of spontaneously changing into another element through the emission of a charged particle. The original radioactive element is called the parent isotope, and the new element that is formed from this decay process is called the daughter product. Radioactive decay continues until a stable non-radioactive element is formed. All elements with an atomic number greater than 83 are radioactive. The elements with atomic numbers from 1 to 83 have both stable and radioactive isotopes.

Isotopes of an element have the same atomic number (number of protons in the nucleus) but have different numbers of neutrons. For example: hydrogen, atomic number = 1, has three isotopes. They are:

NAME	# protons	# neutrons	Radioactive?
Hydrogen	1	0	No
Deuterium	1	1	No
Tritium	1	2	Yes

For a given radioactive isotope the rate of decay (i.e., the average time required to change into another element) is constant. The amount of time required for one half of the radioactive material to decay is called the half-life. For example, tritium has a half-life of 12.33 years. This means if we obtain one gram of tritium today, we will have only 0.5 grams 12.33 years from now. If we measure the amount of tritium remaining after 24.66 years (two half-lives), we will have only 0.25 grams left (half of one-half).

Some of the radioactive isotopes used for dating are:

Isotope	Half-life
Carbon-14	5,730 years
Potassium-40	1,280,000,000 years (1.28×10^9)
Rubidium-87	48,000,000,000 years (4.8×10^{10})
Uranium – 238	4,468,000,000 years ($4,468 \times 10^9$)

Radiometric age dating is based upon the ability to determine accurately the amount of radioactive parent element and its stable daughter product present in the sample. By knowing the ratio of parent to daughter and the half-life, simple mathematics allows one to determine the age of the sample under investigation. (Carbon 14 dating is based on a comparison of the present parent concentration with an estimate of its concentration at a known time in the past.)

Numerous measurements support the assumption that the decay rates and half-lives for the radioactive elements have remained constant over time. If we are to question the results of radiometric dating, it must be on the basis of the other assumptions that are involved.

Two of the weakest assumptions utilized in radiometric dating are:

1. The assumption that the clock was reset to zero when the event under study took place. In other words, only the parent isotope is initially present or the

amount of daughter isotope present at the beginning can be precisely determined and subtracted out before the age is determined.

2. The assumption that the system under study has remained closed. In other words, that there has been no loss or gain of either parent or daughter elements from the surroundings.

Numerous examples are recorded in the geologic literature that illustrates the point that the zero-reset assumption does not always work. A classic example comes from the volcanic ejecta of Mount Rangitoto (Auckland, New Zealand). The volcanic material was found to have a potassium-40 age of 485,000 years; however, trees buried within the volcanic material were found to have a carbon-14 age of less than 300 years!⁹

The position of undisturbed volcanic layers confirms the order of deposition; however, the radiometric ages of the individual layers do not necessarily represent the real emplacement times. The reason for such differences can be found in the fact that there are a wide variety of factors that influence the physical and chemical makeup of the volcanic material before it reaches the surface.¹⁰ These factors can also influence the radiometric age!

How can a researcher be certain that the system under study has remained closed to the exchange of either the parent isotope or the daughter with foreign material from outside the system? He cannot, unless he was present at the time of the geologic event and immediately isolated the sample from its surroundings. Such is not the case for the majority of samples. Techniques have been developed to help correct for suspected exchange of isotopes. However, these corrections cannot account for all of the possible deviations that may have occurred. The criteria that a sample must meet for “good” radiometric dating are very complex.^{11 12}

A radiometric age is often rejected because it does not conform to the age “given” the formation from which it was taken. Arguments are presented for the clock not being reset for ages too old, and arguments for selective removal of the daughter isotope or selective insertion of the parent isotope are given for ages too young. The question that then arises is, “Is there any radiometric date that we can trust?”

Only when *several* different radiometric isotope systems give the same approximate date can that date be looked upon as approaching a reliable time. The organization of the solar system is placed at about 4.56 billion years ago because several different radiometric isotope systems applied to a variety of minerals yield the same age. The samples investigated include meteorites and lunar material.

Slightly different assumption must be employed when carbon-14 is used to date material. The daughter product of carbon-14 is nitrogen-14, which is the principal isotope of the nitrogen in the atmosphere. Therefore, the ratio used to determine the age of the sample is obtained by measuring the carbon-14 in the sample and comparing that

⁹ I. McDougall, A. A. Pollach, and J. J. Stipp, “Excess Radiogenic Argon in Young Subaerial Basalts From Auckland Volcanic Field, New Zealand,” *Geochimica et Cosmochimica Acta* 33 (1969): 1485-1520.

¹⁰ M. J. O’Hara and R. E. Mathews, “Geochemical Evolution in an Advancing Periodically Replenished Magma Chamber,” *Journal of the Geological Society of London* 138 (1981): 237-277.

¹¹ Giles S. Odin, ed., *Numerical Dating in Stratigraphy* (New York and London: John Wiley & Sons, 1982), vols. 1, 2.

¹² N. J. Snelling, *The Chronology of the Geologic Record*, British Geological Survey Memoir No. 10 (London: Blackwell Scientific Publications, 1985).

amount with the carbon-14 found in similar living tissue. The assumption used here is that the sample under investigation represents *exactly* the same conditions that a corresponding modern sample has experienced.¹³

The assumption of a closed system also applies to carbon-14 dating.

Carbon-14 dating shows a reasonable correlation with tree ring dates over the past 3,500 years. Beyond 1500 B.C. the tree ring dates begin to give increasingly greater ages than the carbon-14 dates. With current technology it is possible to obtain a carbon-14 date of about 70,000 radiocarbon years. Tree ring dates are claimed to go back only to about 7000 B.C. (9,000 years).

4.56 billion years! 40,000 years! 9,000 years! 6,000 years! Who's right? Who's wrong? How can a person handle the different ages for the earth? Is there room to harmonize the scientific age data and the data from the Bible? Does it really make a difference what I believe? These are the questions that the thinking Christian must answer while seeking harmony between the Scriptures and science in today's modern society.

There are basically three approaches one can take when dealing with radiometric age data. They are:

1. Completely disregard any data that come from radiometric techniques.
2. Assume that the earth, moon, and stars are about 10,000 years old and that the radiometric data observed today are the result of the earth being created with apparent age.
3. Assume that the activities of Creation week involved large amounts of elementary inorganic matter that was previously created some 4.56 billion years ago.

The first approach is no approach and does not warrant further consideration. The difference between the second and third choices depends upon one's interpretation of Genesis 1:1-3:

“In the beginning God created the heavens and the earth. Now the earth was formless and empty [without form and void], darkness was over the surface of the deep, and the Spirit of God was hovering over the waters. And God said, ‘Let there be light,’ and there was light.”¹⁴

It appears that the first day of Creation week actually begins with verse 3.

The second approach is for individuals whose convictions concerning the biblical interpretation of Creation do not allow for a 4.56 billion-year age for any inorganic matter of the earth. This approach assumes that what we currently classify as long-term radiometric features were introduced as “apparent age” into the inorganic matter in a recent creation.

Probably the strongest support for this approach comes from Moses' account of the fourth day of creation, by assuming that the sun, moon, and stars were brought into

¹³ For an excellent review article on carbon-14, see R. H. Brown, “The Interpretation of C-14 Dates,” *Origins* 6 (1979): 30-44.

¹⁴ New International Version.

existence on that day. However, this approach also carries some objectionable implications.

If the sun, moon, and star were created on day four about 10,000 years ago, then God also created light waves in transit as if coming from the stars millions of light-years away. The stars also had to be created in various stages of maturity, from the black holes to the giant red stars to the white dwarfs. In addition, the nova, supernova such as SN1987A, and other events that seem to have taken place millions of light-years ago really didn't happen.

The "apparent age" of the inorganic matter or the various stages of star maturity have no objectionable implications. They can be looked upon as simple manifestations of God's creative powers. However, the creation of light waves seemingly in transit for millions of years and carrying evidence of supernova that actually did not take place are illusions. These illusions are objectionable because they can imply that God is dishonest. Why should He create evidence for events that did not occur? Or why should He find it necessary to change the laws governing the speed of light?

These objections can be overcome if we interpret the fourth day of Creation week as addressing only our solar system and not the entire universe. This would imply that the remainder of the universe, outside of a 10,000 light-year radius, existed prior to our earth's creation.

Indirectly Job 1:6 can be used to support the possible existence of other created worlds outside our own solar system. In the book *The Great Controversy* reference is made to God's government including the inhabitants of heaven as well as the unfallen worlds.¹⁵ If this is true, then these worlds must have been present before the creation of this world, which brings us to the third approach.

The third approach assumes that elementary inorganic matter existed on Planet Earth before the creation of life there. This assumption is supported by a broader interpretation of Genesis 1:1-2 than the second approach.

The reasoning is as follows: Verse 1 identifies God as the Creator regardless of when the creation process took place. Verse 2 seems to identify the earth before the Creation week as formless, i.e., no specific organization, and empty, i.e., no inhabitants. The same wording, "formless and empty," is also found in Jeremiah 4:23 (NIV). However, this time the wording is used to describe the end of the world. In *The Great Controversy*, reference is made to both Genesis 1:2 and Jeremiah 4:23 through the following statement:

"That the expression 'bottomless pit' represents the earth in a state of confusion and darkness is evident from other scriptures. Concerning the condition of the earth 'in the beginning,' the Bible record says that it 'was without form, and void; and darkness was upon the face of the deep.' Genesis 1:2. Prophecy teaches that it will be brought back, partially at least, to this condition."¹⁶

In addition to the above, one can add the fact that there is no reference in the Scriptures within the Creation week that addresses the creation of water or the mineral components of dry land ("earth" that was created on day three). *The only reference made*

¹⁵ E. G. White, *The Great Controversy*, (Mountain View, Calif.: Pacific Press Publishing Association, 1888), p.49.

¹⁶ *Ibid.*, pp. 658-659.

to their creation is “in the beginning.” It seems possible then that the elementary inorganic matter is not bound by a limited age as is the living matter.

Where then does the figure of 4.5 billion years arise? This age is the natural outcome of the radioactive decay processes that have occurred since originally created inorganic matter condensed to form solid material in our solar system.

The implications of this approach would suggest that the radiometric clocks are not reset to zero whenever the minerals are transported by igneous (volcanic) or erosional processes. This approach also strongly suggests that the radiometric age assigned to the inorganic minerals associated with a fossil is more a reflection of the characteristics of the source material than an indication of the age of the fossil.

Conflicts between scientific and biblical interpretation are minimized with this approach. However, not all of the questions are answered, and areas of *faith* continue to remain.

You may have heard someone say, or maybe even said yourself, “What difference does it make what I believe as to how old the earth and life are?” In short, what are believe as to the ages of the earth and of life does make a big difference in how you interpret both science and Scripture.

As a primary Bible-believing Christian, it is necessary to maintain confidence in the validity of Genesis 1-11! However, we must realize that there is no way that we can proceed directly from the radiometric data to a fiat creation within the past 10,000 years and a worldwide flood some 5,000 years ago. These are religious concepts that are accepted on the basis of faith in the same manner as is salvation.

Through a proper blending of this faith viewpoint and science it is possible to obtain a more complete understanding of God as our Creator and Sustainer. In seeking to harmonize the revelation of God through Scripture and natural science, we must find a model that is consistent with both sources of revelation. This third approach seems to satisfy these needs. Where such consistency is not found, we need to seek a better understanding of both sources through the guidance of the Holy Spirit.

PICTURE CAPTIONS (pictures omitted from this online copy)

The Elba Tablets from Tell Mardikh, Syria (c. 2300 B.C.)

The total time since Creation varies among these versions from about 6,000 years to 7,700 years.

Imagine yourself stranded on an island with no means of telling time.

An old empty treasure chest half buried in the sand.

All goes well until a typhoon blows in and turns your world of investigation inside out.

Streams cut deep canyons within days of the eruption of Mount St. Helens.

Another model studied in detail is the growth of human population.

Half-lives 9,000 years?

Clock reset 6,000 years?

Closed system Who’s right?

4.56 billion years? Who’s wrong?

40,000 years?

Elementary inorganic matter existed on Planet Earth before the creation of life there.

We must find a model that is consistent with both sources of revelation.

CHAPTER 4

FOSSILS AND THE GENESIS FLOOD

VOCABULARY

analog, brachiopods, cycads, epoch, era, glauconitic sandstone, geologic column, index fossils, in situ, limestone, naturalistic, paleontology, period, relative ages, sandstone, sedimentary deposits, sedimentary units, shale, silica, strata, stratified, trilobites

It is easy to see why many individuals reject the concept of a worldwide flood, since visualizing any destructive event large enough to encompass the entire world at the same time is difficult. Even the most violent storms encountered by modern man affect only a small part of the earth's surface at any one time.

Another difficulty encountered in the Genesis flood story involves the animals. How did "all of the species" survive? Or did they? How did the animals get to the various continents from the ark? These and other questions dealing with the diverse life forms lead many scientists to first question and eventually reject all concepts of a worldwide flood and an ark of refuge.

If a worldwide flood took place, what was it like? Is there data to support such a claim? Is a flood story found only in the Hebrew Scriptures? Do other records of ancient history contain a flood story?

In reviewing the records of other cultures, one finds reference to flood stories on every continent and in almost every society of the world.^{17 18} Almost every extra-biblical account specifies universal flooding, some means of escape, and violent associated forces (see appendix). While these facts lend credibility to the Genesis flood story, one must not rely on them alone for support.

The violence associated with the Flood is implicit in the Genesis account of the breaking up of the fountains of the deep and the waters covering the highest mountains to the depth of 15 cubits (\approx 23 feet or 7.0 meters). The book *Patriarchs and Prophets* vividly portrays the violence of the all-encompassing Flood as hurling buildings, trees, rocks, and earth in all directions. The author goes on to state that Satan himself feared for his very existence.¹⁹ The violence of the Flood must have been beyond even our wildest imagination.

If the biblical record of the Flood is accurate, and if it was as violent as depicted, physical evidence that would support such a claim must exist worldwide. Such evidence

¹⁷ Stith Thompson, *Motif Index of Folk Literature* (Bloomington, Ind.: Indiana University Press, 1968).

¹⁸ Herbert S. Robinson and Knox Wilson, *Myths and Legends of All Nations* (New York: Bantam Books, 1950)

¹⁹ E.G. White, *Patriarchs and Prophets*, (Mountain View, Calif.: Pacific Press Publishing Association, 1890), pp. 96-107.

does exist. It includes widespread sedimentary deposits, large-scale geological changes, and massive burial and preservation of plants and animals.

Nearly three quarters of the earth's exposed surface is covered with sedimentary rock deposits.²⁰ The search for oil has produced extensive underground mapping that reveals the massive size of some of these sedimentary deposits. As more and more oil exploration takes place around the world, a picture of the earth's rock layers becomes clearer. Some of the thickest sedimentary rocks are found in North America and India. One of the best places in the world to view some of these sedimentary rock layers is at the Grand Canyon of the Colorado in North America.

The uniqueness of these stratified sediments is not their thickness but their similarities and their wide range of distribution. Many strata can be traced over thousands of square miles and from continent to continent. Some extend over the entire world!

Strata identical to the English "White Cliffs of Dover" can be found in France, Germany, Scandinavia, Poland, Bulgaria, and Russia. Similar chalk deposits of the same geologic age and characteristics can also be found in Texas, Arkansas, Mississippi, and Alabama and North America. And, last but not least, similar chalk deposits can be found also in Western Australia! All of these deposits are resting on the same type of glauconitic sandstone!²¹ These chalk deposits are not the only deposits that are widespread. Other widespread deposits include various types of sandstone, limestone, and shale. **Surely the same conditions had to exist at nearly the same time in all of these places for these similar deposits to form!**

Another puzzling question that occurs when looking at sediments is "Why do I find layers of rock containing seashells high on a mountainside?" It does seem a little strange to find seashells on the tops of mountains, even Mount Everest! On almost every range of mountains the world over, one can find layers of rock that contain remains of past marine life. **Surely similar conditions had to exist in all of these places for these same types of deposits to form!**

The formation of the Grand Canyon, the formation of the mighty mountain ranges, the movement of continents, and the opening of oceans that occurred in the past history of Planet Earth have no geological counterpart today. These massive earth movements had to be the results of forces that do not operate today, forces that no individual can successfully describe or explain. Could these movements be evidences of a worldwide flood?

If we turn again to *Patriarchs and Prophets*, pages 108, 109, we read that after the Flood the surface of the earth was no longer beautiful and the mountains no longer symmetric. Jagged mountains existed where plains were before and visa versa. These changes are said to be the direct result of the Flood.

In the search for evidences of the Flood one must not overlook the fossil fish and huge coal deposits. Where did they come from? What past conditions produced these deposits?

There are two theories concerning the accumulation of plant remains that turned into coal upon burial. The first is the burial of material in situ, that is, in position of growth. Only the coal seams that have no significant fossil beds below them can be in

²⁰ F.J. Pettijohn, *Sedimentary Rocks*, 3rd ed. (New York: Harper & Row Publishers, 1975).

²¹ Derek V. Ager, *The Nature of the Stratigraphic Record*, 2nd ed. (London: Macmillan Press Ltd., 1983).

situ. The second is the burial of material that drifted into a basin from another location. Both of these theories are compatible with the Genesis flood, and both processes are likely to have occurred. One of the most convincing pieces of data suggesting a universal flood is to be found in the vast coal reserves of the world. No processes going on today can approach in magnitude the action necessary to account for this phenomenon.

The present-day process most similar to coal formation is the formation of peat. Peat is the dark-brown to black residual material produced by the partial decay of mosses, trees, and other plants that grow in wet marshes and bogs. Scientists estimate that it would require from two to 20 feet of peat to form one foot of coal, depending upon the coal type. If we take an average of 10 feet of peat to produce one foot of coal, 300 feet of peat would be required to produce a coal seam 30 feet thick. There are few peat bogs, marshes, or swamps anywhere in the world that reach a depth of 100 feet, let alone 300 feet. The average depth of most marshes and bogs is 50 feet or less.

In the western United States, coal seams from 60 – 90 feet in thickness are common, and seams of brown coal in the Latrobe Valley of Australia are reported to be nearly 500 feet in thickness.²²

In addition to a great vertical thickness, the horizontal extent of coal beds is tremendous. The Pittsburgh coal bed is located in parts of Pennsylvania, Ohio, Kentucky, and West Virginia, an area covering more than 2,100 square miles, and averaging about 7 feet in thickness.²³ The Appalachian coal basin extends over some 70,000 square miles. The extent of minable coal in a specific bed often runs into thousands of millions of tons.²⁴

The origin of such vast coal beds has been an area of major study for many geologists. Any uniformitarian model developed by geologists cannot accommodate the immense size or depth of the majority of the coal beds. However, the concept of a global flood that eroded out the forests and plant cover of the pre-Flood world, collected it in great floating mats of debris, and then deposited it in sinking basins seems to be a reasonable model that can account for the great extent and thickness of the coal beds.

If we carefully examine the many sedimentary rock strata that cover the earth, we will soon find that we are actually living on an enormous graveyard. Graveyard? Yes, graveyard! Almost every sedimentary deposit contains fossilized remains of past life, both plant and animal. Some of the more famous strata contain dinosaurs, while others contain substantial fish remains or petrified wood.

One of the first geologic strata to be studied in detail was the Old Red Sandstone formation in England. These rocks, which cover 10,000 square miles or more, contain a staggering number of fish remains. In 1860 Miller made the following statement about the Old Red Sandstone formation:

At this period of our history, some terrible catastrophe involved in sudden destruction the fish of an area at least a hundred miles from boundary to boundary, perhaps more. The figures are contorted, contracted, curved; the tail in many instances is bent around to the head; the spines stick out; the fins are spread full as in fish that die in convulsions.”²⁵

²² H. Herman, *Brown Coal* (Victoria, Australia: State Commission of Victoria, 1952).

²³ W. A. Tarr, *Introduction to Economic Geology* (New York: McGraw-Hill Book Company, 1930).

²⁴ Otto Strutzer and Adolph C. Noe, *Geology of Coal* (Chicago: The University of Chicago Press, 1940).

²⁵ Hugh Miller, *The Old Red Sandstone* (Boston: Gould and Lincoln, 1860).

Other large deposits of fish exist in North America and other parts of the world. It seems probably that the “terrible catastrophe” referred to by Miller was the Genesis flood.

In a continued search for remains of past life in the rock strata, tar pits, and other fossil deposits, one will find a wide variety of species, both plant and animal, as well as several types of preservation. These preserved specimens are called fossils, and the study of fossils is called paleontology.

Fossils have customarily been grouped into four major types, depending upon the method of preservation. They are molds and casts, petrification, carbonization, and unchanged.

A modern analog of a mold fossil could be a dog’s footprint in the newly laid concrete driveway. Mold-type fossils can be the result of animal tracks, but they can also occur from any plant or animal material that has left an impression in the “soft” rock. Probably the most famous mold fossils are those of people and animals found at Pompeii, Italy, where ash from the A.D. 79 eruption of Mount Vesuvius buried them alive. After the ash hardened, the bodies decayed away, leaving molds in the shape of humans and animals.

Cast fossils are simply mold fossils that have been filled with a rock-forming material. Cast fossils can also include animal burrows, worm tubes, or any other fill able object.

Petrification literally means to become stone. Petrified fossils are fossils that have become stone through the replacement or impregnation of the cellular tissue of the specimen with silica, calcium carbonate, or other rock-forming material. In the process of petrification both the exterior and interior structures are preserved, at times in very fine detail. The most common fossil of this type is petrified wood. The beautiful colors in petrified wood come from trace amounts of iron or manganese brought in with the silica during petrification.

As the word suggests, carbonization means turning to carbon. Under ideal conditions and with the absence of oxygen, the organic remains of plants or animals can be partially or completely converted to carbon through the loss of the other materials present. This process may or may not preserve the structure of the organism. The most common fossil of this type is coal. Fossil fish like those from around Green River, Wyoming, are often partially carbonized.

The last major category is the unchanged fossils. This group includes bones and teeth, as found in the La Brea tar pits,²⁶ seashells, small insects found in amber,²⁷ and the mammoths and other animals found frozen in the ice and tundra of the arctic regions. Without a doubt, the most famous fossil from this category is the saber-toothed tiger.

As the paleontologist travels from location to location across the continent and around the world he begins to notice that the fossil assemblages occur in a rather regular sequence. In other words, if you find a particular fossil in a given strata of rock you can predict, with a reasonable degree of accuracy what kind of fossil you should find in the strata above and below. Some of the sequences are so predictable that the fossil itself is used to identify the strata. Those fossils used for strata identification are called index fossils.

²⁶ The La Brea tar pits are found in Los Angeles, California.

²⁷ Amber is fossil resin or sap from prehistoric conifer trees.

There is some inherent danger in using fossils to identify strata when in the beginning it was the strata that was used to identify the fossil! This type of reasoning is circular reasoning and can lead one into incorrect conclusions if not used carefully. Circular reasoning is somewhat like a dog chasing its tail!

The ages of fossils are assigned after radiometric dating of the surrounding rock strata. With this information at hand, the geologists have assigned a time sequence to the crust of the earth known as the geologic column. The largest time unit in the geologic column is the era. Eras are subdivided into periods, and periods are divided into epochs. See page 57 for the complete column. We will use the three eras for the rest of this chapter. They are from oldest to youngest:

1. Paleozoic
2. Mesozoic
3. Cenozoic

All of the rocks older than the Paleozoic Era are lumped together into the Precambrian, which is not an era.

If one were to write a story about the geologic column, it might begin like this, “In the beginning was the Precambrian. In all but the uppermost parts of the Precambrian there existed neither plant nor animal.” This lack of fossils is one of the most outstanding features about the Precambrian sediments. Only in the uppermost parts of these sediments can fossils be found. Even then, the fossils found the Precambrian are extremely rare.

The Precambrian plant kingdom is represented by some blue-green algae and some primitive fungi. The Precambrian animal kingdom is represented by impressions resembling primitive jellyfish and segmented worms. These primitive animals are found largely in the Ediacara Hill sandstone in south Australia.²⁸

As we move from the Precambrian into the Paleozoic Era, both plant and animal fossils become abundant. The Paleozoic Era contains six or seven periods. In ascending order they are:

1. Cambrian
2. Ordovician
3. Silurian
4. Devonian
5. Carboniferous (Mississippian and Pennsylvanian)
6. Permian

The seventh period results from sub-dividing the Carboniferous Period into the Mississippian and Pennsylvanian periods. This subdivision is uniquely North American.

The Paleozoic Era is known for its abundant marine and aquatic animals. Amphibians and small reptiles also abound. The animal life ranges from brachiopods and calcite-eyed trilobites in the Cambrian to sharks and bony fishes in the Devonian. The first fossils of egg-bearing reptiles are found in the Permian.

Some of the most important plant remains are found in the Paleozoic Era and more specifically in the Carboniferous Period. Here we find extensive coal beds composed of the remains of extinct plants such as giant horsetails (*Calamites*), giant tree ferns (*Sphenopsida*), primitive seedless plants (*Psilophytes*), and club mosses

²⁸ A. Lee McAlster, *The History of Life* (Englewood Cliffs, N.J.: Prentice Hall, Inc.).

(*Lycopsida*). Other major coal deposits exist in the Mesozoic and Cenozoic eras; however, they are composed mainly of coniferous trees.

The most fascinating era for fossils has to be the Mesozoic! The reason for this distinction is Dino the enchanting dinosaur. The term *dinosaur* is derived from the Greek words *deinos* and *sauros* and means **terrible reptile**. The Mesozoic Era consists of three periods. Directly above the Paleozoic Era we find in ascending order the Triassic, Jurassic, and Cretaceous Period with Creation events, the Cretaceous Period derives its name from the Latin word *Creta*, meaning chalk. The great chalk cliffs around the world are found in the Cretaceous Period.

Throughout the Mesozoic Era the animal kingdom was represented by Dino and his relatives (other reptiles), but Dino dominated the Cretaceous Period. The dinosaurs ranged through most of the world. They vary in size from the small 2 ½-foot-long *Compsognathus* to the large 65-foot-long *Brontosaurus* and beyond to the giant 85-foot-long *Diplodocus*. Probably the most publicized dinosaur is the flesh-eating *Tryannosaurus rex*. This beast stood about 20 feet tall with a length of some 45 feet.

The plant kingdom of the Mesozoic Era is represented by ferns, the “living fossil plants” (cycads), seed plants (including conifers), and deciduous trees. Many plant species found in the Mesozoic Era are common today!

The close of the Cretaceous Period and the Mesozoic Era is marked with the extinction of many species, both plant and animal, and is hailed by some as “The time of great dying.” The most widely publicized extinction is that of the dinosaurs. Many plants and animals that had been common during the Paleozoic and Mesozoic eras did not continue into the Cenozoic.

The Cenozoic Era consists of two periods, the Tertiary capped by the Quaternary. Because of the extreme complexity of the Cenozoic Era the two periods are further broken down into seven epochs as shown at right.

Mammals are the most common fossil in the Cenozoic layers. Fossils similar to our modern animals can be found throughout the upper part of the Cenozoic. Probably the most famous, and extinct, mammal of the Cenozoic is the saber-toothed tiger (*Smilodon*). *Smilodon* skeletons are found in the Pleistocene tar pits of Rancho La Brea in southern California. Other interesting extinct Cenozoic mammals include the giant sloth and the woolly mammoth.

The Cenozoic plants are essentially the same as those that exist today!

As one thinks about all of these layers and fossil sequences of the geologic column, he wonders how to interpret all of this data. Basically there are two explanations, each with many variations. The geologic column can be interpreted from either a naturalistic viewpoint or from a scriptural viewpoint.

The naturalistic viewpoint, like any other, begins with some assumptions. One assumption is that nature is explainable by natural laws, which we can discover and study. Another assumption is that God does not interfere in nature. From these assumptions, models are developed that explain the fossil layers without any supernatural event such as the biblical flood.

Using the naturalistic viewpoint, the age of a fossilized species is determined from the radiometric age of the layer in which the species was found. Such a direct method yields a seeming relationship between biological complexity and geologic time.

It is not difficult to see why this apparent relationship between biologic complexity and time in the geologic column **must yield** an evolutionary-based model. No other direct interpretation of the data can account for the millions of years between supposedly the simplest and oldest life found in the Precambrian sediments and the most complex and youngest life found in the upper Cenozoic sediments.

The scriptural viewpoint also begins with assumptions. One of the assumptions is that God is active in nature, and that He does intervene at times to change the outcome of natural events. Another assumption is that the Bible is God's Word, and that it gives a reliable history of the earth.

Our scriptural position also includes a literal seven-day Creation week for all life and a later subsequent destruction by a worldwide flood. From these assumptions we can now address the geologic column. However, once we make the above assumptions, we are at odds with the naturalistic interpretation of the data. Let's look at the seven-day creation assumption first.

Assuming a seven-day Creation week implies that the ages assigned to the various sedimentary units are not absolute ages but relative ages. Relative ages imply position or order of sequence only, but do not address the time involved between events. We have already seen some justification for this relative relationship established in chapter 3.

If we look more closely at the increasing "progressive" nature of complexity of the flora and fauna found in the geologic column, we will see that the fossils lowest in the geologic column may be simpler in function than those higher up, but they are still very complex! The structure of the cell in the lower organisms, the basic unit of life, is just as complex as that of the organisms found in the upper layers of the column! We would predict a high level of complexity throughout the geologic column if life were created, and this is what we find.

The assumption of a worldwide flood fits very well within the framework of the geologic column. The Flood could provide the mechanism for the widespread stratigraphic deposits found throughout the crust of the earth. The Flood could provide the type of sorting and layering we find throughout the geologic column. The Flood could also provide the mechanism for collecting and depositing the vast amounts of vegetation that were needed to form the many large coal deposits.

The Flood could also account for the fossil sequences we find in the geologic column. The sequencing could be a result of the Flood waters progressively destroying the various ecological zones. Also, the waters could cause different species to bloat and float to different levels prior to burial. In short, a worldwide flood can provide a very satisfactory model for the geologic column.

In summary, we find that the data found in the stratified crust of the earth can be interpreted from several points of view. The interpretation of the data is influenced by the assumptions of the investigator. And the assumptions of the investigator are influenced by the investigator's personal experiences and philosophy of life. No model, however simple or complex, can yet answer all of the questions or explain all of the data found in the earth's crust. We must therefore choose carefully what we are to believe, recognizing the strengths and weaknesses of our model and the fact that the processes that took place in the past have no counterpart in the processes that are taking place on the surface of the earth today.

PICTURE CAPTIONS (pictures omitted from this online copy)

Dinosaur bones in the original rock as visible in the museum at Dinosaur National Monument, Utah, U.S.A.

Even the most violent storms encountered by modern man affect only a small part of the earth's surface at one time.

How did "all of the species" survive? Or did they?

Sediment layers along the Goosenecks of the San Juan River in Utah, U.S.A.

Extensive underground mapping reveals the massive size of some of these sedimentary deposits.

Grand Canyon of the Colorado River, Arizona, U.S.A.

Central range of the Sierra Nevada mountains in California, U.S.A.

Thick coal seam near Sheridan, Wyoming, U.S.A.

We are actually living on an enormous graveyard.

This coiled rock is a good fossil because it is evidence (internal cast) of a prehistoric living snail.

A carbonized fern frond found in coal-bearing rocks from Nova Scotia, Canada.

Fossil sea bottom animals indicate that this rock was once part of the ocean bottom.

A slab of rock containing many fossil mammal bones that is on display in the Chicago Natural History Museum, Chicago, Illinois, U.S.A.

Geologic Column

Trilobite fossils from a famous quarry on Mt. Stephen in British Columbia, Canada.

Reconstructed skeleton of a dinosaur in the Smithsonian Museum of Natural History, Washington, D.C., U.S.A.

The large 80-foot long brontosaurus.

The flesh-eating tyrannosaurus rex.

Opposite page: Dinosaur bones (some of them still attached together) seen in the Dinosaur National Monument Museum, Utah, U.S.A.

The Saber-toothed Tiger.

La Brea tar pits, Los Angeles, California, U.S.A.

The structure of the cell.

The interpretation of the data is influenced by the assumptions of the investigator.

CHAPTER 5

THE DYNAMIC EARTH

VOCABULARY

antediluvian, cirque, continental drift, crust, deformational features, El Niño, epicenter, erratic, Genesis flood, geology, glaciology, kettle, Mankato Drift, mantle, moraine-lateral, moraine-medial, moraine-terminal, paleomagnetism, Pangaea, plate tectonics, sedimentology, Stratigraphic unit, subduction zone, U-shaped valley

Dynamic is a term that comes from the Greek words *dynamis* and *dynasthai*, words which stand for power and ability. When used to describe the earth, *dynamic* brings forth visions of wrenching earthquakes, seething volcanoes, raging winds and water, and the silent mountain-moving power of glaciers. All of these features can lead to exciting areas of study as well as raise questions that may challenge some of our biblical beliefs concerning time and origins.

The study of the earth and its processes has extended knowledge from a flat earth to a spherical earth covered with a thin crust that contains moving plates and drifting continents. The concept of a spherical earth was firmly established by 350 B.C. However, there was no direct proof for a spherical earth until Magellan's fleet sailed around the world in A.D. 1522. Movement of the earth's crust and drifting continents were first proposed by Alfred Wegener in 1912. The theories of continental drift and plate tectonics were not widely accepted until the confirmation of sea-floor spreading in 1967/1968.

Alfred Wegener, a German meteorologist, must have been an avid puzzle solver! In his book *Die Entstehung der Kontinents and Ozeane* (The Origin of Continents and Oceans), published in 1915, Wegener showed how the continents could be fitted together like giant puzzle pieces to form one supercontinent, **Pangaea**. In addition to the remarkable fit of the continents, Wegener also gained support for the Pangaea concept from fossil beds and mineral deposits.

Uncommon fossil deposits of the freshwater reptile *Mesosaurus* are found only in Brazil and Africa, and the fossil fern *Glossopteris* is found in Africa, India, Australia, Antarctica, and South America. These unique fossil deposits are currently separated by thousands of miles of ocean, but they would be in close proximity to each other on the supercontinent of Pangaea. In addition to fossil deposits, Pangaea could also explain similar mineral deposits of diamonds and nickel in Brazil and Africa.²⁹

Support for the Pangaea concept can be found also in the paleomagnetism of the rocks. As solid rock is formed from cooling magma (molten rock), certain crystals in the rock align themselves with the existing lines of the earth's magnetic field. This magnetic alignment is called paleomagnetism (*paleo* = old or ancient). The paleomagnetic alignments of the continents are not orderly in the modern world; yet, in the arrangement of Pangaea, the rocks of each continent show closely related paleomagnetic orientations. The theory of continental drift was developed to account for these and other ancient phenomena found in the earth's crust. Another theory closely related to the continental-

²⁹ F. Martin Brown and Wayne Bailey, *Earth Science* (Morristown, N.J.: Scott Foresman & Co., General Learning Press, (1978).

drift theory is the theory of plate tectonics. While these theories are sometimes used interchangeably, they are not the same!

The best way to understand what plate tectonics means is to define the individual words and then see how these definitions are applied to the earth. Geologically speaking, **plates** are large, broad, thick blocks that contain both continental and oceanic crust and mantle. Each plate “floats” on the viscous (semiliquid) mantle below and moves more or less independently of the others. **Tectonics** is a branch of geology dealing with the broad organization of the upper part of the earth’s crust. Tectonics includes the assembling of structural and deformational features region by region, with a study of their mutual relation, origin, and historical evolution. Therefore **plate tectonics** can be defined as the study of large blocks of the earth’s crust and their mutual relationships with respect to the observed features of the earth’s surface.

The theory of plate tectonics is more than a vehicle for the study of continental drift. Through the study of plate tectonics scientists have been able to determine a relationship among earthquakes, volcanoes, mountains, and the troughs and ridges found on the ocean floors. The outline of the crust’s major plates was determined by plotting the epicenters of major earthquakes. By overlaying a plot of the earth’s active volcanoes on the earthquake plot the relationship of volcanoes and plate boundaries is immediately seen. Also, by placing a lot of the major mountain ranges over the earthquake and volcano plots scientists become aware of the mountain-building power within the earth’s crust by means of plate tectonics.

Further aspects of the earth’s dynamic relationships were found through oceanography. In 1967/1968 oceanographers discovered that the ocean ridges were actually spreading centers, i.e., the oceanic crust was moving apart at the center of the ridges with new material from the mantle filling in the gap. This discovery, coupled with the discovery that the deep oceanic trenches were the result of one plate dipping below another (subduction zone), opened the way for widespread acceptance of the theories of continental drift and plate tectonics.

Some objections to the theories of continental drift and plate tectonics have been voiced. Midplate island arcs, underwater mountain ranges, large underwater valley structures along the mid-Atlantic ridge, oceanic plateaus, and the lack of subduction zones around Africa are out of harmony with these theories. The greatest area of concern is: “What is the driving force behind the movement of these massive plates of the earth’s crust?” The answer to this question continues to elude the inquisitive minds of today’s earth scientists.

The prior existence of Pangaea seems to be well established. But there is a question as to when it existed. According to the standard geological time scale, Pangaea existed some 200 to 250 million years ago, and slowly began to brake up at the beginning of the Mesozoic Era (\approx 200 million years ago). The continents then migrated to their present positions at the rate of about .8 to 2.0 inches (2 to 5 centimeters) per year. Obviously this time scale contradicts the time indicated in the biblical record.

From a biblical perspective it is possible to propose that the antediluvian world was Pangaea, and that the supercontinent began to break up during the Genesis flood. The continents then continued to drift over the past several thousand years, reaching their present positions within the last thousand years or so. The initial continent migration would have been on the order of tens of meters per year!

This biblical perspective presents some dilemma over the rate of movement of the earth's crust. Such rapid movement of the earth's crust would be extremely violent and devastating, and could indeed have caused the prince of evil to fear for his very existence.

Coupled with such an upheaval of the earth's crust during the breakup of Pangaea and the subsequent drifting of continents would be the dramatic changes in the earth's climate. The climate would be unstable for long periods of time, ever changing until stable weather patterns were established with respect to the modern continental positions. It is very possible that these dramatic changes in the earth's crust triggered the Ice Age.

Evidence for the existence of an ice age can be observed on every continent of earth. The footprints of past glaciers can be observed in many areas today where glaciers do not now exist. For instance, glacial polish and rock grooving can be found in the Sahara Desert and in Australia, where today only a hot desert climate is found.

Probably the most prominent evidence of glacial activity is the U-shaped valley. Normal erosional processes produce the standard V-shaped valley seen throughout the world. However, as the glacier begins to move down the V-shaped valley the tremendous forces of the ice carve away the sides and floor of the valley and transform the V-shape into a U-shape. The material carved away from the valley sides and floor is pushed up along the sides and in front of the glacier to form deposits known as moraines.

The formation of glacial moraines can be visualized as being similar in process to the drawing of your finger through wet sand. The sand ridges formed along the sides of your finger would be termed **lateral moraines** and the sand ridge left at the end of your drag line would be called the **terminal moraine**. The third remaining major moraine type is the medial moraine. The **medial moraine** is formed from the union of two glaciers and the merging of their lateral moraines. The medial moraine can be visualized as the middle ridge formed by bringing two fingers close together as you draw them through the sand.

Moraines can vary in size and shape, depending upon their age and the activity of the glacier that deposited them. The terminal moraine of the Franz Josef glacier, an active glacier in New Zealand, reaches a height of 1,410 feet (430 meters). Other high terminal moraines can be found in the northern Italian Alps. Lateral moraines reaching 2,300 to 2,950 feet (700 to 900 meters) in height can be found in the southern French Alps.

Moraines are not always imposing land structures. In North Dakota there are a series of washboard moraines that reach a height of 4 to 15 feet (1.2 to 4.6 meters) and are spaced 260 to 560 feet (80 to 170 meters) apart. These washboard features occur at the end of the Mankato Drift. Nearly half of the former glaciated area of North Dakota is covered with washboard moraines.

Other prominent glacial footprints include kettle holes, erratics, and ciques. A kettle hole is formed when immense chunks of ice are left isolated under layers of glacial sand and gravel as the glacier retreats. As the ice melts, the overlying material slumps down into the void leaving a kettle-like depression or hole. Often these holes fill with water and turn into ponds or lakes. Kettle lakes are some of the most dominant features in the northern states of Minnesota and Wisconsin.

The true glacial vagabond is the erratic. Erratics are rocks or boulders that have been carried along by the glacier and then abandoned as the glacier retreated. The size of erratics varies widely. One of Europe's best known erratics is the Pierre a Bot or

toadstone. This erratic weighs about 3000 tons and rests in the Jura Mountains of Switzerland, some 70 miles (112 kilometers) from its source, Mont Blanc. Erratics can be found throughout Europe and North America. The grand prize for the largest erratic must, however, go to the vast “Schollen” of Germany. The largest erratic there is 2.5 miles (4 kilometers) long, 1.2 miles (2 kilometers) wide, and 390 feet (120 meters) in thickness! Regardless of the size or location, erratics give mute testimony to the power and mobility of glaciers.

Other than the U-shaped valley, the glacial cirque is one of the most easily recognized forms of glacial erosion. In its most classic form the cirque consists of a rounded basin partially enclosed by steep cliffs and sometimes containing a small lake or cirque glacier. The cliffs at the back of the basin (headwall) may rise to hundreds or even thousands of feet in height. The cirque is nature’s amphitheater.

Wherever glaciation has occurred or is occurring, cirques will be found. It has been estimated that the Western Cwm (Welsh for cirque) on Mount Everest has a width approaching 2.5 miles (4 kilometers) and a headwall height, if the ice were removed, of almost 9,200 feet (2,800 meters).

The development of continental glaciers is still the subject of speculation and controversy. In all probability, several different factors are involved. The most plausible theories are those that are based on a combination of changes in land-mass altitude, changes in the gas composition and particulate matter concentration of the upper atmosphere, and longer-term changes in the quality of solar emission. The complexity of this interaction has been graphically summarized by Crowell and Frakes in the chart below.

Glaciers are the offspring of climate. They are totally dependent upon the elements of climate for their birth and sustenance. Meteorological factors determine their size, activity, and life span. The relationships between glaciers and controlling factors are seldom simple or straightforward. Glaciers are competent and sensitive recorders of climate because they are delicately tuned to the climatic environment.

Many creationists have difficulty addressing the time problems associated with past glaciation and the Ice Age. Some completely deny the existence of an ice age. Others accept one glaciation, but reject the multiple-continental-glaciation concept advocated by most glaciologists. The positional relationship of the vast sedimentary deposits of the earth’s crust and the glacial features require glaciation to be post-Flood. Biblical time constraints allow only one epoch of glaciation within post-Flood time. And this epoch requires the ice buildup and subsequent melting to have occurred many times more rapidly than that proposed by conventional uniformitarian geology.’

Any effort to ease the tensions between the biblical creationists view and modern concepts of glaciology is hampered by the complexity of the subject matter and the lack of a convincing “short time period” model. Progress, nevertheless, is slowly being made in both of these areas.

Assistance in unraveling the complexities of glacial deposits has come from engineering geology, petroleum geology, and sedimentology. Through the methods used by scientists in these fields the traditional features that identify the stratigraphic units in many areas once covered by glaciers have been consolidated into a single unit produced

by a single event, rather than multiple units that accumulated from a series of glacial epochs. This is referred to as a “land-system” approach.³⁰

The significance of the land-system approach for creationists is that many glacial deposits once attributed to multiple glaciations are now considered deposits from one dynamic glacier. Ancient ice sheets are now interpreted to have undergone many advances, retreats and surges similar to modern glaciers, which show multiple surges and retreats.

The most intelligent short time period model for the Ice Age, of which I am aware, is that proposed by Michael J. Oard (U.S. National Weather Service, Great Falls, Montana). In his paper “A Rapid Post-Flood Ice Age”³¹ Oard proposes a scientifically competent Ice Age mechanism that requires only approximately 500 years for the buildup of continental glaciation. When buildup ceased, melting could have removed the glaciers within another 500 years or less.

Oard’s mechanism is based on three key components. The first component is the cooling of the mid- and high-latitude continents from volcanic dust trapped in the upper atmosphere. The second component is a globally warm ocean immediately after the Flood. This universal warmth could have been the consequences of: (a) warmer than usual waters coming from the breaking out of “the fountains of the deep” coupled with (b) additional heating from large amounts of submarine volcanic activity and (c) an initially warm antediluvian ocean. The final component is the moisture needed for the high levels of snowfall necessary for the buildup of continental glaciers. This moisture was provided by evaporation from the worldwide warm oceans. (Note the effects of El Niño on the overall levels of precipitation and cooling over the continents that were “shaded” by volcanic dust.)

The significance of Oard’s Ice Age model to creationists is that it presents for the Ice Age a plausible mechanism that is harmonious with the constraints of both Scripture and science. The principal concern of Oard’s Ice Age model when compared to the standard geological model is his proposed time-frame.

In looking at the earth and its dynamic processes one can become overwhelmed. The magnitude of its features and the energy needed to drive these processes are beyond man’s capability to describe. And yet there is One who stands above all. In Psalm 19:1 we read:

*“The heavens declare the glory of God; and the firmament sheweth his handywork.”*³²

Truly the One we choose to serve is all-powerful!

³⁰ N. Eyles, ed. *Glacial Geology: An Introduction for Engineers and Earth Scientists* (New York: Pergamon Press, 1983), p. 15.

³¹ Michael Oard, “A Rapid Post-Flood Ice Age,” *Creation Research Society Quarterly* 16 (June 1979): 29-58.

³² King James Version

PICTURE CAPTIONS (pictures omitted from this online copy)

Magellan's fleet sailed around the world in A.D. 1522.

Support for the Pangaea concept can be found in the paleomagnetism of the rocks.

By overlaying a plot of the earth's active volcanoes on the earthquake plot the relationship of volcanoes and plate boundaries is immediately seen.

Active Volcanoes – Ring of Fire

The medial moraine is formed from the union of two glaciers and the merging of their lateral moraines.

The sand ridges formed along the sides of your finger would be termed lateral moraines and the sand ridge left at the end of your drag line would be called the terminal moraine.

True glacial vagabond.

The Causes of Ice Ages (J.C. Crosswell & L.A. Frakes, Am. J. Scie. 1970).

ORGANISMS: COMPARISON AND CHANGE

VOCABULARY

classification, control (regulatory) gene, fixity of species, Galapagos Islands, genera (plural of genus), genes, geologic column, industrial melanism, "kinds," lethal mutation, meiosis, metabolic, mutagen, mutations, niche, recombination, species, taxonomy, transitional fossils, ultraviolet radiation

Beginning with the efforts of Carolus Linnaeus and others, living organisms have been classified into natural groups according to similarities of their structural, biochemical, genetic, and cellular organization. This process of classification of organisms is known as modern taxonomy. Simply put, taxonomy is an organizational tool similar to a file indexing system. One must always keep in mind, however, that all systems of taxonomy are artificial and none of them are perfect.

For many centuries most Christians believed in fixity of species. That is, that species cannot change. As one looks at the large number of species it seems reasonable to doubt the "fixity of species" theory. However, two questions immediately come to mind: "If the number of species is not fixed, how much change has occurred; and how much time have these changes required?"

Modern secular science suggests that the extent of change has been from one-celled organisms to man and the amount of time required for these changes have been on the order of 3 billion years! Scripturally-based science suggests that the extent of change has been limited and the amount of time required for these changes to occur has been on the order of thousands, not millions or billions, of years.

Evolutionary theory requires limitless change and variation. Does the scientific evidence support this position? Two questions that need to be answered are: (1) how much change is possible? And (2) by what mechanisms do these changes occur?

Picture in your mind two individuals taking their pets out for a walk. The first individual has a very small teacup toy poodle. The second individual is walking a large Irish wolfhound. Both of these pets are dogs and belong to the family Canidae. Excluding the wild members of the family Canidae, there are hundreds of breeds of dogs! And yet they are still recognizable as dogs. Regardless of the amount of cross-breeding and selection applied to this species, a dog is still a dog. Not once has a dog breeder been able to produce a pig or a cat or any animal that even closely resembles anything other than a dog. The same statements can be made for the cat family Felidae. In fact these statements are true for any kind of animal!

One of the most studied and manipulated forms of life is the fruit fly **Drosophila**. Over the past several decades this species has been the workhorse of the geneticist. Fruit flies have been exposed to essentially every known mutagen in existence, be it

radiological, chemical, or biological. And yet this species still looks like a fruit fly! In addition, thousands of generations of fruit flies have been bred and examined for new gene combinations. Speaking of the efforts to change the fruit fly's genes, Lester and Bohlin make the following statement.

“But this sort of reshuffling is not likely to result in major evolutionary change. It simply recognizes what already exists. Even with new mutations, it will not likely lead to new original metabolic functions and new protein molecules.”³³

“It simply recognizes what already exists.” This is a very powerful statement! These authors are saying that the wide variety of change noted in the fruit fly may be simply an expression of a genetic diversity that is already present. Nothing new has been created; only new genetic combinations have been expressed! Some mutations can be said to be new, but they are merely modifications of structures already present and do not represent new structures or functions.

Other examples of biological change commonly cited in support of evolution include: insect pesticide resistance, bacterial antibiotic resistance, sickle-cell anemia, and industrial melanism. All of these examples succumb to the same explanation as the fruit fly experiments. No new *original* metabolic function or protein molecule is created. There is only an expressed *modification* of preexisting variety! Additional examination of the scientific literature continues to strengthen the conclusion that no new *original* metabolic function or new essential protein molecule is created, regardless of the extent of genetic manipulation.

There are four arguments commonly offered for the genetic variation observed within a species and between species: environmental influences, recombination, mutation, and natural selection.³⁴

Although responses to environmental factors are not passed on from generation to generation, such response has an important function. The ability to change with, i.e. adapt to, changes in environment can be important to survival. The tanning of one's skin as a protective barrier to further ultraviolet radiation could be classified as response to an environmental factor. While the tanned skin cannot be passed on directly, the ability for one's skin to tan may be passed on. Another response to an environmental factor may be the ability to grow more robust with proper nutrition. Responses to different environmental factors may produce differences between individuals, but these are not new genes; they are simply the expression of genes already present!

Recombination is the shuffling of genes that occurs during meiosis.³⁵ This reshuffling is responsible for much of the uniqueness of individuals of the same species. The odds that offspring resulting from the fusion of two gametes will be exactly the same are practically zero. The effects of recombination are illustrated through artificial selection.

The process of producing a new variety of plant or animal through the humanly directed selection of the breeding stock is known as artificial selection. Many species

³³ Lane P. Lester and Raymond G. Bohlin, *The Natural Limits to Biological Change* (Grand Rapids: Zondervan, 1984), p. 69.

³⁴ Natural selection acts upon the variations produced through environmental influences, recombination, and mutation, favoring survival of those best adapted to the environment. Therefore natural selection is not a source of genetic variation.

³⁵ Meiosis is the type of cell division in which, during the formation of the egg or sperm, there is a reduction of the chromosome pairs to single chromosome strands.

have been subjected to artificial selection, such as cats, dogs, cattle, horses, sheep, corn, roses, grasses, and numerous others.

The dog seems to be one of the most variable species. If such dog breeds as the teacup toy poodle and the Irish wolfhound were found in nature, and did not interbreed, they would certainly be classified in different species, and probably in different genera. This illustrates the point that at least some species have the capacity to undergo significant changes in their appearance. Evidence obtained from change through artificial selection provides a basis for believing that there are natural limits to the kinds of changes a species can undergo. It is a general rule that the more extreme the change in a new breed of any species, the less vigorous the breed, and the less likely it could survive in nature.

The results of artificial selection suggest that changes in species could not result in evolutionary progress. This evidence is consistent with the creation account, which states that the different kinds of animals were created at the beginning.

Mutation can best be described as genetic noise. Mutations are actually changes in the genetic code caused by chemicals, radiation, errors in duplication, et cetera. It seems impossible for mutations to add new genetic material, as they only alter existing material. At best, mutations are neutral. In other words, neutral mutations do not decrease the survivability of the species. The odds that mutations will be lethal are quite high. It is highly improbable that a mutation could be constructive. Random changes in any complex integrated system will usually upset the system. For example, random changes in the genes of a fruit fly could cause loss or reduction of wings, changes of eye color, et cetera. This can be further illustrated by observing that random changes in the controls of a TV set will usually make it impossible to view a televised program. The fact that mutations are usually either neutral or harmful is a strong argument for a more perfect original species, and contradicts the view that mutation is a mechanism for the advancement of a species!

For a species to become more complex requires more than simply a mutation in a gene; it requires new genes. But simply adding a new gene would not work. Genes do not work in isolation. Rather, an organism's set of genes work together to produce the organism. A new gene must work properly with all the other genes in order for the organism to survive. Not only that, but several new genes would be required in order to produce a new structure and a more complex organism. Each new gene would require a control (regulatory) gene. In addition, each new gene would have to operate at the right time in development for the new structure to develop correctly. It does not seem reasonable to expect even one new gene to appear, much less several highly coordinated genes working together to produce a new structure.³⁶

Conversely, mutations could account for nonlethal loss of genetic information. Such genetic loss would result in the modification and/or loss of structure or function and still allow the species to survive. Examples of such losses are common and include sightless fish in caves and flightless birds on islands. Some scientists believe that the metabolic energy saved because of the loss of these structures is channeled into other functions, such as reproduction, needed to keep the species viable.

³⁶ L. Jameson Gibson, written communication.

From the evidences of genetic loss, the loss of non-utilized structures, and an understanding of the complex relationships of genetic material, it would seem that unless a new structure or function appears suddenly, it is highly unlikely that the structure will gradually evolve over time. However, the arguments of genetic loss, functional loss, and complex genetic interrelationships are not inconsistent with the Genesis creation account and the consequences of sin.

In artificial selection there is an intelligent overseer with a preconceived goal and a particular trait designated for increase or decrease. This is not true for natural selection, which has no overseer or direction for change. Natural selection is passive selection dependent upon the interaction between the species and its environment.

Rather than argue for natural selection as producing unlimited genetic change, observations of natural selection reveal its limits for potential for change! Darwin's famous finches, located on the Galapagos Islands, of which there are 13 species in three genera, are often used as examples of natural selection and adaptive radiation. These finches, instead of presenting strong arguments in favor of a mechanism for wide changes, are an illustration of limited change. Although the finches differ in their beaks and plumage, they are very similar internally, and are really not very different from each other. The various species of finches were able to become established because of their ability to find and fill an open niche. Regardless of how strong natural selection was in the development of these finches, the changes produced were minor!

If the four sources regularly offered as the origin of genetic variation only produce limited changes, how can the wide variety of organisms be best accounted for? According to scripturally based science, **God created many "kinds" of organisms** within which the sources of variation mentioned above have operated.

Once created, the "kind" would be subject to the recognized sources of genetic variation. However, before the entrance of sin into this world all variation within the "kind" was perfect and nondegenerative. After the entrance of sin, regardless of the extent of genetic variation, the result would only be modification and/or elimination of function or structure rather than generation of new structure or new function. Modification and/or elimination of structure and/or function seems possible and is supported by scientific data. On the other hand, generation of new structure and/or function does not seem possible and is not directly supported by the data.

The original created kinds apparently had a large potential for genetic variability. The diverse members of the group resulted from the manifestation of the potential for genetic variation that existed within the created "kind." No new material would be generated, only new combinations expressed. Those combinations that were not functional did not survive, while those combinations that are functional did survive and occupy an appropriate environmental niche. The surviving members of the group could also exhibit additional variation! Such a model is consistent with the scientific data and is also consistent with the Creation account.

The fossil record supports the model of initially created kinds subject to variation as well as, or better than, it supports evolutionary models. The lowest multicellular fossils appearing in the geologic sequence are complex species! There is a conspicuous lack of genuine transitional fossils (missing links). The argued progression of simple to complex fossils in the geologic column can be attributed more logically to order of burial rather than to order of evolution. This interpretation is strengthened when the limited

change and lack of new structures arising from genetic variation are taken into consideration!

How would this perspective of “kind” influence one’s viewpoint on human evolution? From the scriptural perspective of “kind,” *Homo sapiens* would be the original group representative. All other manlike species could be the result of variation or degeneration rather than steps of advancement! This would place the **Neanderthal** (a somewhat degenerate type) and the **Cro-Magnon** (a fully “modern” type) man in the category of varieties of *Homo sapiens*. On the other hand, such fossil finds as *Australopithecus robustus*, *A. africanus*, and *A. boisei* would be classified as variations of the ape family rather than the human family.

Change with and throughout time is undeniable. Evidence for the amount of change, irrespective of time, has been shown to be limited. It is therefore logical to accept the scriptural concept of created “kinds” into one’s perspective concerning the origin of the great variety of life about us, with allowance for a limited amount of variation.

PICTURE CAPTIONS (pictures omitted from this online copy)

The fruit fly Drosophila.

Skin tanning is a response to an environmental factor.

The dog seems to be one of the most variable species.

Flightless birds on islands are an example of nonlethal loss of genetic information.

Darwin’s famous finches.

God created many “kinds” of organisms within which the sources of variation mentioned have operated.

PERSONAL PHILOSOPHY

Evaluation of the evidence for and against evolution and for and against creation indicates that there are only two major issues of strong disagreement, namely, time and origin.

Time is an issue because of our concept of the nature of God. As Seventh-day Adventists, we believe that God is consistent in what He says and does. If we are to take the time line as presented in the standard geological time scale, the first appearance of life, and later subsequent species, is not consistent with God's Word as given in Genesis 1. The appearance of evil before sin presents another time-related inconsistency.

Violent death, mass extinction, and fierce competition, as inferred from the fossils within the geologic column, not only come before man and sin, but are contradictory to the nature of a God who is concerned with the birds of the air and the beasts of the field.

Time issues that challenge the consistency of the nature of God and His Written Word are encountered repeatedly. As we currently understand the issues facing us, either we can choose the various prevailing time concepts and question the nature and consistency of God, or we can accept the consistency of God and question the prevailing time concepts. There is no middle ground.

The second and more important issue of disagreement is the question of origin. As Seventh-day Adventists, the answer to the question "Where did life originate? Has a tremendous influence upon our beliefs concerning the nature of man, salvation, and the nature and character of God Himself.

If man did originate from macro-evolutionary processes over a long period of time, how then do we relate to the multiple references in Scripture that state that man was created in the "**image of God**" *from the beginning*? How then do we relate to that fact that we must be **re-created in the image of God** through Jesus Christ if we are to attain eternal life? If we were not created originally and we have evolved through vast periods of time to man's current mental and physical status, why must we worry about a process called salvation? Does not salvation become only a higher level on the evolutionary plane?

There are questions that do not have answers from the biblical point of view. However, one does not have to stand on **blind faith** alone! When confronted with these questions a good quotation to keep in mind is found in *Patriarchs and Prophets*. While the original context of this quotation is in the spiritual realm, it can have meaningful significance in the scientific realm as well. It reads as follows:

"Many wander in the mazes of philosophy, in search of reasons and evidence which they will never find, while they reject the evidence which God has been pleased to give. They refuse to walk in the light of the Sun of Righteousness, until the reason of its shining shall be explained. All who persist in this course will fail to come to a knowledge of the truth. God will never remove every occasion for doubt. He gives

sufficient evidence on which to base faith, and if this is not accepted, the mind is left in darkness.”³⁷

What are some of the evidences that we can rely upon?

One of the most outstanding features of the world in which we live is the evidence of design and order. Whether one uses the telescope, microscope, or the naked eye, intricate design and order are obvious even to the untrained observer. From the electron’s path about the nucleus of the atom, to the sun’s path through the galaxy, all follow a given order. The eye by which one beholds or the hand by which one touches gives strong testimony to a design for life!

Is it possible to comprehend the design of a living organism and deny the existence of a master designer? Is it possible to believe that life just happened? Is it possible to believe that life, as we know it, will continue throughout eternity, placing our only hope for perfection on a random genetic mutation?

These questions could go on for pages; however, such a list would not change the bottom line. The bottom line is best described in Joshua 24:15.

“But if serving the Lord seems undesirable to you, then choose for yourselves this day whom you will serve, whether the gods your forefathers served beyond the River, **or the gods of the Amorites, in whose land you are living. But as for me and my household, we will serve the Lord.**”³⁸

We are not asked to make this choice without evidence that God is a real and personal God. God has given us great minds with which to weight all the evidence be it scriptural, scientific, or experiential. God has also promised to direct us in truth through His Holy Spirit. This choice cannot be the choice of parent, friend, or teacher. **IT MUST BE OUR OWN.**

PICTURE CAPTIONS (pictures omitted from this online copy)

Either we can choose the various prevailing time concepts and question the nature and consistency of God...

....or we can accept the consistency of God and question the prevailing time concepts.

One of the most outstanding features of the world in which we live is the evidence of design and order.

³⁷ E.G. White, *Patriarchs and Prophets*, p. 432.

³⁸ New International Version

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GLOSSARY

ANALOG:

Something that is similar to something else, parallel in some way.

ANTEDILUVIAN:

Before the Genesis flood.

APPARENT AGE:

Age based on evidence obtained by indirect means; it may or may or may not be the same as the actual age.

ARCHEOLOGY:

The scientific study of the material remains of past human life and activities.

ASSUMPTION:

A fact or statement taken for granted.

BRACHIOPODS:

Sessile (attached) bivalves that resemble clams. They are extremely abundant as fossils.

CHEMICALLY RICH:

Containing simple chemical building blocks such as amino acids, sugars, fatty acids, purines, and pyrimidines.

CIRQUE:

A steep walled basin shaped like half a bowl on a mountainside.

CLASSIFICATION:

The process of arranging organisms into meaningfully related groups.

CONTINENTAL DRIFT:

The hypothesis that today's continents have moved to their present position after the breakup of the supercontinent Pangaea.

CONTROL (REGULATORY) GENE:

A gene that functions to turn on or off the function of another gene.

CRUST:

The outer part of the earth composed essentially of crystalline rocks.

CYCADS:

A family of tropical gymnosperms abundant during the Mesozoic Era but now limited to 100 species.

DAUGHTER PRODUCT:

A new element formed as a result of radioactive decay.

DEFORMATIONAL FEATURES:

Formations or extensions of rock layers as a result of various forces such as folding, faulting, shearing, or compression.

DIVINE INTERVENTION:

God's involvement in a process or series of events.

EJECTA (VOLCANIC):

Material blown out in the eruption of a volcano.

EL NINO:

A displaced warm ocean current that occurs periodically along the Pacific coast of North America and affects animal distributions and weather.

EMPLACEMENT:

The act of depositing materials.

EPICENTER:

Point of the earth above the focus of an earthquake.

ERA:

A major division of geologic time: e.g., Cenozoic.

ERRATIC BOULDERS:

Rocks carried by glaciers and deposited far from their original location (sometimes referred to simply as erratics).

FIAT CREATION:

Brought into existence by divine command.

FIXITY OF SPECIES:

A concept that animals and plants do not change with time.

FOSSIL:

Any remains, impression, or trace of an animal or plant preserved in the earth's crust.

GALAPAGOS ISLANDS:

Volcanic islands about 600 miles west of Ecuador.

GENERA (PLURAL OF GENUS):

A subdivision of a family that includes one or more closely related species, such as *Canis* for dogs.

GENES:

Segments of chromosomes that determine the characteristics of an organism.

GEOLOGIC COLUMN:

The total vertical sequence of strata considered to have been laid down during geologic time.

GEOLOGIC TIME SCALE:

The time (usually in millions of years) associated with era, periods, and epochs.

GEOLOGY:

The scientific study of the structure of the earth and the processes that cause change.

GLACIAL POLISH:

Smooth surface left on rocks by the friction of a moving glacier.

GLACIOLOGY:

The scientific study of glaciers and their effects on the landscape of the earth.

GLAUCONITIC SANDSTONE:

Stone produced from grains of sand cemented together with a dull-green iron potassium silicate.

HALF-LIFE:

The time needed for one half of the atoms of a radioactive substance to decay.

HYPOTHESIS:

A statement that can be tested by experiment, a preliminary answer to a problem.

IN SITU:

Something found in its natural position.

INDEX FOSSILS:

Those fossils used for identification of strata.

INDUSTRIAL MELANISM:

The excessive accumulation of pigment in tissues influenced by industrial pollution such as smoke.

INORGANIC:

Pertaining to things from nonliving sources.

ISOTOPE:

Two or more atoms of the same element, having the same atomic number but a different atomic mass.

KETTLE:

A steep-sided hollow in the earth's surface, usually associated with glacial activity.

KINDS:

A nonspecific term describing large divisions of organisms. (Example: horse kind, cattle kind, dog kind, mankind, etc.)

LETHAL MUTATIONS:

A mutation that results in the death of the organism.

LIMESTONE:

Rock formed chiefly by the accumulation of organic remains (shells or coral), mostly calcium carbonate.

LUNAR:

Pertaining to the moon.

MACROEVOLUTION:

The evolution or origin of higher classification levels, especially orders or classes.

MANKATO DRIFT:

Washboard-like ridges of rock material found in North Dakota that were formed through glacial activity.

MANTLE:

The interior portion of the earth directly below the crust, extending to just above the molten central core.

MEIOSIS:

A form of nuclear division in which the cell's chromosome number is reduced by half.

MERMEN:

Male mermaids, imaginary fishlike, manlike creatures.

METABOLIC:

A celestial body that enters the earth's atmosphere and strikes the surface.

MISSING LINKS:

See transitional fossils.

MODEL:

A descriptive representation of a process or phenomena.

MORaine:

An accumulation of earth and rocks deposited along the edges of a glacier. There are three general types:

Lateral – ridges of material along the sides of a glacier.

Medial – ridge of material formed at center of two converging glaciers.

Terminal – ridges of material pushed up at the advancing edge of a glacier.

MUTAGEN:

Any agent that is capable of causing a mutation.

NATURAL SELECTION:

Process by which organisms with favorable variations are more likely to survive and reproduce than those with less favorable variations.

NATURALISTIC:

A belief that scientific laws are adequate for all phenomena, and denies that an event or object has a supernatural significance.

NICHE:

An organism's role in the ecosystem (e.g., producer, predator, scavenger, etc.)

ORGANIC:

Pertaining to things from living sources.

PALEONTOLOGY:

The scientific study of fossils.

PANGAEA:

A hypothetical supercontinent that was composed of all the present continents.

PERIOD:

A geological time unit longer than an epoch and shorter than an era (e.g., Cretaceous).

PRIMORDIAL:

Earliest formed or primitive. Used to describe the earth prior to the appearance of life.

RADIOACTIVE DECAY:

The process of one element becoming another by giving off particles and rays.

RADIOMETRIC AGE:

The age determined by comparing the amount of radioactive parent element and its stable daughter product present in the sample.

RECOMBINATION:

New arrangements of genes in offspring producing traits not exhibited by the parents.

SALINITY:

The concentration of salt in solution.

SANDSTONE:

Stone produced from grains of sand cemented together.

SCIENTIFIC METHOD:

A logical sequence of scientific processes used to solve a problem.

SEDIMENTARY DEPOSITS:

One or more sedimentary strata recognized as a unit for description, mapping, or correlation.

SEDIMENTATION:

The depositing of silt, mud, sand, and gravel by wind or water.

SHALE:

A laminated sediment that is composed of very fine particles of rock, mud, and silt.

SILICA:

Silicon dioxide, the principle component of sand.

SPECIES:

Those organisms that can interbreed to produce a fertile offspring.

SPONTANEOUS GENERATION:

A now-disproved theory that living organisms could be formed from nonliving matter.

STRATA:

Beds or layers of rock (plural of stratum).

STRATIFIED:

Arranged in layers.

SUBDUCTION:

The process of one crustal plate descending beneath another.

TAXONOMY:

The science of classification.

TECTONICS:

The branch of geology concerned with the structure of the earth's crust and the movement of continental plates.

THEORY:

A plausible or scientifically acceptable general principle or body of principles offered to explain phenomena. It is subject to modification as more data are collected.

TRANSITIONAL FOSSILS:

Missing links or fossils that are halfway between two kinds of organisms.

TRILOBITES:

Extinct sea creatures that resemble pill or sow bugs.

U-SHAPED VALLEY:

A valley with gentle curved slopes formed from the forces of moving glaciers.

ULTRAVIOLET RADIATION:

Invisible light energy situated between the violet end of the visible spectrum and X-rays; a normal component of sunlight that promotes skin tanning.

UNIFORMITARIANISM:

A belief that suggests that past events and processes occurred at regular and predictable rates similar to those observed today (the classical concept that the present is the key to the past).

APPENDIX

Distribution of Flood Legends by Area

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