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THE BIBLE AND GEOLOGY

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THE BIBLE AND GEOLOGY*Elaine Kennedy**Geoscience Research Institute***Introduction**

A variety of aspects may be explored when writing about the topic the Bible and geology. One might discuss the development of scientific philosophy and its relationship to the Christian community, the harmony between the Bible and nature, the diversity of views held by various denominations and their responses to the scientific community; however, this paper approaches the dialogue between scientific conclusions and personal faith with the assumption that the Bible is the final authority, the foundation of all truth.

Beginning with the authority and historicity¹ of the Bible, the paper outlines the importance of the biblical texts that create guidelines and boundaries for interpretation of nature in general and in personal research. Application of this approach as a means of bolstering faith in the Christian classroom is presented briefly, followed by evidences from the rock record that seem to me to be consistent with the biblical account of a worldwide flood.

Each person's acceptance, modification and/or rejection of the authority and historicity of Scripture as God's word will determine the individual's response to the evidence with regard to earth's prehistory. Trust in God's word developed through one's personal relationship with Jesus Christ is foundational to one's world view.

The Biblical Foundation

Within the Christian community, each individual's position on the historicity of Scripture naturally forms the basis for any discussion of earth's history and prehistory. The prehistoric period is specifically addressed in Genesis 1-11, and within these chapters, we find astounding accounts of

global creation and devastation that must have left striking evidences within the earth's crust as mute testimonies of their occurrences. Acceptance of these evidences as support of the biblical narratives is dependent on each person's world view and especially on one's confidence in the historical accuracy of the Bible. It is little wonder then that the large agnostic, scientific community² would have difficulty recognizing geological evidence for a global catastrophe responsible for the majority of the earth's crustal deformation, deposition and erosion, as well as the fossiliferous remains buried within it.

In general, many in the Christian and most in the non-Christian geological communities summarily reject the historicity of Scripture with respect to earth's prehistoric existence; however, this has not always been the case. In the eighteenth century geologists were Christian men who firmly believed in the biblical account of a global catastrophic flood.³ In the early 19th century theories of multiple catastrophes were promoted by Georges Cuvier, d'Orbigny and William Buckland. These men suggested that the effects of the biblical flood could be seen in erosive surface features and, according to Buckland, in deposits of sediments associated with tropical animals found in Yorkshire.⁴ At the time the theories were hailed by the Protestant and Catholic churches as glorious victories against skeptics that provided evidence for the truth of the Bible.⁵ Unfortunately, the restriction of the biblical flood to the uppermost sediments created serious problems because subsequent work by Agassiz and others identified these deposits as remnants of glaciation⁶ and thus, the widely touted evidence of a global flood was nullified by the scientific reinterpretation of the deposits. During this time a localized flood theory advanced by John Pye Smith, a theologian, was successfully promoted and gained archeological support from Woolley and Langdon in the 20th century.⁷ Subsequent archeological work disproved their claims⁸ but regional flood theories continue

to enthrall the theological community and the public at large (e.g., the most recent theory suggests the rapid filling of the Black Sea could be the source for the biblical flood account.⁹)

As new scientific theories were advanced, theologians seemed to have accepted their claims despite the implications such theories had, and still have, regarding the historicity of scripture and the very authority of God's word in matters of earth's prehistory. The desire on the part of the church leaders to be scientifically up-to-date plunged them into a quagmire of theological implications for which they were unprepared, and ultimately resulted in the loss of biblical authority as the final test of truth within the churches. Consequently, confidence in the truth of scientific theories, conclusions, and in some cases, speculation has led many people to reject the authority and historicity of Scripture, particularly in the area of earth's prehistoric era.¹⁰

Today a very articulate and vocal minority of scientists from a variety of disciplines urge the scientific community to recognize the inadequacy of Darwinian and Neo-Darwinian evolutionary theory and the validity of intelligent design in nature.¹¹ Within Adventism, scientists such as Price, Clark, Coffin, Brand and Roth have advocated throughout the years in numerous publications not only the existence of an intelligent designer but supported the authority and historicity of the Bible particularly in the area of earth's prehistory.¹²

A new generation of flood geologists and other scientists are urging their colleagues, the Christian community and the general public to refrain from seeking scientific arguments to bolster their faith in the Bible.¹³ Evidences and theories consistent with the biblical account do not prove the events, nor do evidences and theories contrary to the biblical account disprove them. These scientists believe that God's word is the foundation and guide to truth, and the testing ground for the evidences and theories that may be advanced regarding the creation/flood issues found in Genesis

1-11. Such beliefs are personal choices based on personal experiences since even the position one takes with respect to the authority and historicity of the Bible is dependent on personal experiences, i.e., the development of trust in God and His word. On this foundation new research is being conducted not to prove God's word but rather to seek answers to the 'how' and 'why' questions presented in Scripture but rarely addressed by scientists.

The Biblical Constraints

While the biblical account of creation and the flood is not couched in scientific language, it nevertheless supplies us with specific information that functions as a guideline in our study of Earth history. Many of these specifics create serious problems for researchers because we do not have the expertise to evaluate the language of the Bible and the validity of the conclusions we draw from the specific information that is provided regarding these events. Since we need a good, solid biblical exegesis, it is important that researchers dialogue with theologians, as they develop models and concepts about the unique events recorded in Scripture.

In the first two chapters of Genesis¹⁴ we read the biblical account of creation; however, it is difficult to determine from the text exactly what is being created with respect to our earth as it is today. For example, on the first day, was the earth covered by water or were the rock and water created *ex nihilo*? How is the third day geologically distinct from the creative acts of the first day?

Can we tell from the geologic record whether some layers in the crust of the earth were a part of the original creation? Geologists often refer to basement rocks but this term has multiple meanings. Basement rock can be igneous¹⁵ rocks, mafic¹⁶ metamorphic¹⁷ rocks, the Precambrian¹⁸ units or simply layers lower than those units being studied by the geologist. Structural features in the Precambrian rocks suggest reworking and metamorphism that may have occurred on day one of

creation, day three of creation or during the Genesis flood.

In Genesis two, verse five the Bible says "for the Lord God had not caused it to rain upon the earth." This statement can be understood in several ways: it may mean that it did not rain in the garden of Eden that it did not rain until after the Fall of humanity, or that it did not rain until the time of the Flood. Ellen G. White comments in *Patriarchs and Prophets*¹⁹ that there was no rain on the earth prior to the Genesis Flood. This concept has far-ranging implications with regard to geological processes. Although rivers move large amounts of sediment and constantly rework the material, as well as the landscape, the bulk of this activity occurs during a flood stage. Without storms, there is no mechanism for flooding rivers and moving vast amounts of sediment; thus, delta development would be minimal. Rates of erosion, transport and deposition would be expected to be less than they are today because increased vegetation in terrestrial, fresh and marine water systems would retard erosion in the preflood world. However, some have suggested that the original area that was vegetating was restricted to the Garden of Eden and that it was the responsibility of Adam and Eve and their descendants to plant and populate the earth. If this was the case, the barrenness of the earth would have lent itself to higher rates of erosion and contributed to significant sediment deposition that might be recognizable in the geologic record. It might be helpful if researchers had easy access to papers with relevant passages that have been subject to a proper exegesis in order to acquire clues to the vegetative state of the preflood earth, how much time passed prior to the flood plus how much time has passed since the flood. As yet we do not have firm chronological parameters to help us ascertain the time frames available for pre- and post- flood deposition and erosion.²⁰

Scripture also tells us that the oceans have restricted boundaries today²¹ so Christian geologists expect modern coastal marine environments to remain relatively stable. Most geologists

would not agree with this statement because there is a geologic record filled with marine transgressions and regressions²² that they believe occurred over millions of years. For flood geologists the Genesis Flood is regarded as an event that interrupted marine stasis,²³ and some of these geologists suspect that the marine system was more stable prior to that event than it is today. It seems likely that at least two thousand years prior to the flood, sediment in the lower part of the geologic column was deposited through various organic and inorganic processes in marine and fresh water systems. We have difficulty researching some of these concepts because we do not know the limitations of our biblical interpretations.

From these examples it should be obvious that how Christian geologists interpret the biblical information affects how they interpret the geologic record. Within the scientific community the previous statement is very objectionable and in some ways it is very uncomfortable for me as well because scientists view this statement as religious bias; however, the biblical narrative of Earth's history and prehistory provides the perspective that shapes the research done by flood geologists. In addition, the scientific community and even most of the Christians working within the scientific community has difficulty accepting the validity of a Bible-based perspective as the prime motivational factor for research on earth's history and prehistory. To acknowledge that one's personal bias, working hypothesis and motivation for research have their origin in the Bible is anathema to the scientist. Yet, acknowledging constraints from a biblical or a religious perspective does not *a priori* invalidate the hypothesis or model, or identify the work and/or worker as unscientific.²⁴

Biblical constraints have been extremely useful for eliminating needless repetition of previous work, focusing the scope of the study, suggesting research to be done, and confirming

conclusions. Flood model development would be greatly enhanced by access to theological implications and interpretations of key texts in Genesis 1-11.

Biblical Influence on Personal Research

As a geologist and scientist, I enjoy puzzles. I like to look at the rocks and try to figure out where they originated, how they were transported, what organisms inhabited the original environment, what organisms inhabited the environments where the sediments were deposited, and what changes have occurred in rocks since their deposition. As a Christian geologist, I like to take these little puzzles, fit them into the much bigger puzzle found in Genesis 1 through 11, and finally place them in the larger context of the Great Controversy. I have not always approached my geological research from this perspective; nevertheless, I have found this approach both challenging and rewarding.

As to the specific influence of the Bible on my personal research, the Bible provides fundamental guidelines that leave me free to do my work using standard geological methodologies while urging me to consider new ideas, and to explore concepts related to time that are not currently accepted within the geologic community.

Having read the biblical account of the worldwide flood I was convinced that there must be evidence of this event in the geological record, and since various aspects of the geologic record had previously suggested to me that this is true, I suspected that it might be possible to define the sequence of flood events from these data. Therefore, my primary interest does not lie in the area of proving the flood but rather developing criteria that would help us define the flood stages that must have existed as water rose and fell across the surface of the earth.

For example, if multiple levels of dinosaur nesting, indicative of multiple nesting seasons,

could be documented, it might be possible to determine the sediments that were deposited either before the flood or after the flood. Knowing where the flood began and ended in the rock record would greatly enhance our ability to develop a comprehensive flood model. Flood geologists recognize that the Genesis Flood was a supernatural event and they are not necessarily trying to explain how God intervened; rather, they are trying to explain the natural processes that are related to the flood activity and the record of their effects preserved in the earth.

Some of my research has been conducted in Patagonia, Argentina, where dinosaur nest sites have been reported.²⁵ It is common in the literature to find localities that are touted as nest sites with no evidence to support that contention except the presence of an egg or multiple eggs. At this locality, multiple eggs occur three-dimensionally within the cross-bedded²⁶ and obviously transported sandstone unit. Several meters below that sandstone lies a mudstone²⁷ unit that does not contain eggs but does contain numerous eggshell fragments. The mudstone itself appears to be a single event and most likely a turbidite.²⁸ The orientation and distribution of the eggshell fragments within the mudstone support the conclusion that the deposits do not represent dinosaur nesting sites.

Even at localities where nest structure has been reported, the evaluation has not been completed within the larger context of the sedimentological setting. In Montana crevasse splays that commonly develop when a river breaches its levee and drops sediment on the flood plain have been identified as dinosaur nests when they contain dinosaur eggs and eggshell fragments. My preliminary sedimentological evaluation of one site demonstrated that the eggshell fragments and the eggs had been transported by the waters depositing the sands and muds of the crevasse splay.²⁹ There was no evidence of nesting at the localities where I worked, even though I was predisposed to find not only nests but multiple layers of nests as well because I was hoping to collect data that might be used to

describe flood stages.

There are additional questions to be addressed with regard to such deposits from the biblical perspective. Christians want to know how dinosaurs fit into the picture of creation and the flood. Did God create the enormous carnivores and put them in the garden of Eden? If God created them, why are they extinct? Were they killed by an asteroid or by the worldwide flood or both? If there are true dinosaur nests in the record, how do they fit into the flood story? Were these nests deposited before the flood, during the flood, or after the flood? How do we explain such behavior within the context of such a tumultuous and catastrophic event? These are the kinds of questions that are being asked as I present lectures about Earth's prehistory to a wide variety of Seventh-day Adventist audiences. Because I do not have good answers for these questions, research in this area seems very worthwhile; however, my primary interest in the dinosaur nests arises more from the influence of the biblical creation and flood accounts (i.e., the origin of all the basic kinds of animals during a creation week and the flood stages generated by the rising and falling of waters) than from any other source.

Placing the geological questions within the context of the biblical flood broadens the scope of research. For example, Dr. Arthur Chadwick and I have been working on a project in the Grand Canyon.³⁰ More than 20 years ago Dr. Chadwick found structures in a sandstone that contradicted currently promoted models regarding its deposition. He gathered data and presented it to the geologists at a professional meeting.³¹ Unfortunately they were not impressed and insisted that he go back to the Canyon where he would find data that supported the commonly held model. Six years ago he invited me to study this sandstone with him and I was thrilled to have the opportunity to look at this particular puzzle because the sandstone sits above rock units that might have been a part of the preflood world. The current explanation for this sandstone contends that it was deposited in a shallow

transgressing sea. Our data suggest an entirely different model, one in which deposition occurred in very deep water.³² Within the flood context, the depth of the water is actually irrelevant but the implications of the work are far ranging for sedimentological interpretations. The nature of the sandstone contact with the underlying units is striking, and it may have important implications with regard to the onset of the Genesis flood. This relationship however cannot yet be demonstrated.

The challenges that such research provides for Christian geologists may at times seem overwhelming; however, our confidence in the historicity and authority of Scripture provides impetus for continued research. Indeed, the biblical narratives buoy our spirits and urge us to demonstrate high ethics and quality research to the secular scientific community.

Teaching Geology in a Christian School

Teaching geology in a Christian school is not going to be easy because stereotypes, held by the geologic community with regard to Christianity³³ and vice versa,³⁴ increase the hostility and resistance to the teaching of earth science in our schools. In addition, geologic concepts and even terminologies are fraught with evolutionary and chronological implications that complicate the presentation of the material for our teachers. Geologically oriented publications have logical, well-rehearsed interpretations of the data that ignore a wealth of biblical information as well as the theological implications of their conclusions. For these reasons it is vital that earth science be taught in our elementary schools, junior academies, senior academies, colleges and universities worldwide. The problematic nature of the discipline provides our educators with a golden opportunity to teach our students how to think, how to separate data from interpretation, how to analyze methodologies and compare techniques against the validity of a conclusion. The discipline has an enormous vocabulary designed to facilitate communication of information and concepts; however, too much

time may be spent memorizing just the facts and vocabulary. In addition, our concept of quality education requires that students perform well on standardized exams; thus, earth science teachers regardless of their background in geology are placed in a very uncomfortable position. The time available to them to instruct the students beyond the basic information is typically inadequate.³⁵ Our educators need to strike a balance -- to present information in their classrooms and teach the students how to think, how to analyze, how to evaluate, how to integrate what they are receiving into their belief system.

For example, a class exercise to demonstrate how to separate data from interpretation could use an article from a newspaper or national magazine written on some geologically interesting site or some exciting new fossil. As the students compile their lists of data, comparisons would be made and the merits of the data discussed. Once the data have been thoroughly separated from the interpretations, the class would participate in a brainstorming session to develop other explanations for the data. In the next step, students would incorporate data from biblical and historical sources to draw conclusions regarding compatibility of various ideas with their personal beliefs. Data that are better or more easily explained from a long age model provide an opportunity to illustrate that we do not have all the answers and that our beliefs are based on the authority and historicity of Scripture rather than any scientific proof. Such techniques could then be applied to all of their reading assignments.

Such an education is challenging not only to our teachers but also the students. Our young people typically want to know what will be required for the next test. They want answers because they are not really interested in the complex scientific paradigms. Church leaders, pastors, teachers, and members often want us to just give them the answers, as well. Our world is filled with complex

environmental and political problems that are related to geology so our students should be prepared for the reasoning that is required to make honorable choices, influencing our world for God.

Teaching geology gives us a platform for true education, an opportunity to challenge our students to think for themselves rather than to parrot their teachers and professors in our academies, colleges and universities. It also gives us an opportunity to impress upon our students the importance of a foundation based on the validity of Scripture as a guide, not only in the spiritual life, but also in the practical matters that we must deal within our world.

Geology and Faith

Four aspects of geology have affirmed my faith through the years. For example, there is a series of philosophical comments in my first geology textbook that admits scientists might ascribe many of the features we see in the rocks to a catastrophic, worldwide flood and that such an explanation is legitimate. The authors of the text go on to say that the same features can be generated over long periods of time, and thus, the cataclysmic explanation is not needed.³⁶ However, the admission that the structures in the rock record can be attributed to the Genesis Flood without impugning my integrity as a scientist.

Most important are the details from the rock record that indicate a shorter chronology than that proposed by the secular geologic community. Within the geologic record there are numerous contacts among the layers that show little evidence for the passage of time. These contacts may have no evidence of continuing deposition and have little erosion; they may be gradational³⁷ or lithologically³⁸ continuous. Typically the time frames denoted by the layers are based upon fossil content or from radiometric dates determined from associated volcanic ash beds or lavas and do not match the sedimentological data associated with the contact.

Sedimentologically, there is abundant evidence for catastrophic deposition, rapidly deposited sequences but little evidence for extremely long-term deposition. Sedimentation is aperiodic; erosion and deposition occur in short-term events.³⁹ Deposition that is considered long-term is based on the time postulated for the development of a particular environmental system or estimated time necessary for evolutionary development of the fossils contained in the deposit or associated radiometric dates. The validity of the time required to generate these deposits depends to some extent on the validity of the interpretations. For example, coal beds are thought to have formed on deltas; however, upright trees in these beds indicate the sediments were rapidly deposited because these trees must have been buried and preserved before they rotted.⁴⁰ The time required for the growth and development of the swampy, deltaic environment does not coincide with the preservational needs of the deposit.

Since structural relationships of these environments may be affected by tectonic⁴¹ and marine activity that can be explained by a highly complex worldwide flood or the conventional model, what one believes about the mechanisms generating these deposits is a choice based on personal world view. (It should be noted however that the conventional models imply, and some might say they require, that God function very differently from His own explanation of His character in the Bible.) These sedimentological features are consistent with the biblical chronological data in the Genesis account of earth's prehistory.

Secondly, there are numerous deposits with similar types of rock, fossils, and chemistries that are regionally extensive but geographically isolated from each other all over the world. For example, Cretaceous⁴² chalk beds are found worldwide; Permo-Triassic⁴³ salt beds and red beds are found throughout Europe, eastern and western North America, Argentina and China; Mississippian⁴⁴ limestones in western and eastern North America as well as in western Europe contain similar fossils

and have strikingly similar lithology. Devonian⁴⁵ limestones containing rugose corals⁴⁶ and stromatoporoids⁴⁷ were deposited in southwest England, Belgium, northern France, southwest Germany, Moravia, U.S. Midwest, Canadian Rockies and western Australia. There is also a worldwide Cambrian/Precambrian⁴⁸ sequence of a basal conglomerate⁴⁹ overlain by an orthoquartzite,⁵⁰ glauconitic⁵¹ sandstone, shale and capped by limestone.⁵² The deposition of these units with their diverse sedimentological and paleontological features raises fascinating questions about source areas and a possible global depositional mechanism.

Thirdly, the concept of plate tectonics supported by the maps of ridges, earthquakes, and volcanoes worldwide has made it clear to everyone that at some time in the past the crust of our earth was shattered worldwide.⁵³ The exact cause of this shattering is not known but the fracture system suggests movement of the crust on an extremely large scale. Such massive upheaval is consistent with a biblical view for earth's prehistory.

Another aspect of the geologic record that provides clues to events that occurred during the Genesis Flood is the mass mortality deposits. Not every roadside outcrop contains fossils but the geologic record is replete with extensive beds of dead organisms. Trilobites dominate the Cambrian deposits worldwide. Devonian deposits are referred to as the age of fishes because, although other organisms are preserved in these beds, extinct fish dominate them. The Morrison Formation extends from Texas to Canada and can be identified by its position in the layers, the types of rock in the unit, as well as the dinosaur fossils found within it. The London Clay contains seeds and pods from a wide variety of plants and the Green River Formation is well known for its fossil fish, palm fronds, oil shale, bivalves, mammals, and birds. The most interesting aspect of these units and their fossil data is the sequence, the order that is easily discerned in the fossil record.⁵⁴

Although I have been generally and somewhat favorably impressed with the concept of ecological zonation⁵⁵ as an explanation for the fossil sequence, I have not been able to resolve the detailed sequencing found in the record to my personal satisfaction. The sequence may be attributed to a complex variety of processes such as source areas, transport and sorting, survivability, rapidly changing environmental conditions, sequential destruction of ecological niches. A statement by Ellen White suggests to me that there is an answer to this puzzle that may be directly related to God's purposes.⁵⁶ I do not have that answer but I do have an idea that is totally unacceptable to most scientists yet very appealing to me as a believer.⁵⁷ If the Genesis flood is truly the undoing of creation, then it seems reasonable to assume that any action on God's part, in the midst of the flood's chaos, should reflect His character as a God of order. This does not require a correlation between the sequence of events occurring during creation and the sequence in the geological column. However, if the assumption is correct, the sequence itself would provide strong evidence that the Genesis flood involved not only catastrophic natural processes but did in fact occur within the context of a supernatural calamity.⁵⁸ At present I cannot think of any way to scientifically demonstrate this concept. Having said that I would like to reemphasize that the acceptance of the Genesis flood as a judgment of God does not preclude the study of that flood and the processes contributing to it, including the sequence/the order in the geologic record.

The geologic evidence does not compel me to believe the Bible but it is faith affirming because as I look at the geology I can see evidence for the Genesis Flood. I see the destructive results of human sin in the corruption and mass mortalities found in the rock record. I am appalled at what sin has cost our world and our God. Although organisms do change, the fossil record indicates that there is no grand scheme of evolution. The fossil record is a record of death that predicts that species

go extinct and then are replaced by something else. Thus, humans will go extinct according to the fossil record and there is no hope, there is no future, there is no afterlife, no heaven or hell, nothing. That is the interpretation offered to us by the secular scientific community in regard to the fossil record.

Conclusion

The Genesis Flood is described in the Bible as a judgment from God, the undoing of the creation, and this required the almost total destruction of life on our earth. Within a short chronological context the fossil record contains abundant data consistent with a worldwide Flood. The problems of chronology and sequencing do not support our belief system; to believers these issues are a matter of faith. In addition to our personal experiences with Jesus Christ and despite the chronology and sequencing problems, there is ample geologic evidence⁵⁹ that can be interpreted in a manner consistent with our position thus, encouraging our confidence in God's Word.

Evidence of large-scale, high-energy deposition of sediments, contortion of rock layers, displacement of mountains, rapid movement of rock units, devastation of organisms and massive erosion certainly can be interpreted within the context of a long chronology for earth's history; however, this evidence is also consistent with the short chronology proposed by the biblical account of creation and the worldwide flood. This evidence is subject to interpretation based upon one's world view. My own world view has been shaped by my trust in God's word, and that trust has been built on my personal relationship with my Redeemer.

My biblical understanding of the fossil record is very different from the current interpretations presented by the geologic community. The biblical account of the Genesis Flood records God's continuous action to preserve life. God warned Noah that the flood was coming and God used Noah

to preach to the people in an effort to save lives. God gave Noah specific instructions so that he would build an ark for the preservation of a wide variety of land dwelling organisms. Ellen White tells us that if God had not protected the ark during the Flood, it would have perished.⁶⁰ The shattering of the earth's crust that is documented in the geologic record would seem to support that statement. From the text in Genesis⁶¹ it seems clear that human sin was responsible for the Genesis Flood just as Scripture informs us that we are responsible for the current situation in which we live. The book of Genesis records God's actions as the creator and author of life. The authenticity and historicity of Scripture and including especially those texts found in Genesis are the foundation for my belief that God is not only the Creator but also the Redeemer of this world.

Endnotes

1. The term "historicity" is not used as a technical term in this paper; but rather, as a truthful and reliable account of an event that actually occurred, i.e., a real event and genuine account of earth during its prehistory.
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4. *Ibid.*, p. 92-93.
5. *Ibid.*, p. 94.
6. Tarbuck, Edward J. and Lutgens, Frederick K. 1987. *The Earth: An Introduction to Physical Geology* (2nd edition): Merrill Publishing Co., Columbus, p287-288. See also: Rehwinkel, Alfred M. 1951. *The Flood: Concordia Publishing House, St. Louis*, p298-300.
7. Morris and Whitcomb, p. 109-110.
8. *Ibid.*, p. 111.

9. Ryan, William and Pitman, Walter C. 1997. Noah's Flood: The New Scientific Discoveries About the Event that Changed History: Simon & Schuster, Inc., NYC, 319p. See also Stiling 1997. The Diminishing Flood: Ph.D. Dissertation, University of Wisconsin.
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13. Ashton, p. 229-360.
14. Biblical references are from the King James version.
15. Rocks cooled from a molten state.
16. Dark, dense rocks.
17. Rocks altered by heat and pressure.
18. The geologic record is described within the context of a worldwide, idealized composite of the crustal layers of the earth that is known as the geologic column. There are four major sections in the geologic column that are denoted as the Precambrian, Paleozoic Era ("ancient life"), Mesozoic Era ("middle life"), and Cenozoic Era ("recent life"). From the base of the geologic column the deposits occur in the following order: Precambrian, Paleozoic Era (Cambrian, Ordovician, Silurian, Devonian, Mississippian and Pennsylvanian – also known as the Carboniferous, Permian), Mesozoic Era (Triassic, Jurassic, Cretaceous), Cenozoic Era (Tertiary– Paleocene, Eocene, Oligocene, Miocene, Pliocene; Quaternary– Pleistocene).

19. White, Ellen G. 1958. *Patriarchs and Prophets*: Pacific Press Publishing Association, Mountain View, CA, p. 96-97.
20. Chronologies for recent earth or old earth/young life are not really needed due to the inconsistency between the nature of God as portrayed in the Bible and the life of Christ versus the fossil record filled with wanton catastrophic destruction of life over postulated millions of years.
21. Psalms 104: 5-9; Jeremiah 5: 22.
22. Rise and fall in sea level.
23. Stable sea level.
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26. An inclined bed deposited by wind or water currents.
27. Hardened, fine-grained mud.
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33. Allen, John Eliot, Burns, Marjorie and Sargent, Samuel C. 1986. *Cataclysms on the Columbia*: Timber Press, Portland, Oregon, p. 1 – 73.
34. Personal communication with church members, pastors and church leaders, 1991-2000.
35. Personal experience, 1983-85, 89-90.
36. Stokes, William Lee and Judson, Sheldon 1968. *Introduction to Geology: Physical and Historical*: Prentice-Hall, Inc., Englewood Cliffs, New Jersey, p. 296.
37. Continuous deposition of sediments across the contact from one unit into the overlying unit.
38. Lithology refers to the type of rocks occurring in a deposit. For a unit to be lithologically continuous requires that the rock type remains the same both laterally and vertically regardless of the paleontology i.e., fossil content.
39. Ager, Derek V. 1981. *The Nature of the Stratigraphical Record*: Macmillan Press, London, p. 42.
40. In Louisiana bayous experiments conducted in the '50s, wood and plant material rotted within two weeks. Personal communication from Dr. Maurice Powers.
41. Forces and structures associated with crustal movement.
42. Cretaceous deposits occur at the top of the Mesozoic and immediately underlie the Paleocene in the Cenozoic. See endnote 16.
43. Permian deposits are found at the top of the Paleozoic Era. The Triassic deposits overlying the Permian deposits constitute the base of the Mesozoic Era. The Permo-Triassic refers to deposits in the geologic record that are individually designated as the Permian and the Triassic. See endnote 16.
44. The Mississippian is the basal portion of the Carboniferous which underlies the Permian. See endnote 16.
45. Devonian deposits underlie the Carboniferous in the Paleozoic. See endnote 16.
46. Solitary, conical or cylindrical, massive or branching coral. Some varieties are commonly called horn coral.
47. Organisms known only from their encrusting, calcareous skeletons with sub-horizontal to laminar, open network structure.
48. Basal units in the geologic column. See endnote 16.

49. A sedimentary rock composed of cemented, rounded pebbles and/or cobbles and/or boulders.
50. A "pure" quartz sandstone.
51. A green-colored mineral in the mica group.
52. Ibid, p.7-8. See also: Ager, Derek V. 1993. *The New Catastrophism*: Cambridge University Press, Cambridge, p. 41-49.
53. I am assuming the existence of a Pangaeian sea during some part of the Genesis flood without precluding geographically separated, large seas associated with the continents pre-flood.
54. Note: The fossil record is not perfectly ordered. See, Raup, David M. 1981. *Evolution and the Fossil Record*: Science (Letters) 213(4505):289.
55. The concept of ecological zonation is described by Harold Clark.
Clark, Harold W. 1968. *Fossils, Flood, and Fire: Outdoor Pictures*, Escondido, CA, p. 55 – 60.
56. White, p. 112: "In the days of Noah, men, animals, and trees, many times larger than now exist, were buried, and thus preserved as an evidence to later generations that the antediluvian perished by a flood. God designed that the discovery of these things should establish faith in inspired history; but men, with their vain reasoning, fall into the same error as did the people before the Flood– the things which God gave them as a benefit, they turn into a curse by making a wrong use of them."
57. There are several ways to define the term supernatural, but with respect to the concept I am proposing I am restricting the definition to an event caused by a special act of God that includes natural processes, i.e. including processes that lie within the realm of scientific inquiry.
58. Genesis 6:17.
59. Brand, p. 266.
60. White, p. 100.
61. Genesis 6:13