

A BIBLICAL APPROACH TO GEOLOGY

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INTRODUCTION

A variety of aspects may be explored when writing about a biblical approach to geology. One might discuss the development of scientific philosophy and its relationship to the Christian educational community, the harmony between the Bible and nature, the diversity of views held by various educational institutions and their responsibility to the scientific community; however, this paper approaches the dialogue between scientific conclusions and Seventh-day Adventist educational perspectives with the assumption that the Bible is the final authority, the foundation of all truth.

Beginning with the authority and historicity of Scripture,¹ the paper outlines the importance of the biblical texts that create guidelines and boundaries for interpretation of nature in general and in the classroom. Application of this approach as a means of bolstering faith in the Christian classroom is presented, followed by evidences from the rock record that seem to me to be consistent with the biblical account of a worldwide flood.

Each teacher's acceptance, modification and/ or rejection of the authority and historicity of Scripture as God's word will influence the students' response to the evidence with regard to its prehistory. Trust in God's Word developed through one's personal relationship with Jesus Christ is foundational to one's worldview.

¹ The concept of the historicity of Scripture is used in this paper as the description of a real event rather than as an historically documented account of the creation and the Genesis flood.

THE BIBLICAL FOUNDATION

Within the Christian educational community, each school's position on the historicity of Scripture naturally forms the basis for any discussion of earth's history and prehistory. The prehistoric period as specifically addressed in Genesis 1-11 includes 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 for the biblical narratives is dependent on each person's worldview and particularly on one's confidence in the historical accuracy of the Bible. It is little wonder then that the largely atheistic, 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. Consequently, earth science teaching materials for Seventh-day Adventist classrooms are difficult to obtain.

In general, those in both the Christian and non-Christian educational communities summarily reject the historicity of Scripture with respect to earth's prehistoric existence; however, this has not always been the case. Eighteenth century geologists were Christian men who firmly believed and taught the biblical account of a global catastrophic flood.³ In the early 19th century theories of multiple Catastrophism were promoted by George Cuvier, d'Orbigny and William Buckland. These

² Larson, Edward and Witham, Larry 1999. Scientists and Religion in America: Scientific American 281 (3):88-93. A random sample of scientists listed in American Men and Women of Science indicates 60% of the scientists are non-believers. The result of a poll of National Academy of Science members indicates more than 90% do not believe in a God who answers prayers and grants personal immortality (beliefs held about God throughout Christianity).

³ Morris, Henry M. and Whitcomb, Jr., John C. 1961. The Genesis Flood: Presbyterian and Reformed Publishing Company, Philadelphia, p. 91.

men suggested that the effects of the biblical flood could be seen in the 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 providing evidence for the truth of the Bible and were quickly incorporated into the educational systems of the day.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 eliminated by the scientific reinterpretation of the deposits. During this time a localized flood theory advanced by 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)

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* (second edition): Merrill Publishing Company, Columbus, p. 287-288. See also: Rehwindel, Alfred M. 1951. *The Flood*: Concordia Publishing House, St. Louis, p. 298-300.

7 Morris and Whitcomb, pp. 109-111.

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 and Schuster, Inc., New York City, p. 319.

As new scientific theories were advanced, theologians seemed to have accepted the ideas 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 and science educators 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 and educational system. 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 urge educators and school boards to recognize the inadequacy of Darwinism and Neo-Darwinism evolutionary theory and the validity of intelligent design in nature.¹¹ Within Adventism throughout the years, scientists such as Price, Clark, Coffin, Brand and Roth have advocated in numerous publications the existence of an intelligent designer and have supported the authority and historicity of the Bible the area of earth's prehistory.¹²

¹⁰ Roth, Areil A. 1998. *Origins: Linking Science and Scripture*: Review and Herald Publishing Association, Hagerstown, Maryland, p. 384.

¹¹ Denton, Michael 1985. *Evolution: A Theology in Crisis*: Adler and Adler Publishers, Inc., Bethesda, Maryland, p. 368. See also: Johnson, Philip E. 1991. *Darwin on Trial*: Inter Varsity Press, Downers Grove, IL., p. 195. Morland, J. P. (editor) 1994. *The Creation Hypothesis: Scientific Evidence for an Intelligent Designer*: InterVarsity Press, Downers Grove, IL., p. 335. Behe, Michael J. 1996. In *Six Days: Why 50 Scientists Choose to Believe in Creation*: New Holland Publishers, Sydney, Australia, p. 360.

¹² Price, George McCready 1916. *Back to the Bible or, The New Protestantism*: Review and Herald Publishing Association, Washington, D.C., p. 235. Coffin, Harold G. 1969. *Creation: Accident or Design? Or, Origin by Design*: Review and Herald Publishing Assn. Washington, D.C., p. 512. Brand, Leonard 1997. *Faith, Reason, and Earth History: A Paradigm of Earth and Biological Origins by Intelligent Design*: Andrews University Press, Berrien Springs, Michigan, p. 332. Roth, Ariel A. 1998. *Origins: Linking Science and Scripture*: Review and Herald Publishing Association, Hagerstown, Maryland, p. 384.

A new generation of flood geologists and other scientists are urging their colleagues, the general public, the Christian community and especially Christian educators to refrain from seeking scientific arguments to bolster their faith in the Bible.¹³ It is particularly vital that science educators refrain from using scientific arguments in the classroom to support the biblical narrative. The biblical accounts of creation and the flood are supported by faith, not science because all science is tentative. Scientific data may be presented as evidences consistent with the biblical account of earth's prehistory but neither evidences and theories with the biblical account prove the events, nor evidences and theories contrary to the biblical account disprove the events.

Many modern catastrophists like some of the earlier workers believe that God's word is the ultimate truth and 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 science. There are however a considerable amount of data that are more easily explained within the context of a short

¹³ Ashton, pp. 229-360.

chronology. There are data that are so consistent with what one would expect from the biblical account of earth's prehistory that one is not required to blindly believe the biblical texts. From this perspective faith may be affirmed without relying on the scientific data for the developing and/or the establishing of faith.

GEOLOGY AND FAITH

There are four aspects of geology that through the years have affirmed my faith. For example, there is a statement in my first geology textbook that admits scientists might ascribe many of the features we see in the rocks to a catastrophic, world wide 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.¹⁴ However, their admission that the structures in the rock record can be attributed to the Genesis Flood suggests their recognition of the validity of my catastrophic viewpoint without impugning my integrity as a scientist. Students should be made aware that the geologic community accepts the reality of catastrophic events in the geologic record and that despite the claims made by some of the more radical anti-creationists our belief system is valid.¹⁵

Most important are the details from the rock record that indicate a shorter chronology than that generally proposed by the geologic community. Within the geologic record there are numerous

¹⁴ Stokes, William Lee and Judson, Sheldon 1968. *Introducing to Geology: Physical and Historical*: Prentice-Hall, Inc., Englewood Cliffs, New Jersey, p. 296.

¹⁵ Ratzsch, Del 1996. *The Battle of Beginnings: Why Neither Side Is Winning the Creation - Evolution Debate*: InterVarsity Press, Downers Grove, IL., pp. 158-179.

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 gradational,¹⁶ or lithologically¹⁷ continuous. Typically the time frames denoted by the layers are based upon fossil content or radiometric dates determined from associated volcanic ash beds or lavas and do not match the data associated with the contact. Radiometric dates in particular are problematic for Adventist students because when they see numbers they think the numbers represent data; however, radiometric dates are not data. The data used to determine the dates consist of the distribution of isotopes in rocks or minerals. Radiometric dates are calculations from the data. This concept of data with respect to the nature of the contacts and the dating information needs to be emphasized and illustrated in our classrooms.

Sedimentologically, there is abundant evidence for catastrophic deposition, rapidly deposited sequences but little evidence for extremely long-term deposition. Sedimentation is episodic, i.e., erosion and deposition occur in short-term events.¹⁸ Deposition that is considered long-term is based on the time postulated for the development of a particular environmental system or estimated time required for evolutionary development of the fossils contained in the deposit. The validity of the time required to generate these deposits depends to some extent on whether or not the

¹⁶ Continuous deposition of sediments across the contact for one unit into the overlying unit.

¹⁷ Lithology refers to the type of rock 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 e.g., fossil content.

¹⁸ Ager, Dereck V. 1981. *The Nature of the Stratigraphical Record*: MacMillan Press, London, England, p. 42.

environmental setting has been correctly identified. For example, coal measures 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.¹⁹ 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 tectonic²⁰ and marine activity that can be explained by highly complex world wide flood or the conventional model, what one believes about the mechanisms generating these deposits is a choice based on personal world view. These sedimentological features are consistent with the biblical chronologies for the history of our earth and can be presented to our students without building a false foundation on science.

Secondly, there are the numerous deposits that are regionally extensive but geographically isolated all over the world.²¹ For example, Cretaceous²² chalk beds are found worldwide; Permo-

¹⁹ In Louisiana bayous, experiments were conducted in the 50's demonstrating that wood and plant material rotted within two weeks. Personal communication from Dr. Maurice Powers.

²⁰ Forces and structures associated with crustal movement.

²¹ The geological 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).

²² Cretaceous deposits occur at the top of the Mesozoic and immediately underlie the Paleocene in the Cenozoic. See footnote 21.

Triassic²³ salt beds and red beds are found throughout Europe, eastern and western North America, Argentina and China; Mississippian²⁴ limestones in western and eastern North America as well as in western Europe contain similar fossils and have strikingly similar lithology. Devonian²⁵ limestones containing rugose corals²⁶ and stromatoporoids²⁷ 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/Precambrian²⁸ sequence of a basal conglomerate²⁹ overlain by an orthoquartzite,³⁰ glauconitic³¹ sandstone, shale and capped by limestone.³² The deposition of these units with diverse sedimentological and paleontological features raises fascinating questions about source areas and a possible depositional mechanism.

23 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 footnote 21

24 The Mississippian is the basal portion of the Carboniferous which underlies the Permian. See footnote 21.

25 Devonian deposits underlying the Carboniferous in the Paleozoic. See footnote 21.

26 Solitary, conical or cylindrical, massive or branching coral. Some varieties are commonly called horn coral.

27 Organisms known only from their encrusting, calcareous skeletons with sub-horizontal to laminar, open network structure.

28 Basal units in the geologic column. See footnote 21.

29 A sedimentary rock composed of cemented, rounded pebbles and/or cobbles and/or boulders.

30 A "pure" quartz sandstone.

31 A green-colored mineral in the mica group.

32 Ager (1981), 7-8, See also: Ager 1993. *The New Catastrophism*: Cambridge University Press, Cambridge, England, 41-49.

Thirdly, the concept of plate tectonics supported by the maps of ridges, earthquakes, and volcanoes worldwide has made it clear to everyone that at sometimes in the past the crust of our earth was shattered.³³The 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, unique and extinct fish dominate them. The Morrison Formation extends from Texas to Canada and can be identified by its position in the layers, the rock in the unit, and the dinosaur fossils found in 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.³⁴

³³ 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.

³⁴ Personal observations and experiences supported by numerous general and historical geology textbooks. Note: The fossil record is not perfectly ordered. See, Raup, David M. 1981. *Evolution and the Fossil Record: Science (Letters)* 213 (4505): 289.

Although I have been generally and somewhat favorably impressed with the concept of ecological zonation³⁵ 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: source areas, transport and sorting, survivability, rapidly changing environmental conditions, and sequential destruction of ecological niches. This is a topic that presents serious difficulties for students in science. Many scientists believe that the fossil sequence disproves the biblical account of the worldwide flood. While we do not want to shake the faith of our students, we must be careful in the way that we present the concept of ecological zonation and the fossil sequence.

TEACHING GEOLOGY IN A CHRISTIAN SCHOOL

Teaching geology in a Christian school is not going to be easy. Stereotypes held by the geologic community with regard to Christianity³⁶ and vice versa³⁷ 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 frustrate teachers in our schools largely because very few of our teachers have any significant training in this field from a Christian perspective. It is for these reasons it is vital that earth science be taught in our elementary, junior academy, senior academy, colleges and universities worldwide. The problematic nature of the discipline provides our educator with a golden opportunity to teach our students how to think how to separate data from interpretation, how to analyze methodologies and compare processes against the

³⁵ The concept of ecological zonation is described by Harold Clark. Clark, Harald W. 1968. Fossils, Flood, and Fire: Outdoor Pictures, Escondido, CA, p. 55-60.

³⁶ Allen, John Eliot, Burns, Marjorie and Sargent, Samuel C. 1986. Cataclysms on the Columbia: Timber Press, Portland, Oregon, 1-73.

³⁷ Personal communication with church members, pastors and church leaders, 1991-2000.

validity of a conclusion. Unfortunately, the vast majority of educators present information in their classrooms and never have time to actually teach the students how to think, how to analyze, how to evaluate, how to integrate what they are receiving into their belief system.

This is a major problem when teaching geology. The discipline has an enormous vocabulary designed to facilitate communication of information and concepts; however, too much time may be quickly spent memorizing 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.³⁸

Our young people are perfectly normal students. They want to know what will be required for the next test. They want answers because they are not really interested in the maze-like, contorted, confusing innuendo of 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 problems but we often fail to prepare our students for the reasoning that is required to make choices in that world. Teaching geology gives us a platform for true education, an opportunity to challenge our students to think for themselves rather than to parrot those in authority over them. 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 in our world with which we must cope.

³⁸ Personal experience, 1983 – 85, 89 –90.

CRITICAL TOPICS FOR THE EARTH SCIENCE CLASSROOM

The topics of rocks and minerals is typically covered in four chapters during a college semester. There are of course on the college level individual classes that provide more detail for each chapter. In K – 12 this particular section is laboratory intensive. Instruction should include mineral identification, the rock cycle, classification, origin, and occurrence of igneous, sedimentary and metamorphic rocks. Class discussions may include topics such as the ultimate source for matter and energy in our universe, design in nature and the implications of the standard scientific conclusions with respect to our own theology. Astrology may be included in this discussion with respect to origin of the universe and matter or, it may be treated as a separate topic with more detailed coverage of the planets and their moons.

Tectonics

Classroom discussion on tectonics should include crustal deformation (faulting and folding), mountain building, and plate tectonics (earthquakes and the internal structure of the earth). Eight graders have difficulty with the three-dimensional modeling aspects of plate tectonics so some students may require entirely physical hands-on laboratory exercises. Theoretical conclusions drawn from data such as the seismic information relative to the internal structure of the earth can be used to illustrate limits of scientific knowledge.

Hydrosphere

Fresh surface and subsurface water, as well as marine systems, earth's atmosphere and the water cycle provide the introductory base for the discussion of weathering and erosion, toxic waste and environmental concerns, and humanity's responsibility toward the environment. This unit may

also include glaciers. Mass movement and wind erosion may be introduced briefly.

Natural resources

A brief section on ore deposits and energy resources (oil, gas, coal) may be presented to the students in conjunction with the section on environmental concerns. If the hydrosphere section includes geothermal waters with groundwater systems, then ore discussions should be included there and not presented as a separate unit. Energy resources could then be included in the section on fossils.

Geologic column

This unit should provide a fundamental understanding of the rock and fossil record and their interrelationship. Topics such as origin of life, fossilization processes, sequence of the fossil record, stratigraphy and associated rock types should be included with a thorough discussion of the implications for our faith. The nature of the fossil record as a record of death, sudden appearances and extinctions, rather than an evolutionary sequence is a critical concept for students.

Radiometric dating

This will probably be the most difficult unit for the students. The basic assumptions that are used in radiometric dating need to be outlined. Articles related to this issue have been published by the Geoscience Research Institute in Geoscience Reports and may be downloaded from the GRI web site (www.grisda.org).

This list of topics is not intended to be comprehensive and probably does not meet state or national requirements for earth science courses since many government guidelines include topics such as meteorology. Consequently, the broad overviews of the major periods in the Phanerozoic that are typically taught in standard geology classrooms have not been included in this list in order to provide flexibility for educators as they develop their class plans. In addition, teaching units that specifically address creation and the Genesis flood have not been outlined. It is hoped that these topics will be integrated into the entire curriculum.

CHALLENGING THE STANDARD GEOLOGIC CONCLUSIONS

As a geologist and scientist, I enjoy puzzle. 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 much more 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, to explore concepts related to time that are not currently accepted within the geologic community.

For example, I have been conducting research in Patagonia, Argentina, where dinosaur nest

sites have been reported.³⁹ 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 my locality, multiple eggs occur three-dimensionally within the cross-bedded and obviously transported sandstone unit. Several meters below that sandstone lies a mudstone 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. The orientation and distribution of the eggshell fragments within the mudstone support the conclusion that the deposit does not represent dinosaur nests.

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 the eggshell fragments and the eggs had been transported by the waters depositing the sands and muds of the crevasse splay.⁴⁰ There was no evidence of nesting at the localities where I worked even though I was predisposed to find not only nests but the multiple layers of nests as well because I was hoping to document data that might be used to describe flood stages.

³⁹ Kennedy, Elaine and Spencer, Lee 1995. An unusual occurrence of dinosaur eggshell fragments in a storm deposit, Lamargue Group, Patagonia, Argentina: Geological Society of America, Abstracts with Programs, 27:A - 318.

⁴⁰ Kennedy, Elaine 1997. Distribution of dinosaur eggshell fragments in an overbank deposit, Two Medicine Formation, Choteau, Montana: A preliminary report: Geological Society of America, Abstracts with Programs, 29:A-272.

There are additional issues, 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? 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 text than from any other source.

Having read the biblical account of the worldwide flood I was convinced that there must be evidence of this event in the geologic 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 this 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 waters rose and fell across the surface of the earth. If multiple levels of nesting indicative of multiple nesting seasons could be documented, it might be possible to determine the sediments that were deposited prior either to 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 recognized that the Genesis Flood was a supernatural event and they are not trying to explain how God intervened; rather, they are trying to explain the natural process that are related to the flood activity and subsequently preserved in the earth.

Placing the geological questions within the context of the biblical flood, broadens the scope of the projects. For examples, Dr. Arthur Chadwick and I have been working on a project in the Grand Canyon.⁴¹ 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.⁴² Unfortunately they were not impressed and insisted that they 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 pre-flood world. The current explanation for this sandstone contends that it was deposited in a shallow transgressing sea. Our data suggests an entirely different model, one in which deposition occurred in a very deep water.⁴³ Within the flood context, the depth of 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 unit is so striking it may have important implications with regard to the onset of the Genesis flood. This concept however cannot yet be demonstrated.

41 Chadwick, Arthur V. and Kennedy, Elaine 1998. Evidence for deepwater deposition of the Tapeats sandstone, Grand Canyon, Arizona, U.S.A.: 15th Sedimentological Congress, Alicante, Spain, p. 247

42 Personal communication with Dr. Arthur V. Chadwick, Department Chairman, Biology Department, Southwestern Adventist University.

43 Kennedy, Elaine, Kablanow, Ray and Chadwick, Arthur V. 1997. Evidence for deep water deposition of the Tapeats sandstone, Grand Canyon, Arizona: Proceedings of the Third Biennial Conference of Research on the Colorado Plateau, Charles van Riper, III and Elena T. Deshler (editors), Transactions and Proceedings Series NPS/NRNAU/NRTP-97/12, U.S. Dept. of Interior, p. 215 - 228.

The challenge that such research provides for Adventist 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 ethical and quality research to the secular scientific community.

It is my hope that students in Adventist classrooms will be encouraged to challenge the conclusions drawn by scientists with respect to earth's prehistory. In order to meet those challenges students must be well grounded in their faith and in the fundamental differences between data and interpretations.

CONCLUSION

The Genesis Flood is described in the Bible as a judgment from God, the undoing of the creation, and this requires the almost total destruction of life on our earth. Such destruction should have left a remarkable geologic record consistent with the biblical account. Within a short chronological context the fossil record contains abundant data corroborating a worldwide Flood. The problems of chronology and sequencing do not support our belief system; however, to believers these issues are a matter of faith. In addition to our personal experiences with Jesus Christ, there is ample geologic evidence⁴⁴ that is consistent with our position and encourages 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, wholesale destruction of life and massive erosion certainly can be interpreted within the context of a long chronology for earth's history;

⁴⁴ Brand, p. 266.

however, this evidence is also consistent with the short chronology proposed by the biblical account of creation and the worldwide flood. This evidence, this data is subject to interpretation based upon one's worldview. My own worldview has been shaped by my trust in God's word, and that trust has been built on my personal relationship with my Redeemer. It is my hope that geology will be taught in Adventist schools in such a way that students will be drawn to a knowledge of Jesus Christ and that their faith will be firmly grounded, not in science, but in God and His Word.

The geologic evidence does not compel me to believe the Bible but it does affirm my faith because as I look at the geology I see evidence consistent with the Genesis Flood. I see the destructive effects 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. The fossil record is a record of death and makes it very clear that there is no future for humanity. Organisms do change but the fossil record indicates there is no grand scheme of evolution but rather, that species go extinct and are replaced by new species. 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.

My biblical understanding of the fossil record is very different. 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.⁴⁵ The shattering of the earth's crust that is documented in the geologic record

⁴⁵ White, p. 100

would seem to support that statement. From the text in Genesis⁴⁶ 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. Genesis records God's actions as the creator and author of life. The authenticity and historicity of Scripture and 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.

⁴⁶ Genesis 6:13

Annotated Bibliography

NOTE: There are very few volumes that address the issue of "A Biblical Approach to Geology." Most of those worthy of mention are written by Ph.D.'s in biology rather than geology and are included here largely because they have published geologically-oriented field research. Many other authors could be mentioned; however, much if not most of their material is based on readings become young earth creationist literature or includes too many a substantiated assertions.

Allen, and John Eliot and Burns, Marjorie 1986. Cataclysms on the Columbia: A layman's guide to the features produced by the catastrophic Bretz floods in the Pacific Northwest: Timber Press, Portland, Oregon, 213p.

This volume is the story of the geologic research conducted in the state of Washington by J. Harlem Bretz. Parts I and II of this book deal with the opposition he encountered in the geologic community at the suggestion of regional catastrophic deposition and erosion across the states of Washington, northern Oregon and northwestern Idaho. The reading is fascinating and provides insight into the bias and misconceptions of the geologic community regarding the Genesis flood.

Brand, Leonard 1997. Faith, Reason, and Earth History: Andrews University Press, Berrien Springs, Michigan, 332p.

Dr. Leonard Brand is a biologist at Loma Linda University. His research emphasis has been on paleontological topics for many years. The purpose of his book is to stimulate discussion of Earth history issues and their integration with "and interventionist paradigm of Earth history."

Four chapters of this volume deal with geological issues:

Chapter 13 *The Geologic Record* compares the validity of the conventional and catastrophic approaches to geology. It also includes information on the basic rock types, segmentation processes and rates, depositional environment and patterns, as well as place the agent and the development of

the Ice Age. The chapter illustrates repeatedly how the same data may be interpreted by both theories. The latter portion of the chapter is devoted to stratigraphy and paleontology within the context of the geologic column and concludes with comments regarding a catastrophist's interpretation of the record. Overall, the chapter is well done.

Chapter 14 *Geologic Time* presents evidence supportive of, and in opposition to, catastrophism and conventional theories plus a discussion of radiometric dating. The supportive evidence for catastrophic time frames is focused on sedimentological factors; however, the chart on page 266 lists a wider variety of evidences for catastrophism.

Chapter 15 *A Catastrophic Theory of Earth History: General Principles* discusses the preflood world, general flood questions (e.g., where did the water come from?), and ecological zonation. His assessment of ecological zonation is particularly helpful.

Chapter 16 *A Catastrophic Theory of Earth History: Interpreting the Historical Record* includes a wide variety of topics. Flood stages and development are discussed in relationship to the Paleozoic and Mesozoic deposits. A short section follows on plate tectonics and mountain building activity during the flood. Brand's model then proposes and into the flood somewhere between the Cretaceous and the Pliocene and launches into a discussion of the post flood biogeographic distributions. Very brief comments on post flood evolution, Cenozoic basin development, the Ice Age, post flood humans and modern regional flood studies concluded the chapter.

The chapters are well-written with respect to the presentation and discussion of issues related to geology and a short chronology. Regardless where he ends the flood in the Cenozoic, some will argue that he will have problems with mammalian evolution. This book is excellent as a teacher's resource in both geology and biology.

Coffin, Harold 1983. Origin by Design: Review and Herald Publishing Association, Hagerstown,

Maryland, 494p.

Harold Coffin received his doctorate in biology from the University of Southern California. Early in his career at Geoscience Research Institute he focused his research on the Yellowstone Fossil "Forest." That work has been published in a special issue of *Origins* 24 (1) and can be obtained from Geoscience Research Institute, L. L. U., Loma Linda, CA 92350.

Much of this volume discusses specific localities and research in the context of geologic catastrophism. Unlike Brand, Coffin includes Cenozoic deposits in his flood model. He also uses the question approach like Clark for problematic areas of discussion. This volume includes three chapters by Robert Brown on age of the earth and radiometric dating. Coffin concludes his book with six chapters on biological issues.

This book is currently under revision. The present version appeals to a wide range of data and its applicability to flood geology; however, the chapter *Evidences of a Useful World* would have been much stronger had he presented a broader range of data to support the idea. This book is an excellent resource for the teachers and will help them clarify issues and impress their students with the difference between data and interpretation.

Giem, Paul A. L. 1997. Scientific Theology: La Sierra University Press, Riverside, CA, 291p.

Giem is an emergency room physician with an abiding interest in creation/evolution issues. He has devoted several years to literature research and personal interviews on radiometric dating. The book has an excellent section on radiometric dating in chapter 5: The Pentateuch and Joshua. The author's approach is science-based rather than faith-based.

Roth, Ariel A. 1998. *Origins: Linking Science and Scripture: Review and Herald Publishing Association, Hagerstown, Maryland, and 384p.*

Ariel Roth has a doctorate in biology and a broader formal background in geology that most

of the authors in this area. He approaches this issue from a science-based, rather than a faith-based position.

Section headings in this volume are: The Questions, Living Organisms, The Fossils, The Rocks, An Evaluation of Science and Scripture, and Conclusions. The chapter titled Geological Evidence for a Worldwide Flood could use more examples from outside the United States and the chart of erosion across the Colorado Plateau might be improved with a comparison of low relief marine surfaces compared to the ancient marine contacts. Overall the chapter makes strong points for the author's position and the book is well done with numerous illustrations and examples for each topic. This is an excellent book as a teacher's resource in both geology and biology.