
Pilgrimage in the Rockies: The AAF Geology Tour

by Karen Bottomley

During the past 10 years the issue of the age of rocks and life on Earth has repeatedly arisen within the North American Adventist community, but often only in the hushed whispers of church scientists or in public proclamations endorsing a "short chronology" published in the *Adventist Review and Ministry*. The 1985 AAF field trips and conference on geology and the biblical record proposed a new approach—to welcome any interested parties to participate in a study of the evidence from both of God's great books of revelation—nature and the Bible.

The sense that we were participating in a unique Adventist venture sparked an air of excitement as members of the first field trip met at the Hillview Inn near Price, Utah, on Sunday, July 28. Fifty-six adults plus assorted family members were gathered to explore the geological record in Utah and Wyoming for 10 days before joining the participants of the second field trip (conducted August 12-22) for a five-day conference at West Yellowstone to consider how geoscience and theology can be synthesized within the Adventist tradition. At this first meeting the scientists suggested that an understanding of the geological record should precede theological debates. To this end, each participant received road logs,

geological maps, and two 250-page binders filled with scientific articles. These materials were to be assimilated outside of the daily lectures, field examinations of geological strata, fossil hunting expeditions, and museum visits, which normally occupied the group from 8:00 a.m. to 9:00 p.m.

This wealth of material would have been overwhelming without the enthusiastic leadership of Richard Ritland, Edward Lugenbeal, Peter E. Hare and Bill Hughes. Ritland, who received a doctorate in paleontology and comparative anatomy from Harvard University, served as both field trip director and roving encyclopedia. He was assisted by "the Iceman," Ed Lugenbeal of Kettering Medical Institute, who studied theology at Andrews Theological Seminary and received a doctorate in the anthropology of early man at the University of Wisconsin; Peter Hare of the Carnegie Institute, who created a new analytic method of dating fossils while earning a doctoral degree in geochemistry at the California Institute of Technology; and Bill Hughes of Andrews University, who received a doctorate in paleobiology from Loma Linda University and completed post-graduate studies in Newcastle, England. Three of the leaders—Ritland, Lugenbeal and Hare—were returning to familiar country, having collaborated in previous field trips in the area while employed by the Geoscience Research Institute.

Karen Bottomley lives in Calgary, Alberta, and is completing a doctorate in European history from the University of Toronto.

The Field Trip

The field trip explored an area noted for its abundant plant and animal fossil deposits, magnificent mountain ranges and meandering river valleys. Our starting point was Price, an area rich with Cretaceous coal seams and strata, which have preserved dinosaur tracks, upright stumps and marine fossils. The caravan then headed north through the Unita Basin in Vernal. After a visit to the nearby Dinosaur National Monument, which features a spectacular display of the excavation of one of its 110 deposits of dinosaur bones from the Jurassic Period, we headed north along the Green River to Rock Springs, Wyoming. This route is publicized as the "Drive through the Ages," because numerous upthrusts and faults allow you to pass through eight of the 12 geological periods falling between the Cambrian and Quaternary systems.

The caravan proceeded north to the Fremont Lake area to learn how to differentiate between the age of two distinct Pleistocene glacial deposits—the Pinedale and the Bull Lake—by examining soil, pebbles and weathering patterns. After backtracking to skirt the edge of the Wind River Mountains via the Southern Pass of the Oregon Trail, the group proceeded northeast to Lander and the Boysen Reservoir. Here the sharp cliffs of the Wind River Canyon revealed massive weathered upthrusts of Precambrian metamorphic rock streaked with distinctive pink and white intrusive granite. The next stop was Dubois, which served as a base for a short jaunt to Whiskey Canyon to examine Precambrian rocks grooved, striated and polished by Pleistocene glaciers.

By this time the group had been on the road for six days, and the evening session on Friday, August 2, provided a welcome opportunity to discuss how geology and theology might fit together. Jack Provonsha, professor of religion and ethics at Loma Linda University, led a lively discussion on

what difference it would make to traditional Adventist theology if the church accepted a "long chronology" for Earth's biological and geological history. Due to the participants' reluctance to end the discussion, it was resumed the next morning on citizens band radios as the caravan wandered into Yellowstone National Park, and again at a Saturday evening session.

Sunday morning the group travelled east out of Yellowstone Park towards Lovell, Wyoming, with stops to see Chimney Rock's petrified stumps and fossil leaf fragments and Mummy Cave, where archaeological artifacts and the body of "Indian Joe" (dated around 680 A.D.) suggest approximately 9000 radiocarbon years of continuous habitation from 7280 B.C to 1580 A.D. This route led into the Big Horn Basin area, noted for its rich fossil deposits of mammals and the widespread bright red Triassic Chugwater Formation, which is delightfully easy for amateur geologists to identify. Here we saw the Heart Mountain overthrust, where a massive layer of Paleozoic Madison limestone slid over the much younger strata of the Eocene Willwood Formation. A flotilla of slightly worn but seaworthy vessels transported the group up the Big Horn River, whose clastic Madison limestone canyon walls were formed during successive cycles of marine depositions. These retreats

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of the sea allowed erosion and weathering to carve caverns in the strata, which were subsequently refilled with new sediments and fossils.

From Lovell the expedition headed west into Yellowstone National Park for a second time by way of Dead Indian Pass, where Clark Fork and the Beartooth Faults have raised enormous blocks of Precambrian rock

up to 20,000 feet. The caravan passed through the national park to West Yellowstone to embark on the last activity of the field trip, a hike up Specimen Creek in the Gallatin Mountains for a first-hand inspection of the exposed petrified tree stumps from as many as 40 distinct forest layers. That evening, August 7, the exhausted hikers were given a chance to rest and bask in their newly acquired knowledge as the tour leaders reviewed what had been seen so far for the benefit of the participants of the second field trip who had just arrived for the joint conference.

As this abbreviated account of our itinerary suggests, the trip provided a basic introduction to the earth sciences and paleobiology, as each day we viewed evidence of dramatic geological activity and prowled vast deposits of floral and faunal fossils. But the underlying assignment was to reconcile geology with theology. The tour leaders did not promote any single interpretation of how all this physical evidence correlates with our understanding of God and the origins of this world, but argued daily that any approach must account for all of the evidence. This pinpointed our attention to the problem of time—namely, whether our church's traditional endorsement of a "short chronology" of 6,000 to 10,000 years can account for all of the physical record of nature. Two important groups of evidence illustrated this problem of time: the geological record and the fossil record.

The Geological Record. Any study of the Earth clearly reveals that it is constantly changing, and certainly not a static pile of rocks. On Earth's surface we readily note how floods, rivers, ice floes, wind storms, volcanic eruptions, fault lines and reactions can drastically alter our environment. But the deeper geological record, which is readily visible in road cuts, canyon walls and oil wells, shows that these and other agents of change have been at work in the past as well. During the trip we learned to spot the distinctive U-shaped mountain valleys and sharp matterhorn peaks sculpted by ice

glaciers, to note the colorful igneous rock seams which worked their way into pre-existing granite at Wind River Canyon and to account for the secondary sedimentary deposits in the caverns of the canyon walls of the Big Horn River. We saw that the course of the Shoshone River, which cuts through the Rattlesnake and Cedar Mountains instead of easily circumventing the range by flowing south a few miles, is more readily understood if the river predates the emergence of the mountain range. Every day we were confronted with evidence of slow processes of change to pre-existing layers of strata.

It is not hard to accept the concept of change within the geological record. Nor is

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it difficult to accept that the examination of strata around the world has confirmed that there is a predictable order and time sequence for geological strata. However, the combination of these two concepts suggests that no one act of creation nor any single catastrophic event could account for all of the geological record witnessed on this trip. Each layer of strata required time to be laid down, then altered by successive agents of geological change.

The Fossil Record. The fossil record reinforces the idea that long periods of time are required to create the strata we find today, for the upright trees with root systems in the petrified forests of the Yellowstone area, the dinosaur tracks in the coal seams of Price and the marine fossils found on the slopes of the Unita Mountains all required time to be buried, preserved and sometimes raised by upthrusts to their present site in a totally

different climatic zone. But the lectures and readings which supplemented our fossil expeditions also illustrated other problems presented by the fossil record. First, current age-dating techniques suggest life, not just rocks, is very old. Stromatolites, which have modern counterparts found offshore of Australia, Alaska and the Yucatan, have been dated as far back as 2.2 to 2.7 billion years. Second, there is a consistent association of certain life forms with certain layers of strata, as well as a marked increase in the complexity of life forms as one moves from the older to the more recent layers of rock. However, Ritland repeatedly stressed that this progression of life forms has not always been fully documented in the fossil record; groups of highly organized, complex forms do sometimes suddenly appear with no obvious links to previous life forms.

The Conference

The conference united the 104 registered participants of the first and second field trips for five days, August 7-11, at West Yellowstone, Montana. More than 30 speakers, respondents and moderators contributed to the sessions on geology and the biblical record. Their presentations, reflecting extensive professional expertise, were laced with personal testimonies, as many recounted their attempts to reconcile the traditional Adventist perspectives on the origins of this world with the geological and fossil records. Some of the speakers requested that their contributions be viewed as works-in-progress and not be circulated via the usual Adventist grapevine of photocopies and cassette tapes until their studies are completed. To honor these requests, this report will confine itself to descriptions of the topics addressed. The Association of Adventist Forums hopes to soon be able to make all of the conference papers available to *Spectrum* readers.

The conference emphasized three themes: nature's record of Earth's history, the bib-

lical accounts of the origins of this world, and the responses of committed Christians as they reconcile these two sources of revelation. The scientific presentations on Earth's history were divided between the geological and the fossil records. The former included a summary by Ritland of what had been seen during the first field trip, a description of the distinctive features and cycles of Pleistocene ice glaciers by Lugenbeal, a slide presentation by Hare and Ritland of geological sites of interest in the Holy Land, and films on the theory of plate tectonics and the investigation of the underwater creation of new earth crust introduced by Ross Barnes, a marine biologist associated with Washington University in Seattle. Hughes presented evidence of life within the geologic column, including the nature and distribution of organic reefs and fossil invertebrates, and Ritland explained the geographic distribution of life within the geological column, emphasizing patterns of extinction and "missing links." Case studies were presented by Loretta Satchell, a paleontologist with Exxon, USA, who analyzed pollen found in drill core samples to reconstruct the climate and chronological sequence of forests in the Bering Sea, Oregon and Wyoming. Ritland reviewed the importance of the abundant plant and mammal fossils found in layers of strata separated by lava flows in the Columbia River Plateau sequence.

All of these presentations implied a need for blocks of time to accommodate the evidence, from the cyclical advance and retreat of glaciers to the creation and subsequent burial of marine organic reefs found today in land-locked strata. Our ability to assign accurate dates to archaeological, geological and biological evidence was addressed in talks by R.E. Taylor (specialist in prehistoric archaeology at the University of California, Riverside), Richard Bottomley (geophysicist with Shell Canada Resources, Ltd.), and Hare on the methodology and reliability of age-dating techniques such as carbon 14, potassium-argon and the analysis of amino

acids. Larry Herr, professor of Old Testament at Canadian Union College, explained how archaeological artifacts such as ornate axes and flintstones are used to date early civilizations in the Holy Land, and Hare critiqued the use of pleochroic haloes or radiohalos for attempts to prove an instantaneous creation occurred a few thousand years ago. Lugenbeal reported amazing correlations between traditional age-dating techniques and a study using varve counts and pollen preserved in peat bogs and lakebeds to delineate the changes in the earth's climate and magnetic field.

The second theme of the conference, the biblical accounts of the origins of this world, focused attention on specific passages as well as the broader questions of the interpretation of Scripture. The studies of specific passages of the Bible used different approaches but consistently emphasized understanding the author's focus on spiritual truth. Fred Harder, former executive secretary of the General Conference Board of Higher Education, analyzed the occurrence of vocabulary and the literary structure of Genesis 1:1 through Genesis 2:3, Herr's exegesis emphasized the biblical author's cosmogony and the links between Genesis 2 and 3, while Brian Bull of Loma Linda University provided a response to both papers. Raymond Cottrell, former editor of the *Adventist Review*, turned to the Flood account and compared its use of such phrases as "all the earth" with similar terminology used elsewhere in the Bible.

These presentations all suggested a common concern with biblical interpretation. Cottrell explored this theme more explicitly in another talk on the inspiration and authority of the Bible for Christians who accept nature as a second revelation from God, to which Richard Hammill, former General Conference vice president and former president of Andrews University, responded. Harder analyzed whether our acceptance of the accuracy, inspiration and authority of Scripture varies when we look for scientific or theological truth.

Hammill and Harder made powerful presentations on the Creation theme at the Friday evening session. Hammill, noting our predominant reliance on Genesis 1 and 2 for a biblical perspective of the origins of this world, explored the importance of the Creation theme in other Old Testament passages, particularly Psalm 104. Harder developed the theological significance of the doctrine of Creation in the New Testament, stressing the theme of salvation. Glenn Coe, lawyer and director of special projects for AAF, captured the mood of the audience when he thanked the speakers for their messages, adding that we could all feel the presence of the Holy Spirit. This sense of corporate worship continued with the Sabbath morning service as Roy Branson, senior research fellow at the Kennedy Institute, Washington D.C., and editor of *Spectrum*, explored the three themes of order, freedom and fellowship inherent in our understanding and celebration of the Sabbath. Branson concluded that the Sabbath counters the chaos and loneliness of our lives with Christ's promise of a more abundant life.

The third theme of the conference, the response of committed Christians as they synthesize geology and theology, was approached from experimental, historical, analytical and personal perspectives. Two models which attempt to accommodate the evidence from both fields were presented to the group. Provonsha proposed that the fossil and geological record, which is marked with violence and death, is contrary to the nature of God and so might be viewed as the inferior creative work of Satan, over which God superimposed his more complete and recent creation as recorded in the biblical account. The second model, the "Ecological Zonation Theory" developed by Adventist scientist Harold Clark to account for the geological record, was critiqued by a panel of Hughes, Lugenbeal, Barnes, Satchell and Ritland.

A historic perspective of this problem was

provided by Gary Land, history professor at Andrews University, and Ritland, who surveyed the solutions proposed by 18th- and 19th-century geologists in Europe and America, many of them dedicated Christians. Continuing this historic perspective, James Hayward of Union College recounted how religious beliefs and careless science often resulted in the misidentification of fossils, as when the teeth and bones of mammoths or mastodons were proclaimed to be those of early giant men.

Fritz Guy, professor of theology at Loma Linda University, examined the work of four prominent 20th-century theologians—Bernard Ramm, Karl Barth, Langdon Gilkey and Carl F. H. Henry—who have written about the biblical account of Creation. Guy also outlined a model of three possible types of responses, but added that he could not find in current theological literature “even one example of a serious, sustained theological argument for affirming the creation of the world in six literal days a few thousand years ago.”

Graeme Sharrock, University of Chicago graduate student, responded to theories of developmental psychology to suggest seven possible stages in our perception of reality which affect, but do not necessarily destroy, personal faith as we search for meaning in life. Other speakers provided a more personal answer, as they shared how they combined an understanding of science and religion. Rodney Willard of the Loma Linda School of Medicine stressed the theme of divine providence in his own life, and Clark Rowland, physicist at Andrews University, argued that a physicist’s *a priori* acceptance of the existence of reality is compatible with the acceptance of the existence of God. Rowland also gently rebuked excessive skepticism about the reliability of science: “Frequently we are reminded of the partial nature of our scientific knowledge, but seldom is the partial nature of our theological knowledge emphasized.” In addition, a panel of scientists consisting of Dowell

Martz, Ken Thompson, Earl Aagard, Barnes, Bottomley and Rowland, recounted their personal experiences in response to the questions, “What do you feel are the two or three most critical issues in science and religion?” and “How have you personally resolved these issues?”

The conference concluded with a session on “the road ahead” for Seventh-day Adventists, in which Mollerus Couperus (physician from Angwin, California, and former editor of *Spectrum*), Hammill, Hare and Coe called for faith, courage and commitment to both the pursuit for truth and the Adventist Church.

What did the AAF field trips and conference accomplish this summer? According to surveys, the participants encompassed as wide a spectrum of conservative and liberal positions as the church at large on the issue of how to reconcile geology and theology. Yet this diverse group was united in its endorsement of the first open discussion within the denomination on the origins of the world which accepted both science and Scripture as valuable revelations from God. In a unanimous vote, the participants requested that the Association of Adventist Forums consider publishing a book using materials presented at the conference so that others could have access to the wealth of material prepared for this meeting. The AAF has approved that suggestion and invited Ed Lugenbeal to edit a volume, laying the foundation for future discussions on origins within the Adventist community.

The conference generated some feelings of apprehension, partly because not all of the familiar answers seem adequate to explain what we saw, and because participants were concerned that the issue of origins might be divisive for the Adventist Church. But mostly the conference generated excitement and spiritual commitment, because the participants were convinced they were moving forward within the Adventist tradition of progressive truth as they studied God’s revelation in both nature and the Bible.