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MINISYMPOSIUM ON OROGENY—PART I

MOUNTAIN MODERATED LIFE: A FOSSIL INTERPRETATION

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Received 15 November 1986 Revised 11 January 1987

Abstract

This paper and the five which follow make up a CRS symposium on orogeny which is the study of the origin of mountains. Because of their influence on local climate, mountains have helped to govern the associations of plants and animals which have survived in any particular region, as widely evidenced from the fossil record. Which species lived where after the Flood and during postFlood times has to some major extent been controlled by the formation of the worlds mountain ranges. It is extremely important that Flood geologists wishing to explain biogeography past and present, give deep thought to such questions as how and when mountains arose.

In the second paper of the symposium a creationist meteorologist has written how mountains modify climate and presently dictate patterns of vegetational distribution. Next, three earth scientists and one geologically-trained theologian have prepared four very different creationist interpretations of how the Creator synthesized mountains.

Fossil Plants Differ From Plants Today

Extensive catalogues or "floras" of fossil plants have been produced at many localities throughout the American West and elsewhere. The results of these studies have been summarized in several volumes of which the following are representative: Andrews (1947), Andrews (1961), Arnold (1947), Darrah (1960), and Taggert and Cross (1980). From these the fact emerges that there are distinct differences between the species found in the fossil strata and the plants living at those same sites today. Near Clarkia, Idaho, for example, there are abundant fossils of subtropical plants where today only conifer forests flourish—Clutter (1985). In the Green River fossil flora of southwestern Wyoming there are fossil palm leaves in situations which now support only sagebrush, grassland, and dwarf conifer life forms—Andrews (1947, p. 203). The Kenai fossil flora of Alaska contains such subtropical species as the magnolia and fig—Darrah (1960, p. 231). Fossil floras labeled Eocene from Oregon and California appear to contain tropical plant species which are very much unlike the forms currently growing in those areas. In regions of the western United States that presently support grassland, chaparral shrub, or desert vegetation, there are numerous fossil beds containing temperate, subtropical and even tropical plants.

Climatic Change

Uniformitarians assume that this shift in plant life reflected a gradual modification of the climate covering millions of years of Cenozoic (Paleocene, Eocene, Oligocene, Miocene, and Pliocene) time. Instead, catastrophists suggest that perhaps soon after the Flood the earth was repopulated with plants—Howe (1968) (1979, pp. 42-3) (1981, p. 224), and Golike and Howe (1975). During the decades and even centuries that followed the Flood, fossilization evidently continued while striking climatic changes transpired. Plants which were designed for cooler and drier climates at first flourished only in marginal habitats. When the climatic shifts took place, these species which were "preadapted" or "predesigned" perhaps began to invade larger and larger land areas at the same time that the original tropical and subtropical plants diminished and even disappeared. Catastrophists hold that this rapid appearance of drought-tolerating plants was not a rapid evolution, as many macroevolutionists imagine, but that it was rather an ecological selection favoring preexisting forms that were able to cover larger land areas than previously.

Involvement of Volcanoes

Both the uniformitarians and the catastrophists agree that the climate has changed since ancient times—becoming cooler and drier. A sizeable part of this shift is attributed to the uplift of mountains. Volcanoes themselves have played a two-fold role in that they first yielded gas and ash-fall that were directly responsible for wholesale fossilization of plant life and for erasing existing vegetational cover. This in itself would allow for migration and colonization by plants that had previously been of less overall importance in the vegetational cover.

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Taggert and Cross (1960) report for the Succor Creek area of Oregon and Idaho that there was a:

> pattern of repetitive disruption of mid-Miocene forest communities. The probable cause of these periodic disruptions was direct ash falls and gas venting that resulted from the volcanic activity that produced the volcanically derived sediments in which the flora is preserved. p. 185.

In some situations like those near Clarkia, Idaho, the plants were fossilized so quickly and thoroughly by volcanic action that their cellular details and even colors are still visible—Clutter (1985):

> Silt and periodic blankets of volcanic ash (that continue today from such Cascade giants as Mount St. Helens) steadily filled the resulting deep lake, innocuously burying layer after layer of wind-blown forest debris . . . Below, however, the age-old sediments are still wet with the lake's original water, and actual branches, leaves, needles, cones, flowers, seeds, and even pollen are trapped within the soft, clay-like rock. Nearly every piece yields fossils—an average cubic foot of the ancient lake silt contains 267 specimens, with a high of 862. . . There's something wondrous, almost magical in seeing a color that's millions of years old . . . Pastel against black rock, avocado's dull green, or oak's dusty red disappear rapidly upon exposure to light and air. On a hot day, eons vanish in seconds. pp. 22 and 24.

Andrews (1961) has emphasized the extent of volcanism in the American Northwest:

> Vast outpourings of lava took place in Miocene times east of the Cascade range, resulting in the area known as the Columbia Plateau; some concept of the magnitude of this volcanic action may be gained from the fact that the total accumulation of lava is estimated at about 100,000 cubic miles. New lakes and swamps developed as a result of damming of streams and valleys, and numerous fossil localities were formed as plant remains, and ash from local volcanoes, accumulated in these newly formed bodies of water. pp 205-6.

Creationist researcher S. Austin (S. Nevins) (1971, p. 222) asserts that this tremendous lava bed was the result ". . . of a single, regionally extensive lava flow." Yet he reports that there are widely different dates from various portions of the basalt which would ". . . seem to invalidate the potassium-argon dating method."

Mountains Played a Role

But volcanic activity is important for another reason: it was one of the means by which large masses of rock got projected above the horizon to produce mountains and plateaus which in themselves are believed to have modified the movement of storms from the oceans. Hence this would have wrought lasting changes in the climate of large areas inland. Andrews (1961) attributes much of the vegetation change to the uplift of mountains in the United States:

> Extensive uplift of the Cascade-Sierra Nevada mountain range in early Pliocene times resulted in still greater aridity of the Great Basin area. This allowed a more northerly extension of the xerophytic elements of the north Mexican vegetation . . . p. 209.

This role of mountains in regulating the types of plants which will thrive or even survive at a particular location was emphasized earlier and even more forcefully by Andrews (1947) in the following passage:

> It has been concluded from the former eastern range of the moisture-loving sequoias that the Cascades had not been elevated to the height they have now attained. But as they continued to rise during the Pliocene less and less of the air-borne water passed east of this mountain barrier. The early and middle Pliocene floras of eastern Oregon and Idaho reflect a much drier climate than that of the Miocene, a vast drought that has continued to increase in intensity to the present time. pp. 208-9.

Darrah (1960) extends this mountain-generated climatic shift to cover the whole Great Basin:

> In western North America there was an extensive uplift, the Cascade-Sierra Nevada revolution commencing in late Miocene and continuing in the Pliocene. The immediate effect on interior America was decreased rainfall. The Great Basin became more arid and awesome Colorado River system erosion increased. p. 241.

The effects of mountain uplift on storm distribution patterns were the cause of some rather amazing changes in temperature and rainfall for various regions inland. Andrews (1961, p. 203) points out that the Florissand fossil beds now high in the Colorado Rockies contain plants which suggest more moderate climate with an absolute minimum temperature greater than 20°F., an average annual temperature greater than 65°F., and a rainfall above 20 inches. Summarizing the work of Chaney and Sandbom, Andrews (1947) asserts that the rainfall of west central Oregon (Goshen flora) was about 70 inches annually in fossil times whereas it is presently only about 38 inches. The distribution or pattern of rainfall throughout the months of the year has apparently changed in eastern Oregon as well:

> The nature of the plants comprising the fossil flora indicate, moreover, that the rainfall, nearly twice that of the present, was more uniformly distributed throughout the year. This is especially important since the nature of distribution of the annual precipitation in a given region generally has an even greater effect on the flora than the actual amounts of rain in inches. Two-thirds of the annual rainfall at Eugene now falls from November through March and the rainfall from June through August is extremely scanty, amounting to but 2.5 inches. Andrews (1947, p. 202).

Evidently the major fabric of tropical and subtropical vegetation which at first clothed the western United States was broken so that only various clusters of plant species from that original fabric survived to populate large land areas. Paleobotanists speak of this as a "segregation" of modern vegetational assemblages from the pristine original forest and the communities of plants which resulted from this segregation are often called "association segregates." Thus Darrah (1960) explains that the various modern plant communities in the Southwest have "segregated" from a rich, earlier flora:

> Clements and Chaney have pointed out that the woodland association was established in Miocene times and that the present-day climate associations of the Southwest were *segregated* from this ancient complex. The three modern communities, oak-juniper (southwestern United States and northern Mexico), pinon-juniper (Great Basin and Colorado Plateau), and digger pine (California) were *segregated* in the Pliocene. p. 241, (Emphasis added).

A Creationist Interpretation

Our existing vegetation is thus seen by paleoecologists to be an inheritance from species that once composed a rich "upper Cretaceous flora" from which various association-segregates have arisen over widespread areas today. It is unnecessary to make any references to macroevolution in such a scheme since the rich "upper Cretaceous floras" might have been the vegetational fabric which covered the earth before the Flood and was rapidly reestablished on earth shortly after the Flood as "Paleocene" and "Miocene" vegetation. Perhaps subsequent stages in postFlood ecological history were fossilized successively by volcanic and other means so that paleobotanists now have a representative view of changes which took place throughout the postFlood interval.

Evolution is in fact embarrassed at several points in this connection because "new" major vegetational associations *appear* suddenly, as D. I. Axelrod (1961) has understood but has not been able to explain. Such new associations of plants seem not to have evolved but rather to have been "waiting in the eaves" until a time when the climate would become more suitable for widespread survival of their genotypes over vast acreages. Plants like yuccas, cacti, creosote bush, chamise, juniper, and others which presently enjoy a widespread distribution in the Southwest may have lived on marginal habitats, covering only small areas in the original postFlood forests. Whether dealing with macroevolutionary ideas or those of creationism, the scenario for development of vegetation over vast continental areas is somewhat speculative. In all of the speculation, however, the overall factual importance of mountain uplift emerges as a source of major climatic change which indirectly governed the current distribution of plant species. Thus the subject of orogeny takes on a biological as well as geological significance.

How the Present Symposium was Developed

The five papers which follow in this series are based on an entire year of correspondence about orogeny among the writers. Each author read the letters of the other participants and posed written questions to which replies were given.

Each writer's letters were subsequently edited to produce short papers followed by questions and answers. Although these essays are authoritative and generously documented, they still maintain the vigor and clarity of letters as opposed to scientific reports. The question and answer sections contain an ongoing debate concerning the merits and demerits of each option profferred.

The other authors and I trust that this symposium will generate more papers on orogeny and letters to the editor from readers be they authorities or amateurs in geology. Please address editorial letters to the Quarterly Editor, E. L. Williams. Each author also invites personal correspondence so that we may become better equipped to continue our studies.

Some Other Views

Several other scientifically-minded creationists corresponded with me during this time but since the number of papers possible in this one issue was limited to only six, some of the views of these other correspondents must be only briefly summarized.

Water Expansion as Steam—James and Westberg

Douglas James (1985) supposed that in ancient times a cubic mile or so of water somehow entered the interior of the earth and as it came into contact with some 250 million cubic miles of molten material, produced a gigantic subterranean steam generator. He assumes that the water expanded its volume by a factor of 1670. The escaping steam would have had many effects and would have gone a long way, James holds, to synthesize mountains at ". . . a greater speed than any ice age could produce them."

V. L. Westberg, author of *The Master Architect* (n. d.) has sent some interesting ideas on orogeny. He stresses that lava eruptions, which covered land areas of the western states, would have synthesized portions of many mountains and plateaus. Furthermore he believes that Psalm 104:6 and Genesis 7:11 speak of such events.

Westberg, like James above, believes that ". . . there is no force equal to steam to raise mountains (1986). He ties the genesis of such mountains to the Flood event which he holds to have involved an ice canopy—Westberg (n. d.). There was an interaction between Flood waters and lava producing many of our mountains. Westberg believes (1986 and n. d.) that some of the mountain-building earthquakes were actually caused by Flood waters lubricating vast underground regions like spill waters which run back into mines may generate earthquakes today.

Tectonics During the Flood—Woodmorappe

J. Woodmorappe (1983b) produced a monumental synthesis of geological index fossils from which he concluded that the entire fossil assemblage at any given point on the earth was not the result of successive "ages" of deposition but of tectonic action superimposed on ecological zonation at the time of the Flood. While he did not treat directly with orogeny in the 1983b paper, he clearly assumes that much tectonic activity (and hence by inference mountain synthesis) occurred during and immediately after the Flood. He has not specified what mechanism the Creator may have used to induce tectonics during the Flood.

Woodmorappe and one of our symposium writers (G. Morton) have had an extensive and profitable series of discussions in *CRSQ* — Woodmorappe (1983a) (1985) and (1986) and Morton (1983). Woodmorappe has an important comment and question for Morton regarding the distribution of sediments—a question which has appeared in print (Woodmorappe, 1986) but which also appears here in Morton's question and answer section.

Island-Dump Hypothesis—Daly

In his book (1972) and in several letters (1985) Daly asserted that the mountains near coastlines were most likely formed, like offshore islands as well, during the Flood in the form of gigantic dumpheaps of sediments and remains draining off nearby land. He assumes that these offshore Flood deposits remained on the continental shelves. He has sited many examples of offshore islands as evidence in support of such an orogenic view.

His proposal for the origin of mountains surrounding the Pacific Ocean is as follows:

> The 'Ring of Fire' around the Pacific fits smoothly into the Flood theory. Flood debris from the continents poured into the receding Flood waters. The velocity automatically decreased. Debris and mud with quite a quantity of animal and fish life was precipitated in a Pacific "ring". . . of mountains. They are set back from present shorelines because the water line had not yet receded. All over the world this phenomenon of mountains set back from the present beaches exists and is explained by this debris dump hypothesis. (1985)

Mountains far inland—such as those along the continental divide—Daly (1972) also feels were formed by the Flood itself:

> As the highest part of each continent first sank beneath the rising water, and then again rose out of receding Floodwater mud, a long, thick bank of alluvium was thrown up first along the submerged crest, and then along the shore of the rising continental divide, forming the Himalayas, Andes, and all other ranges that run along the crests of high level watersheds. pp. 294-5.

It is hoped that this brief paleobotanical introduction and summary of views of orogeny will whet the readers' interest toward carefully considering how mountains influence climate today in the next article and then how mountains arose (in the subsequent four papers).

Acknowledgements

I thank the Research Committee for authorizing and funding these studies from interest of the Laboratory Project Fund. I appreciate those who made this fund possible by their generous contributions.

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MOUNTAINS AND LEESIDE CLIMATE: AN INDICATOR OF CHANGE

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Received 15 November 1986 Revised 12 January 1987

Abstract

There is substantial evidence that significant changes have occurred in the plant distribution found today in the American West and other mountainous regions as compared to those of earlier times. My purpose in this paper is to summarize the ways in which existing mountains modify climate on their own slopes and on leeward land masses nearby, possibly accounting for the observed patterns of plant distribution. An alternative suggestion is also briefly discussed.

Introduction

Mountains act as barriers and alter the prevailing windflow. The effect of mountain distribution on precipitation can be significant. It is not the mountain or mountain range alone that determines the result, but a combination of factors that characterizes the synthesis between the mountains and the atmosphere as emphasized by Barry (1981):

> Mountains have three types of effects on weather in their vicinity. First, there is substantial modification of synoptic weather systems or airflows, by

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