EDITORIAL COMMENTS

This issue features Part II of the minisymposium on orogeny organized by George Howe, Director of the CRS Grand Canyon Experiment Station. The question and answer portions at the end of the papers are quite interesting and revealing. The final part of an extensive book review by A. W. Mehlert is also featured. This review of a typical anticreationist book exposes the poor science employed in the defense of evolution against creationist tenets. Along the same line, Paul DuBois illustrates how invalid another attack on creationists is.

Dr. John R. Meyer, Chairman of the Research Committee, starts a two-part series on his work at Shiva Temple in the Grand Canyon. The first paper deals with the historical background necessary to understand the recent CRS work. Wilbert Rusch indulges in some reflections of his part in the development of the Society as well as a discussion of his creationist philosophy. Dr. H. S. Hamilton has written another fine article on eyes and the lack of evidence for any evolution.

Colin Brown further develops his genetics principles based on a creation model of science and Lawrence McGhee outlines some metaphysics involved in modern science. Dr. Dudley J. Benton calls much needed attention to the referencing practices of many creationist writers. Hopefully this letter will encourage more attention to detail by future authors of creationist material. I hope you will find much of interest in this issue and that you will express your opinion to me. Also your help in encouraging wide circulation of the *Quarterly*, particularly in university libraries, is needed.

Emmett L. Williams, Editor

MINISYMPOSIUM ON OROGENY—PART II

MOUNTAIN SYNTHESIS ON AN EXPANDING EARTH

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Abstract

The expanding radius model of the earth after the Flood is offered as a mechanism for orogeny. Continental uplift with ocean basin subsidence after the Flood does not seem probable. The Flood process lasted much longer than one year.

Introduction

Flood catastrophists generally assume that the pre-Flood mountains were not as tall as modern mountains and early ocean basins not quite as deep. While these workers differ regarding the role (if any) that comets and/or plate tectonics might have played in the Flood, nearly all of them assume that the waters arose over the early land mass because of a sudden and immense increase in the global water supply.

It is generally held that some of this added water came from a canopy or from deep space (the waters above the firmament), while the rest of the added water issued from below (the fountains of the great deep), possibly arising from volcanoes. Although I agree with other creationists about water being added to the earth's system by volcanic activity, I object to the canopy model as it is usually presented: see Morton (1979 and 1980a) for a critique of the usual canopy model.

How Did the Continent Reappear and Dry Out after the Flood?

(1) Continental uplift with ocean basin subsidence?

To account for drainage of waters from the continent into the ocean basins after the Flood, many creationists espouse what shall here be called the "uplift-subsidence model," by which they imagine that the ocean basins rapidly sank and at the same time the continent(s) experienced uplift. In such a scenario mountains and other physiographic features would arise later as a result of continental rifting or other postFlood uplift changes.

The Problem of Sedimentary Distribution

I believe this uplift-subsidence model faces several critical problems, one of which centers on the distribution of sediments. Based on this view, one would predict that the newly-added canopy waters would generally wash material from the higher areas (continents) into the lower regions (oceans), thereby depositing far more sediments in the basins than on the continents—see Morton (1980b and c).

During the tremendous rain storms, materials would be largely picked up on the continents and carried downhill until the Flood waters reached the oceans. Here the velocity of waters draining off continents would decrease, allowing sedimentation to occur in the oceans or on the continental shelves. Some sedimentation would also be expected on continents, of course, but to a much lesser extent than in the oceans.

Most of the sedimentary deposits, however, are found on the continental platforms, which are topographically higher and not in the ocean depths which are topographically lower. The present ocean basins average only 300 meters of sediments while a comparable average sedimentary depth for large land areas is 3000 meters. If these deposits resulted from the

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uplift-subsidence sequence, their distribution would seem to violate the second law of thermodynamics—Morton (1980b and c). To account for this it would seem to require additional miraculous intervention.*

The Problem of What Force Might Have Caused Uplift and Subsidence

The uplift-subsidence believers face a further problem regarding what force might have caused the upward movement of the continent and downward shift of ocean basins. An examination of the physical constraints on vertical continental movement raises serious difficulties for creationists who believe in such rapid uplift and subsidence. These difficulties occur both in the mechanism which caused the movements and in the speed with which isostatic balance would be reestablished afterwards.

In terms of modern geophysics the granitic continental platforms are seen as floating in the underlying mantle. The continents as a whole are isostatically balanced, meaning that the weight of the continent is balanced by the buoyant upward forces.

In a glass of water, for example, an ice cube floats in isostatic balance when approximately nine-tenths of it is submerged and 10 percent is above the water. When one pushes the cube below the surface, the forces are no longer balanced as the upward push of buoyancy is greater than the downward force of gravity on the cube. If one then releases the ice cube, again it will rise until an equilibrium of forces is reestablished.

The continents are similar to the ice cube except that they are floating in a much thicker material than water. Like unusually thick honey or asphalt, the mantle is far too viscous to allow rapid upward or downward movements. Small areas can be uplifted by magma movement but not the exceptionally large ones posited in the uplift-subsidence view.

In water, which has a viscosity of 0.01 poise, a fishing bob can move up and down with a period of under one second—Morton (1981b). In thick honey, (vicosity 100 poise), the bob may take several minutes to move up in response to isostatic changes. But the earth's mantle has been calculated to have a viscosity of 10^{22} poise so the expected period required for the uplift of a continent through such a medium would be on the order of thousands of years—see Morton (1980b) for calculations.

There thus appears to be no way short of a series of miracles for the continents to have risen and ocean basins to have sunk in time to drain Flood waters rapidly from the land after the Flood. Creationists defending the uplift-subsidence model must face the problem of this phenomenally slow movement expected for continents.

(2) Did the Earth's Radius Expand?

Instead of an uplift-subsidence approach to ending the Flood, I believe that the waters went down as a result of the earth's radius expanding after the majority of Flood sediments had been deposited; a view which can be called the "expanding radius model"—Morton (1980b and 1983). Thus I am seriously proposing the bizarre and seemingly outrageous idea that the earth was physically smaller before the Flood and that it began expanding near the end of the Flood.

Although there is the immediate temptation to dismiss such a concept as entirely too radical, it has had some serious and widespread discussion. Lester King's book (1983) on an expanding Earth and a defense of Earth expansion by Warren Carey (1976) are two examples. Oddly enough, Carey was also the first man to suggest continental drift in its presently accepted form long before others liked the idea. By the time everyone accepted plate tectonics, however, he had abandoned it in favor of radius expansion: the fellow's timing was poor!

Would the Present Supply of Water Cover Mountains on a Smaller Earth?

Rehwinkle (1951) developed a calculation which he thought proved the Flood could have covered the continents. I feel this is invalid but quite useful as a gauge of scale. If one were to equalize all elevations around the world and make a uniformly deep sea, the oceans on the present sized earth would be 1.7 miles deep. If, however, one took the same approach for a *smaller* earth, the ocean would be 6.8 miles deep. Thus the smaller pre-expansion earth would require less water to achieve an equally deep inundation regardless of pre-Flood topography. On the present sized earth, miles of additional water would not cover Mount Everest but Everest would be easily covered by the same water volume on a smaller earth.

I am not suggesting that the Flood occurred by means of the leveling of the elevations, as Rehwinkle (1951) believed. But what I do envision, however, is that the geometric relationship between the surface area of a smaller earth and the surface of the present earth actually explains how the earth could at first have been covered with the water and later dried out—see Figures 1, 2 and 3.

Radius Expansion and the Flood

Consider a smaller preFlood earth with less water than exists today. Its seas would on average be shallower than the present oceans. Evidently before the Flood the earth had an outer granitic crust covering its mantle—Figure 1. Assume then that the earth began expanding. The first thing that might be expected to happen would be for this outer granitic crust (Figure 1) to crack. Along these fractures, lava would pour out bringing with it much juvenile water in the form of steam. As the steam cooled, rain would fall, adding new water to the earth's surface. The heat given off during the condensation of this water vapor reveals a serious problem in accounting for the apparent 40 days of worldwide rainfall. I have addressed this problem elsewhere—Morton (1980a).

Whether or not the sea level would rise under such conditions would depend on whether these newly formed cracks began to fill with lava or remained as huge gashes in the earth. Assuming that they were filled with lava from below, the sea level would rise for a while. But after some time the pressure on the lava would lessen so that it would fill less and less of the gash that kept reopening during continued expansion. When this occurred, the sea level would begin to

*This additional miraculous intervention is obviously not mentioned in the Bible. (G. F. Howe)

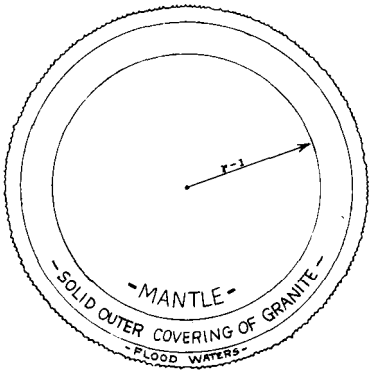

Figure 1. Early earth during the peak of the Flood. The crust of the earth at this time was solid granite. The radius of the mantle (r-l) was small so that the waters were able to cover the entire continental mass. Drawing by Ross Marshall.

fall, exposing the highest elevations on the continents at the "end" of the Flood—see Figure 2. Note that the expanding radius view will help us understand why a rainbow would appear after the Flood whereas it did not previously—see Morton (1981a).

Evidently it was during this later period of time that Noah and the animals left the ark. Once some of the land area was permanently exposed, not to be inundated again, the ark served no further useful purpose. But I assume that the earth's radius continued expanding over a period of at least several centuries and the waters thus moved back and forth across the lowlands, causing later fossilization for dozens and even hundreds of years after animals and plants had begun to repopulate the earth.

As illustrated in Figures 2 and 3 the expansion would cause tremendous extensional faulting of the granitic crust. As sedimentation took place, more faulting continued. The places where the granitic crust remained stable received sediments deposited horizontally. The other areas surrounding the plateaus, faulted downward and fell away from these stable areas. Thus plateaus such as the Kaibab Plateau through which the Grand Canyon was cut, were not *uplifted* as most creationists assume but are areas that have always remained relatively stable.

Evidence Supporting the Belief That the Kaibab Plateau Was Never "Uplifted"

The so-called Kaibab "uplift" in Arizona is surrounded on three sides by areas that were structurally lower. To the northwest is the Cordilleran geosyncline, to the south is the Arizona Sag, to the east is the Black Mesa Sag, and only to the north is there a structural high. Apparently the Kaibab Plateau downfaulted early from the Piute structural high to the north but then remained stable while everything south and west continued to downfault.

This Kaibab Plateau is part of the larger Colorado Plateau which has a thicker crust under it than is found either in the basin and range to the west or the Rio Grande Rift to the east. This thicker crust was harder to break than the thinner crust in surrounding areas. Thus the stresses associated with expansion were taken up by faulting in the thinner crust areas surrounding the plateau. The granitic crust produces much heat so this fits with the fact that there is greater heat flow through the Colorado Plateau than through its surrounding areas.

As one might also expect in keeping with the expansion view, tensional structures are actually found along the plateau margins, and more volcanism occurs around the margins than on the plateaus. The plateau itself is generally lacking in volcanic deposits. As one approaches the edge of the plateau, volcanic deposits are found more often. Earthquakes also are rare on the plateaus, as are major faults. From a tectonic standpoint the plateau is boring but the edges are exciting and this is as we would expect to find it in keeping with the expanding radius model.

Does This Radius Expansion View Help Explain the Grand Canyon?

As the waters finally drained off the plateau, the rainfall continued after it was exposed, thereby cutting through the canyon itself. The "great unconformity occurs where Precambrian beds like Shinomo quartzite, Hakatai Shale, and Dox sandstone lie at an angle of approximately 35°. They were eroded and overlain by the nearly horizontal Cambrian Tapeats Sandstone. According to my view these Precambrian beds were pre-diluvial sediments tilted and eroded during the early part of the Flood.

This unconformity and subsequent other unconformities higher up the canyon wall were caused by very minor shifts in sea level which for brief periods of time exposed these areas to erosion before they reinundated and experienced further deposition.

Evidence from Geographical Extent of Sediments Supports Expansion

Geologists have used the distribution of rocks containing marine fossils to determine where the sea was and where the land was when that particular rock was deposited—see Dott and Batten (1971) for example. Obviously this method is not foolproof but it should give a reasonable estimation of where the sea was at particular times. By using these distributions for various geologic "epochs" one can produce a series of paleographic maps. Such a series reveals that the sediments of the earliest geologic periods (such as the Cambrian) are the most geographically widespread—implying the greatest extent of inundation at the time they were formed. The youngest sediments, on the other hand, merely fringe present day coastlines as if the sea level were only a few tens of feet higher than at present—Dott and Batten (1971).

The Earth is Presently under Tensional Stress

Another piece of evidence which supports the expanding radius view is that the earth has been under tensional (pull-apart) stress since the Triassic, as Kent (1981) writes: "It is difficult to dismiss entirely the thesis that this very long continued tensional episode reflects global expansion . . ." p. 7.

How long did the Flood last?

Within this expanding radius model it is assumed that the entire Flood process lasted much longer than one year. The Bible teaches that Noah was on the ark

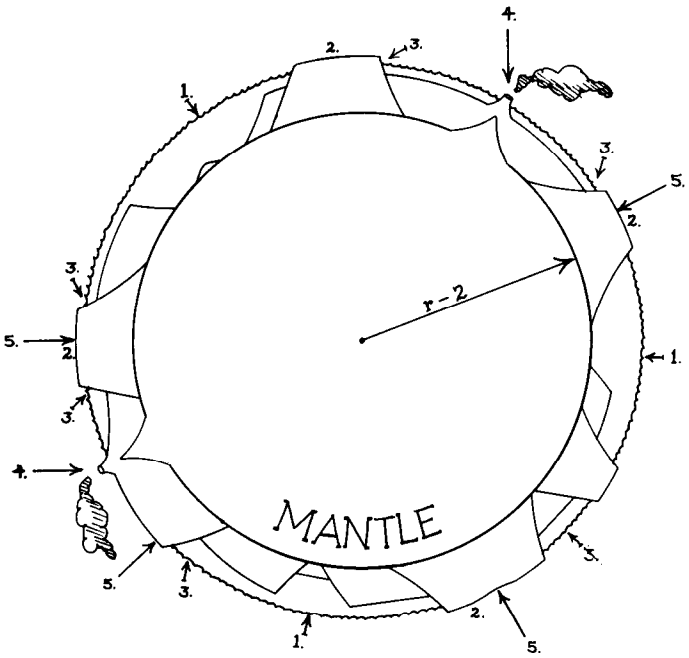

Figure 2. Intermediate earth. Here the earth is shown at the time Noah disembarked. There has been an increment of expansion so that the mantle (r-2) and the crust have both expanded. Note, however, that the crust has split and been broken because it is rich in silica and would thus be expected to expand considerably less than the mantle which is rich in magnesium compounds which would have expanded more. The various features of the earth at this time include the following:

1. **Incipient ocean basins with ridge which is center of expansion.**
2. **Plateaus. Notice how everything is dropping in relation to them.**
3. **Cratonic Basins—like the Anadarko Basin of Oklahoma.**
4. **Volcanism due to cracking of outer shell from underneath. This is because the shell attempted to adjust itself to a radius of curvature much like an orange peel when one attempts to flatten it.**
5. **Exposed land area where animals lived after they were released from the ark.**

Drawing by Ross Marshall.

for a year but it does not really designate the period of time the world was different geographically from the present world. Perhaps Noah recorded observations about only his immediate environment. Genesis 8:13-14 relates that the earth was completely dry. If one assumes that this passage is *revelation* about the entire earth to Noah or to Moses, then my interpretation must fail. But if this is the record of one of Noah's observations, then it might refer only to the area immediately surrounding the ark, since it is unlikely that Noah was recording any extensive survey of coastlines!

Currently the sea level is rising at the rate of 1.5 feet per century. In light of this, what does it mean to say that the earth is "completely dry?" When saying that the Flood lasted longer than one year, I am referring to the entire period between the Flood's onset and the time when the sea was nearly down to its present boundaries: a period of time which perhaps involved many hundreds or thousands of years. D. W. Unfred (1988) has done a thorough job of comparing my view of an expanding earth with creationist plate tectonics and then analyzing its relationship to Scripture and postFlood events.

PostFlood Fossilization and Extinction Occurred

After Noah released the animals, it would seem likely that they were on their own for survival. As they were repopulating the earth, the geologic work was continuing. Many of them were killed and fossilized in some of the more minor catastrophes. Fossilization, extinction, and continued earth expansion all occurred simultaneously in the postFlood environment.

This is the only view that seems to explain adequately why kangaroos live only in Australia and why Australia is likewise the only place where fossil kangaroos are found. Evolutionists criticize creationism on this point. If the fossils are the remains of preFlood animals, then the kangaroo must have lived in Australia before the Flood, hopped to wherever Noah built the ark, and then hopped quickly back to its former home; leaving no trace of itself anywhere else! This approach at best seems quite unlikely.

Living plants can be found as fossils in areas that they now no longer inhabit. If one continues to study older rocks, however, those fossils of living plants are found distributed even further away from their living locality. Accordingly many of the more recent fossil layers represent a record of plant and animal distribution long after the Flood—see Morton (1982b and 1984) for additional details.

By what Mechanism did the Creator Expand the Earth's Radius?

One of the major problems facing all those who have proposed views of earth expansion is that of finding a suitable mechanism. I have assumed that the Creator could have brought about earth expansion after the Flood by increasing the size of all atoms (Morton 1983). Each atom has electrons which orbit its nucleus at certain distances. This is attributable to the fact that the electrons are attracted to the nuclear protons.

But at the same time each atom repels other atoms with a certain repulsiveness which is the Pauli exclusion force, n—Morton (1983). When one atom tries to occupy the same space as another, it is prevented from doing so by this repulsion.

If the distance between the electrons and the protons in each atom were to increase, so would the value of "n" (repulsiveness) increase and each atom as well as the earth itself would expand. Furthermore, if each different type of atom (magnesium, versus silicon, for example) were to experience different amounts of expansion then there would be differential size changes in various materials—a point to which we shall return when discussing compressional features of the earth.

A mechanism for earth expansion is neither really as complex nor as hard to conceive as might appear at first. The size of the atoms is determined by the size of the electron orbits. If the force which holds the electron close to the nucleus changes such that the atom gets bigger, then the earth must expand as well. By analogy, if one were to weaken the force of gravity then the moon would move away from the earth; its orbit would be bigger. What I am suggesting is thus a change in the atomic equivalent of gravity. Only the Creator could have caused such a change so it is at this point that I propose a single point of the miraculous.*

*This is obviously a miracle not mentioned in the Bible. (G. F. Howe)

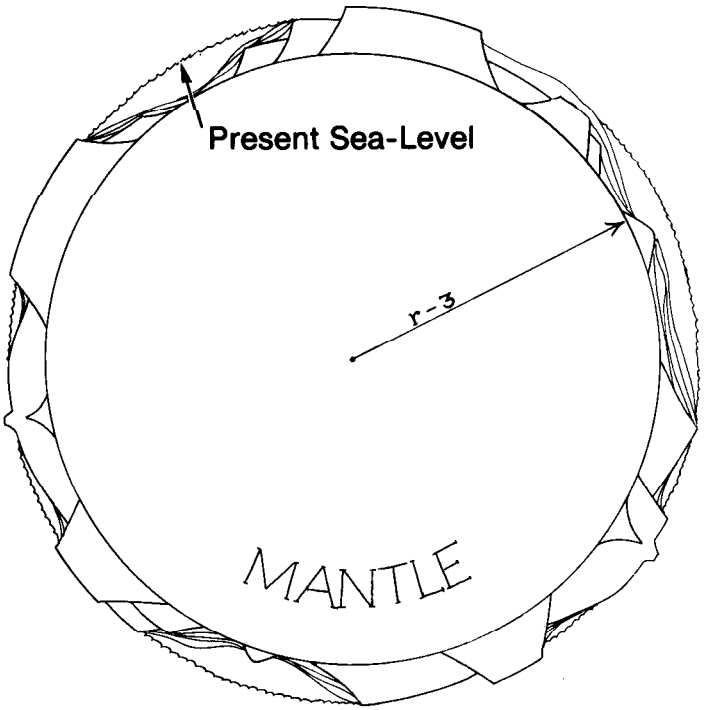

Figure 3. Present earth. For a considerable length of time after the Flood, the earth's radius continued to expand, and thus it is obvious from the figure that [4-3] (the radius of the mantle) is greater than it was even in the intermediate earth, r-2. The crust also expanded but to a lesser amount so that it split.

Drawing by Ross Marshall.

Please note, however, that this expansion view does not require additional "mass" as some might suggest.

How Could the Expanding Radius View Account for Compressive Forces Involved in Mountain Building?

The expanding earth model would seem to have a severe problem explaining compressive forces. And yet mountains often involve just such compressive features in their formation: places where the rocks have been pushed together in collision (rather than pulled apart.) Thus historically many geoscientists have rejected the expanding-radius model because of its apparent inability to explain and predict compression forces on an expanding earth. For example, Scheidegger (1958) stated it this way:

> However, there is one fundamental difficulty. This is that in an expansion theory, it is no longer easy to account for the observed crustal shortening as there is no reason for the 'skin' of an expanding sphere to become crumpled up. It would therefore appear that all the expansion could create, is a pattern of fissures through which the liquid magma below could rise to cause mountains. There seems to be no possibility of explaining nappes and similar phenomena. pp. 204-5

More recently Skinner has summarized the problem as follows:

> Evidence of vertical motions is abundant in the geological record, but it cannot explain certain features—especially the existence of mountain ranges, for which lateral forces seem to be required. p. 404

From this I surmise that the formation of mountains by lateral forces is a problem faced by all geologists, not just those who hold to earth expansion.

If atoms expanded uniformly, there would be no evidence of expansion nor would there be a basis to understand compressive changes. In fact, uniform expansion would give all the appearances of an earth that had never expanded.

I have argued instead—Morton (1983)—that different minerals expanded at different rates. Since that article was published I have been able to show that the silica rich granite of the crust (see Figures 1, 2, 3) would expand at about one-half the rate of silica poor basalt since silica has a value for "n" of about twice that of magnesium containing compounds. The granitic continental platforms would thus expand much less than the mantle of the earth because the granite contains much silica (low expansion) while the mantle is high in magnesium compounds which would have relatively high expansion. The interior of the earth would approximately double in size in relation to the outer granitic platforms.

If one were to place potassium iodide (KI) around a body of Al_2O_3 there would be compression at their interface since Al_2O_3 becomes much larger than the KI, even though both are expanding. Extending this reasoning to the crust, if one part of the crust is slightly enriched with a more expansive mineral and this region expands faster than the earth as a whole, there will be compression in that area. I believe this led to a breaking, twisting, and crumpling of the crust yielding faults and even compression mountains.

Incidentally, uniformitarians who hold to expansion will not accept this differential expansion idea of mine because changing the permittivity of free space between the atoms requires that the universe be much younger than they prefer to believe—see Morton (1982).

The new volume in the interior and elsewhere is taken up by the atoms that used to be smaller. The trenches are really incipient ridges because after the crack in the crust gets deep enough, lava will come out.

A Comparison and Contrast of the Rapid Rifting View and the Expanding Radius Model

Believers in both plate tectonics and expansion would view the ridges as places where new material has been added to the earth's surface. There is evidence for this in that pillow lavas have been observed forming along the ridges. In the expanding-radius view the ridges are the places of the initial fracture of the granitic crust which occurred at the onset of expansion. Hence there is no need to correlate each one with a subducting trench as must be done in plate tectonics. This is fortunate as there appears to be an absence of such necessary trenches in the cases of Africa and Antarctica. (See my questions to Northrup in this symposium.)

In the plate tectonics view, what goes up from the ridge must go down in some area of subduction—a trench. In the expansion view, however, the same ridges are seen as nothing more than tensional cracks. Often behind the ridges there are horsts and grabens rather than thrusts—data which affirm that trenches

are extensional features rather than the compressional ones required by continental drift. Continental drifters have coined the term "back arc spreading" to refer to this phenomenon which they would otherwise not expect to find.

The Aleutian trench retains the same morphology from one end to the other. But if drift really is occurring (as plate tectonics people say) then the eastern part of this trench must be subducting while the plate motion is actually pointed away from the western edge of the Aleutian trench—an unlikely prospect, to say the least. Going back to the tensional nature of trenches, Carey said (1976):

> Commonly patterns interpreted as compressional are equally valid when the stresses are reversed, with compression replaced by tension. Thus in Scheidegger's analysis of Wilson's theory of compressional island arcs, he pointed out that the stress terms are squared, so that a tensional regime could mimic a compressional regime. p. 65

Also the sediment in the trenches is quite often horizontal and undisturbed which is at least a little more understandable with an extensional regime like the expanding radius view than in a compressional one like plate tectonics.

Summary

Although the expanding-radius view has experienced a studied neglect by most geophysicists, it deserves to be resurrected. By it one can explain how water drained from the continents after the Flood. Likewise it conforms with all the data supporting a geographic fit between modern continents to produce a single original continent. By use of my differential expansion concept whereby different kinds of atoms differed as to the amount of expansion they experienced, it is possible to understand how compressional mountains were produced in postFlood times. If we wonder how the Creator made mountains, the expanding radius model deserves our very serious consideration.

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Questions, Comments, and Replies

Comment from Waisgerber to Morton

The evidence proposed by Morton could be used just as easily to postulate an earth which was much larger in diameter before the Flood. Then the shrinking of the earth would have caused a varied topography about the earth, including such things as basins or depressions. Morton's report and this comment both fail because they deal in *theoretics* (inductive reasoning) and not in *specifics* (deductive reasoning). One must deal with all the specific strata on earth and not in generalities. In order for Morton to be convincing in geology, he must show by analysis of localized geological phenomena that such an expansion event actually occurred.

Let me state further that my experience with the use of mathematical formulae in treating geophysics leads me to the one conclusion that the earth's crust cannot be understood in terms of formulae alone. Such conception may lead to outlandish theories inconsistent with what we see. I believe that the earth was created with a diameter similar to the current one and being in its present orbit was warmed by a sun whose energy not changed materially from the time of creation. If this represents "uniformitarianism" to other creationists, then so be it.

Ever since Wegener proposed continental drift as a theory, there have been physicists and geophysicists who have concluded on the basis of mathematic formulae that continents could not drift. From the beginning such formulae were conceived in the laboratory and have never been proved in the field. Morton's formulae fit this criticism as they are based on textbooks and not in the characteristics of the actual materials that make up the earth's crust in sites.

Reply by Morton

I frankly fail to see how the evidence presented in my papers could be used to prove a *larger* earth that shrank. If one will work with the mathematics he will find that on a *larger* earth, more of the sediment would flow into the deep ocean basins thereby exasperating the problem of sediment distribution rather than solving it. Perhaps what emerges here in the differences between my views and Waisgerber's relate to the differences usually evident between geophysicists (like myself) and geologists (like Waisgerber). Being concerned with the taxonomy of strata (often in one locality such as the Los Angeles Basin), geologists are immediately suspect of the more sweeping studies of geophysicists. Generally geologists do not use or understand mathematics.

I must disagree with Waisgerber's idea that we must always argue from the specific to the general. Really, both inductive and deductive logic must go hand in hand. One cannot analyze how a certain rock layer