to loose contact with the very real physical evidence left for us by earth's great geological catastrophes.

Comments by Waisgerber to Northrup: Plate tectonics is but one current theory which supposedly explains earthquakes, the development of some land forms and the existence of some rock formations. In 25 years I predict that this model will fail, just as have all previous models for the development of the earth's crust. Creationists should use plate tectonics only in a very tentative way.

Concerning the evidence for one original continent, I believe that stratigraphic and paleontologic data merely suggest that all continents were connected at one time (perhaps only by way of land bridges). The distribution of sedimentary formations and the distribution of fossil life within existing continents suggest that these connected continents were under water for the most part.

On the other hand, I do not believe that plate tectonics should be totally abandoned as a possible model just because a suitable mechanism is not presently apparent. It would be acceptable to sustain it on the basis of other evidence alone, with or without a mechanism. I believe as Burdick has cautioned, that creationists should react only very slowly in accepting any theory put forth to explain our globe. They should continue to evaluate the evidence for and against plate tectonics.

Reply by Northrup: This is precisely my point. My catastrophe series harmonization model is nothing more than a model, an attempt to explain the physical data which we find (or which we as creationists should be finding and observing) in the physical geological record. As a theologian and Old Testament scholar who honors the text of the Bible as the Word of God, I insist that the physical data which I or others have found in the earth's crust must eventually be found to be in perfect agreement. One source of information comes from the handiwork of the Creator and from His activities since Creation. The other information source is the very Word of the Creator. As a theologian I wrestle with the union of God and man in the God-Man, Christ Jesus. I test my understanding of that relationship by the Biblical evidence, revising my conclusion as I discover that it does not accurately account for all of the revelation on the subject. As a geologist I attempt to understand earth's great orogenesis in the light of the physical evidence found in the very real physical, geological column as it exists in the field. But, at the same time, I evaluate my tentative conclusions in the light of my ever growing knowledge of the final authority, the Word of the Creator. Often I find I must revise my conclusions to harmonize with the facts.

THE MECHANISMS FOR MOUNTAIN BUILDING FROM A CREATIONIST PERSPECTIVE ARE NOT YET UNDERSTOOD

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Received 15 November 1986 Revised 10 August 1987

Abstract

For this symposium the writer and others were asked to prepare papers concerning orogenesis—the process of mountain making. Then each writer was to read other papers and question the papers' authors in accordance with the questioner's scientific background. Since the writer is a geologist, questions to authors are principally geological in nature.

Preface

No model for orogenesis has yet been proposed which satisfies every part of the scientific community. That is because each scientist views the world from a differing scientific frame of reference. To a geologist, any model proposed concerning development of mountains should explain why mountain making occurred where mountains exist currently. Also the model should explain current differing geomorphic configurations of mountain ranges within any extensive part of a continent. Further, the orogenic model should explain why sedimentary strata and fossiliferous horizons vary from region to region, from country to country and from continent to continent. Also, where possible, the orogenic model should explain which strata are pre-orogenic and which are post-orogenic, and why. The model must explain the existence (or absence) of fault systems.

It is the writer's opinion that the ruling elite of 19th century western Europe were led astray principally by scientifically deficient, often anti-Biblical forces. A late 19th century result was intellectual acceptance of the myth of evolution based on what was believed to be the fact of geologic time. A mythical corollary was intellectual acceptance of geologic time based on the presumed fact of evolution. Thus any creationist model should include, where applicable, some explanation as to how the elite of the 19th century strayed into a scientific cul de sac to reside there to this day.

Because the writer does not propose an orogenic model, this should not be taken as a reluctance to propose. There is no question that mountain building relates directly to volcanic activity. The mechanism which allowed for such volcanic activity has not been determined, in the writer's opinion, plate tectonics to the contrary notwithstanding.

Because no scientist is omniscient, it is mandatory that scientists from one discipline read the proposals of those from other disciplines. Fresh ideas thrown into the caldron of scientific scrutiny will either spice the theoretical stew or cause the stew to be unpalatable. Criticism of a model is as important as is the model proposed.

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For example, the writer takes issue with 1) assignation of a Paleozoic age to the Flood by Northrup, 2) the earth expansion model of Morton, and 3) the Mars flyby beliefs of Patten. However, there may be parts of each proposal which require closer analysis and better understanding. Thus, the theoretical whole may be unacceptable, yet some parts of that whole may help explain tectonism, stratigraphy and paleontology for future creationist models.

Canopy/Flood Model

A catastrophic Flood did occur in the opinion of the writer. However there is a currently popular creationist explanation which is not acceptable to the writer. It is the so-called Canopy/Flood model where the planet's atmosphere was covered with a water canopy or an ice canopy prior to the Flood. It is the writer's opinion that Biblical evidence for the canopy part of the model is not at all compelling. Also the Flood part of the model is concluded to be an attempt to explain stratigraphy and sedimentation solely from the viewpoint of hydraulic engineering. Stratigraphic distribution of rocks and fossils is much too complex to be explained by "the Flood did it all" model.

Scripture merely separates waters from waters. The waters above can be (and for centuries were) interpreted more readily as atmospheric moisture, including ordinary clouds. A study of ancient, Biblically related literature such as the works of Josephus suggests very strongly that ancients believed rains fell shortly after Earth was created. Thus 1) there was no 2000 year dry spell prior to the Flood, as some canopy theorists assert and 2) there was neither an ice canopy nor a water canopy.

However, there was a destructive universal catastrophe—The Flood. It is current, common understanding among scientists of varied persuasions that 10,000 years ago (more or less) ocean levels were 200 feet to 300 feet lower in elevation than are ocean levels today. A 300 feet rise in the ocean level should be a flood by any definition.

Asteroidal Impacts

The evidence that asteroids or other heavenly bodies impacted the Earth, as presented by Unfred (1984) and Northrup (1979) in this symposium is acceptable. We should consider asteroids, comets and meteorites as probable initiators of surface consequences on earth, after impact. However, there is nothing in either paper to convince the writer that asteroidal impacts in fact relate directly to the formation of mountains, as the mountains are presently distributed.

The writer must object to the incorporation of believable asteroidal impact and literature with a hardly believable Canopy/Flood model. The two should be considered separately.

The Earth Divided In The Days of Peleg?

Hansen (1982) believes that he must account for the separation of continents within a short term Biblical time frame. Thus Peleg's division seemingly offers Hansen the opportunity to separate continents during the life span of Peleg. Yet throughout history, Peleg's division was believed by devout Jews and Christians to be the time when Japhetites, Shemites and Hamites were dispersed; not continents divided.

The mechanism for continental separation could have begun at the time of the origin of the Earth, even before dry land appeared. Then again, it could be that the continents never separated.

Are Plate Tectonics a Valid Theory?

Burdick (1980) criticizes creationist and secular versions of plate tectonics in language that a geologist can understand. Burdick also offers references from professional geological journals. Burdick rightly pleads for creationists to react slowly before accepting any explanation such as plate tectonics.

It is the writer's opinion that plate tectonics is merely among the latest of evolutionary scientific playthings put forth in an effort to better comprehend Earth and its geologic structures. Plate tectonics will be discarded in time, when the theory is tested across all continents and the theory is found wanting.

Problems With Isostatic Equilibrium and Viscosity

Morton (1981) believes that earth is presently in isostatic equilibrium. However, data exist which indicate contrary opinions. For example, many parts of earth offer evidence that localized uplift and/or subsidence continues, as for example within Los Angeles. According to one prominent UCLA geologist (now deceased) the Baldwin Hills in Los Angeles are rising significantly. If uplift continues, then within a few thousand years, the Baldwin Hills will be among the highest mountains in the world.

In situ conditions observed by the writer of metamorphic rocks in this part of California offer evidence that uplift is not caused by movement via a viscous medium. Rocks encountered (1) in deep gold mines and (2) in water tunnels through mountains, reveal that the deeper one penetrates Earth's crust, the greater is the observed fracturing of the underlying rock. For example, massive granitic rocks such as those of the Tejon Lookout Granite Formation, in the Tehachapi Mountains of Los Angeles County and Kern County, California, crop out boldly on the surface. However, diamond drilling to depths exceeding 1500 feet, through such rock, reveals that granitic rock and associated metamorphic rocks have been crushed into a putty like fault gouge. Individual fault gouge zones may be in excess of 20 feet in thickness.

The writer finds it difficult to believe Morton's proposal that crustal uplift via a viscous medium would have ruptured the rock in the manner described above. Uplift via a viscous medium should produce massive, relatively unbroken bedrock at depth. Fractured rock would be expected near the surface, where flexing of rock would be presumed to be greater.

Should Creationists Believe in Geologic Time?

Northrup's paper (1979) suggests a belief that evolutionary geologic time units such as Paleozoic Era, Mesozoic Era and Cenozoic Era are useable units for creationists. It should be understood that standard time units such as eras, periods, epochs and ages are just as theoretical as is the theory of evolution. Hence creationists who propose models using evolutionary geologic time units, must do so with great discretion.

Originally, the word era (as in Paleozoic Era, Mesozoic Era and Cenozoic Era) was assigned to sediment-

ary rock with similar paleontologic assemblages. Assignation of the dimension of time was a later adaptation. Pressure by evolutionists on 19th century geologists resulted in the emplacement of strata from one era above strata of another era to suggest ages long geologic time. Yet in fact, in North America and in all other countries, strata assigned to each era lie more in horizontal relationship, one era with another.

How eral time units were developed incorrectly can be seen in the states of Arizona, New Mexico, Colorado and Utah—the Four Corners area and the general region. For example within Grand Canyon and vicinity there are supposed Paleozoic formations lying one on another, above pre-Paleozoic Era (or in this instance, Pre-Cambrian Period) rocks. Commencing at the base of these Paleozoic formations one can observe rocks which are (1) deeper water marine formations, overlain by (2) near-shore marine and non-marine formations, followed by (3) on-shore, wind blown deposits and finally by (4) an overlying marine formation. Within Grand Canyon, windblown deposits are assigned to the Coconino Formation. The Coconino Formation is part of the Permian System of rocks in Grand Canyon.

Then consider stratigraphy elsewhere as within the Four Corners area, such as Painted Desert and Zion Canyon. Strata exposed within these areas are assigned to the supposedly younger Mesozoic Era. Yet one can observe similar lithological, stratal succession as described within Grand Canyon's Paleozoic succession. Mesozoic Era strata include what could be called (1) basal, marine formations which are succeeded by (2) near-shore marine and non-marine deposits, followed by (3) on-shore, windblown deposits and then followed by (4) overlying marine formations. Mesozoic Era windblown deposits are known as the Navajo Sandstone. The Navajo Formation is part of the Jurassic System of rocks.

The Paleozoic Era, Coconino Sandstone and the Mesozoic Era, Navajo Sandstone appear to be 1) lithologically similar and 2) placed similarly within respective geological stratal successions. Yet the writer knows of no mountain where the two formations appear together in outcrops, where the Navajo Sandstones can be seen to rest above the Coconino Sandstone. Navajo Sandstone can be seen in Zion Canyon and in such other places as "Rainbow Bridge" in Utah.

If evolutionary scientists can produce an observable columnar relationship (Coconino Sandstone below and Navajo Sandstone above) this would establish firmly that Navajo sandstones are younger than Coconino sandstones. Until such a relationship is seen, it is mandatory for the well trained, objective stratigrapher to provide alternative relationships. One such relationship would be that Navajo Sandstone and Coconino Sandstone are one and the same.

Additional strata exist above the highest of Mesozoic Era marine formations. These are coal beds assigned to the Cretaceous Period of the Mesozoic Era. Yet Pennsylvanian Period (Paleozoic Age) coal strata, so widely distributed in the middle and eastern parts of the United States, have not been observed in the Rocky Mountains, particularly that part of Grand Canyon which exhibits Paleozoic Strata. Why are Pennsylvanian Period formations so lacking in coal in the Rocky Mountains? It could be all bituminous and anthracitic coal horizons are of similar age. Then again they may not be exactly equivalent. Research is needed here to determine age relationships.

Paleozoic Fossil Distribution

Using the end member concept for understanding alternative beliefs, Paleozoic marine fossil distribution should be explained either chronologically or ecologically. Unfortunately, it is the chronological end member which has influenced 20th century scientists that there is such an interval of time as Paleozoic Era. In the opinion of the writer the real answer lies somewhere between the two end members, but probably closer to the ecological end member.

Ecologically speaking so-called Paleozoic marine fossils can be considered principally cold water and/or deep water elements, many of which still exist today. Paleozoic fossils are widely distributed simply because oceans in times past were as extensive in distribution as they are today. Hence cold water forms living at ocean depths were (and are) more widely distributed than were (and are) tropical sea, shallow water forms.

When the names Cambrian, Ordovician, Silurian, etc. are thus applied to rock deposits, one can equate them with ecological assemblages occurring essentially at one and the same time. However, in any one area, the higher placed formations should be considered as being younger. Consequently there is a need for geologic time to allow for localized deposition, whatever that time interval is. Also, in times past, earth had many such ecological zones that were fossilized, though not necessarily simultaneously. Research is needed here.

Other Evidences Against "Geologic Time"

It is well known among stratigraphers in North America that formations assigned to every geological period rest directly on Precambrian bedrock. Any objective stratigrapher must then use such knowledge to test the reliability of geologic time and evolution.

The end member concept for the development of theories is applicable here. One end member would be that these basal strata actually are of varied ages. Thus it is pure chance which allowed for formations within every geological period to rest directly on Precambrian rocks. Acceptance of this end member belief means that intervals of lost time must exist. Such hiatuses would vary from a few million years to over two billion years. Such lapses of depositional time are hardly believable. Such hiatuses would require the existence of structural unconformities the world over.

A second end member belief would be that all basal formations are in fact of equivalent age. If one believes this second end member, then geologic time as taught in many colleges and universities about the world must be wrong. Million year to billion year hiatuses would not exist. There would be no need for proposing the existence of unconformities the world over.

If one believes in evolution, however, then one must accept with blind faith, the first end member described: that there are billions of years of geologic time. However, in the writer's opinion, true historical geological time must lie more closely to the second end

member: thus there is no such thing as geologic time as taught currently.

There is reason to believe that subsurface strata of supposed varied ages grade laterally one into another, across all continents. Examples of stratal interfingering can be seen in evolutionary inspired textbooks on geology. Interfingering explains why petroleum geologists have such enormous difficulties in correlating one petroleum basin with another.

Research is needed concerning the stratigraphy of each state in the United States and of each province in Canada using petroleum drill data. The writer believes that future research will determine that strata of one age grade with frequency into strata of another age. We have found some evidence of this even in the Grand Canyon (Waisgerber, Howe and Williams, 1987).

Research is needed to determine the depth of sedimentary formations within each state. Then the formations should be correlated across states to show that depth of sedimentary strata is not related to geologic time. Researchers will determine that there are Paleozoic, Mesozoic and Cenozoic formations exceeding 20,000 feet in thickness in selected basins. These deep basins could have been formed over one interval of time, rather than successively.

The state of Nebraska would be an excellent state to commence study in the subsurface. So would be states such as Iowa, Illinois, Indiana, Ohio and Michigan.

Oil And Gas Deposits Demand Recency

There is strong evidence for a young Earth via a study of oil and gas deposits. These liquid and gaseous elements are trapped in sedimentary strata. A research program to determine the permabilities of these same strata should reveal that these strata cannot trap oil (or gas) for millions of years. Even the tightest of strata will allow water to migrate about an inch a year. Gas would migrate considerably more rapidly. Therefore the belief that we have gas trapped in strata ranging in age from about 10 million years to five hundred million years is a belief in the supernatural. It is not science.

Conclusion

The writer does not support any specific creation model to explain geology and geologic time. There are far too many areas of science which have not been incorporated into any model: areas which are not known to, nor understood by the writer. Hence the writer's immediate objective is to suggest areas requiring research in order to come closer to an understanding of the history of earth. There is no doubt that future research will result in a history of earth which will not include evolution as the key element.

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Note: *CRSQ—Creation Research Society Quarterly.*

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Questions, Comments, and Replies

Question from Morton to Waisgerber

It is difficult to understand how Mesozoic coal and lignite can be rafted into place at the same time as Paleozoic coal considering that they exhibit a vertical relationship to each other. The same can be said of the rocks named Cambrian, Ordovician, Silurian, etc. If these materials are deposited at identically the same time and represent different ecological assemblages, then why are they found on top of each other rather than side by side in a horizontal relationship? One must explain why the Lehigh coal beds of the Ouachita in southern Oklahoma are covered by strata of Mesozoic affinities which also contain coal and lignite. The Ouachitas can be followed seismically to the south where they are buried by several thousand feet of sediment which also contains coal and lignite. It would seem difficult to have these coals be deposited simultaneously.

Reply by Waisgerber

The rafting of Mesozoic coal into place at the same time as Paleozoic coal is but one end member of a field of study concerning the stratigraphy of North America. At the other end of this field of study would be the slow, ages long accumulation of sediments and coal as represented by evolutionary thinking. Thus there exists any number of interpolations between those end members.

In the first place no mention was made by me of lignite. I refer to massive accumulations of what could be economically excavatable bituminous and anthracitic coals such as exist in Pennsylvania and in the Rocky Mountains.

Secondly, I challenge Morton's statement that the Paleozoic coals and the Mesozoic coals show a vertical relationship, one with another. Where in Pennsylvania is there Mesozoic coal resting on Paleozoic coal? Where in the northern Rockies of the United States is Mesozoic or Cenozoic coal underlain observably by Paleozoic coal?

Thirdly, I never said that Cambrian, Ordovician, Silurian, etc. deposits were deposited at one and the same time. The principle of superposition readily explains that overlying higher formations are younger than are underlying formations, presuming no tectonic complications. There must be an interval of time in order for sedimentary materials to accumulate, no. matter what the energy source.

Fourthly, a question was asked as to why the formations are found to be on top of each other rather than side by side in a horizontal relationship. The answer to that question is to be found in a study of the history of stratigraphy. It is enough to say that correlation of strata across the United States is virtually impossible because, at depth, sedimentary formations of various ages in fact grade into strata of other ages. Such lateral relationships are known by the stratigraphic fraternity, especially within eastern states.

Even the venerable United States Geological Survey has not yet been able to correlate formations across the United States because (1) the formations beneath may not exist on the surface (2) subsurface formations undergo facies change laterally and vertically and (3) because fossil evidence defining geologic time in the