

Have the continents really moved apart?

A review of
Plate Tectonics: A Different View

Edited by John K. Reed
Creation Research Society
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John R. Baumgardner

Plate tectonics theory provides a coherent framework for understanding an incredibly broad spectrum of observations concerning our planet. With respect to the ocean bottom, it accounts for the topographical features of mid-ocean ridges, fracture zones, island arcs, and deep ocean trenches. It further accounts for the sediment thickness distribution, the lateral and vertical fossil distribution in the sediments, correlation of magnetic anomalies in the sediments and in the igneous basement rocks, the pattern of heat flow from the ocean floor, variation in ocean depth, igneous basement rock chemistry, earthquake distribution and earthquake focal mechanism pattern, as well as the similarity in shape of the opposite sides of the Atlantic basin. These are all elegantly explained by plate tectonics and by no other geophysical theory. With respect to the continents, plate tectonics theory accounts for the locations of the primary mountain chains, the lateral distribution of volcano and

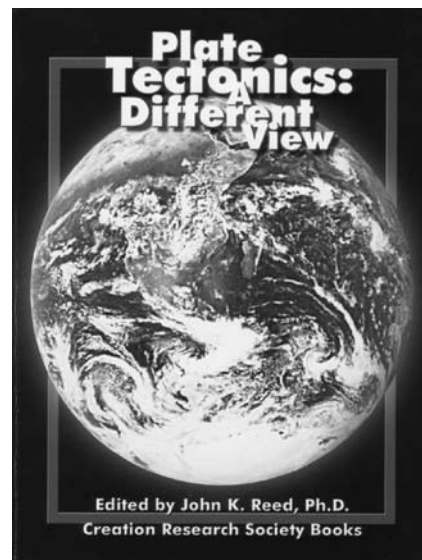
John Baumgardner has been at the forefront of developing the concept of Catastrophic Plate Tectonics. He, along with a number of other young-Earth creationist scientists, has published and lectured extensively about CPT over many years in different creationist forums. *Plate Tectonics: A Different View* is written by a number of creationist scientists who express skepticism with the concept of plate tectonics. A special forum on the topic of plate tectonics is planned for the next issue of *TJ*.

earthquake belts, the distribution of andesite volcanoes, lateral locations of deep earthquakes, the gravity anomaly pattern, differences in apparent polar wander on different continents, and subsidence and uplift patterns that have profoundly influenced continental sediment thickness and erosion. Again, these features are elegantly explained by plate tectonics and by no other geophysical theory.

A different view

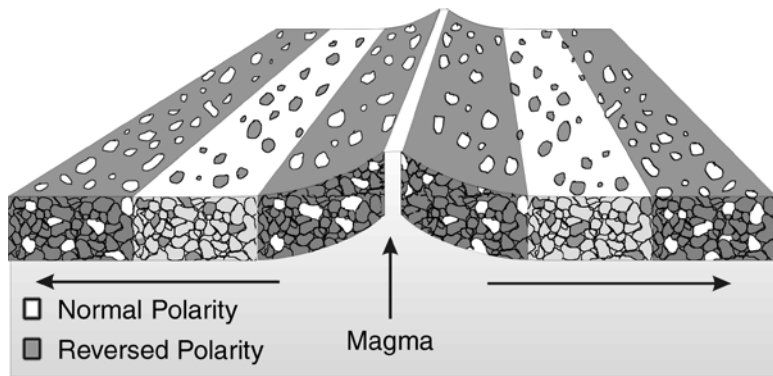
As acknowledged in its Introduction, the monograph, *Plate Tectonics: A Different View*, edited by John K. Reed, takes a skeptical view of the validity of plate tectonics. I believe it is fair to say the four young-Earth creationist authors take not just a skeptical view but an openly hostile view. A notable consequence of this hostility is a serious lack of objectivity. A good example appears in their summary of the observational evidence in support of plate tectonics in chapter one. There is a strange silence regarding what most earth science investigators would regard as the most definitive evidence, namely, the results of the Deep Sea Drilling Program and the Ocean Drilling Program. This international effort spanning more than 30 years has drilled some 2,000 holes in the ocean sediment cover, most to igneous basement rock.

The cores obtained from these holes have provided a wealth of data relating to the history of the world's ocean basins. These data make it possible to correlate fossils in the deep ocean sediments with the marine microfossil record on the continental shelves and hence with the overall continental fossil record. They also make possible correlation of the magnetic reversal pattern recorded by orientations of magnetic minerals in the deep ocean sediments with the same pattern recorded in successive lava flows on



the flanks of continental volcanoes as well as in the igneous basement rocks beneath the ocean sediments. Such correlations are independent of radiometric dating and assumptions about absolute age. In the case of magnetic reversals one can simply count reversals from the top downward in the sediment cores and the lava flow sequences with no assumptions whatever concerning absolute age. It is this sort of observational data that so strongly constrains the **relative** age of all the present-day ocean basins to be younger than the Paleozoic sediment record of the continents.

At an even more basic level, the ocean sediment thickness obtained by this drilling effort itself provides strong support for plate tectonics, a point these authors neglect to mention. The sediment distribution is strongly correlated in a geometrical sense with the mid-ocean ridge system. In general, the greater the distance from a mid-ocean ridge the greater is the sediment thickness. Coupled with the observations of extremely high heat flow along the ridge axis, of actual magma eruptions occurring today along portions of ridge axis, and of the high topography of the ridges implying higher temperatures in the underlying rock column, the case is compelling that seafloor spreading is a reality and is responsible for this observed distribution of ocean sediment. By omitting most of the primary evidence that undergirds the plate



The magnetic pattern in the volcanic rock formed on the sea-floor at the mid-ocean ridges suggests very rapid processes, not millions of years. The patchwork patterns of polarity are evidence for rapid formation of the rock.

tectonics paradigm, the authors of the monograph lead the unwary reader to believe plate tectonics was accepted by the earth science community and continues to be held on the basis of very slim support indeed. This is simply not an accurate picture.

Objections not sustained

In addition to neglecting the considerable evidence base supporting plate tectonics theory, the authors raise several dozen specific objections that are not sustainable. I will deal briefly with just a few of these. In chapter two an entire section is devoted to the claim that plate tectonics has no driving mechanism. But certainly this is not the case. I myself have shown for many years, even in the creationist literature,¹ how the density variations in the plates at the Earth's surface naturally drive a pattern of flow just like plate tectonics predicts. There is nothing mysterious or difficult about how this occurs. It has been demonstrated repeatedly for many years in numerical models. The numerical approach simply divides the volume of the mantle into a large number of more or less equal-sized cells and solves equations expressing the conservation of mass and the conservation of energy, together with a balance of forces, for each of these cells. The basic driving mechanism is the thin layer of rock at the Earth's surface that cools and then sinks, because of its higher density, into the hotter, less dense mantle be-

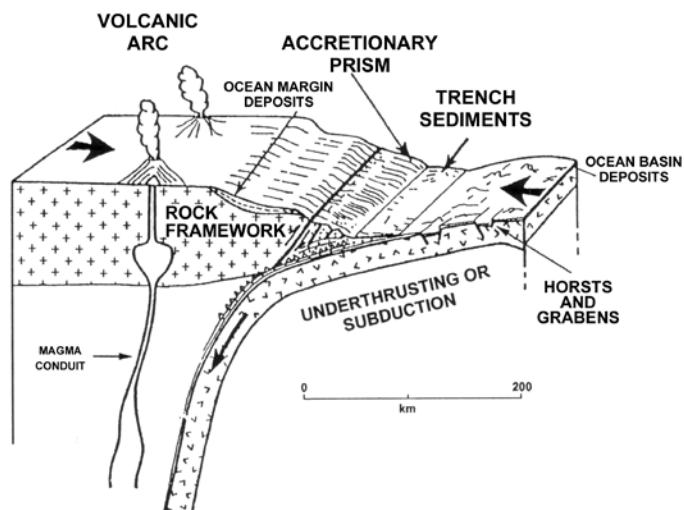
neath. The mechanism is really just that straightforward and clear. The source for the mechanical work is the gravitational potential energy of the cold rock.

Chapter three in the monograph focuses on the claim that the phenomenon of spreading ocean ridges on three sides of the African plate is an enigma as yet unexplained by plate tectonic theory. What this author refers to as an enigma is the lack of subduction zones to balance the sea-floor spreading that is occurring on both the eastern and western sides of the African plate. Although the author acknowledges the answer given in many places in the conventional literature, he simply dismisses it as *ad hoc* and 'not supported by any specific geological/geophysical evidence'. The

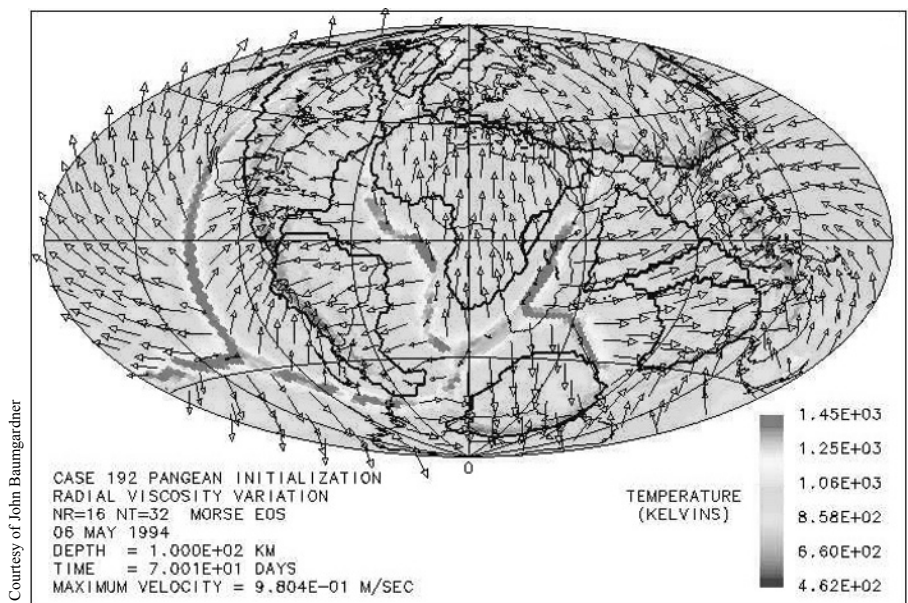
difficulty, however, seems to be that he understands neither the answer nor the evidence that supports it. Part of the answer is that both North and South America have moved in a dramatic manner to the west as a consequence of the large amount of subduction that has taken place on their western margins. In response to this westward motion of the Americas, the spreading ridge centred in the Atlantic has migrated westward relative to Africa.

The ridge migrates because the hot rock rising in response to spreading at the ridge axis cools and strengthens at the same rate on both sides of the axis. This spreading zone tends to reside and remain where the rock is the weakest. Therefore an equal amount of new plate is formed on either side of the ridge axis, even when one of the plates is stationary. This implies ridge migration. It is just that simple. The author could not imagine how a mid-ocean ridge could migrate and so made this claim of an unsolved enigma. The author seems not to be aware of my paper¹ in which I show numerical calculations displaying this very phenomenon of ridge migration on three sides of the African plate that unfolds in an entirely spontaneous way.

Chapter four seeks to discredit the obvious similarity of shape of the eastern and western margins of the Atlantic basin by showing some eighteen other continental 'fits'; for example, South



Typical accretionary prism in a subduction zone—a genuine problem for uniformitarian plate tectonics.



Computer images showing the plate movement of Baumgardner's theory of Catastrophic Plate Tectonics.

America turned upside down and moved northward such that its current Pacific coast mates with the Pacific coast of North America, and Greenland tuned upside down so it meshes with the east coast of Africa! Most of these the author admits are 'spoofs'. But, he avoids any serious discussion of primary physical features of the Atlantic basin, for example the Mid-Atlantic Ridge, which cry out for an alternative explanation if one rejects the notion of seafloor spreading. The author, however, offers no alternative.

Chapter five raises an issue that indeed is a genuine problem for uniformitarian plate tectonics, namely, why there is so little evidence for plate convergence in the sediments occupying the deep ocean trenches. Observations show that trenches adjacent to continents typically contain horizontally layered terrigenous sediments. These sediments display little evidence of the compressional deformation one expects if the ocean plate had been subducting beneath the continent in a constant manner as uniformitarian theory assumes. The author is correct in pointing this out. However, he apparently fails to understand that these observations are exactly what catastrophic plate tectonics (CPT) anticipates. In this framework, most subduction and plate motion occurs during

a brief runaway episode during which rock strength throughout the mantle is reduced by many orders of magnitude. When this runaway ends, rock strength approaches its present range of values and plate motion comes to a near standstill. In simple terms, the runaway episode corresponds to the transgressive stage of the Flood, and massive runoff from the continents then follows. In the CPT framework, sediments in trenches near continents are the product of the runoff stage of the Flood, with very little plate motion or subduction thereafter. These sediments therefore display little internal deformation. So, what this author takes to be a problem for plate tectonics actually represents strong support for the CPT version of the theory.

Space limitations prevent me from reviewing the other issues raised in this monograph. Nevertheless, there is a wealth of observational data that relate to these questions. An upcoming forum in *TJ* will hopefully provide an opportunity to air many of them.

Let's pull together

In conclusion, a major barrier to a credible technical defence of the Genesis Flood for well over two centuries has been the lack of a plausible mechanism. Plate tectonics has pro-

vided an essential clue for discovery of this mechanism, namely, realization that the upper 50–100 km of the ocean floor can sink and in the past indeed has sunk into the Earth's interior. Another crucial clue has come from mineral physics experiments that show silicate minerals weaken dramatically under high temperature and stress. The implication with profound importance to the issue of the Flood is that the ocean floor can sink into the Earth's interior quickly, on the order of days to weeks. This mechanism includes a built-in energy source to drive the process. I believe we are now able to model and understand and defend the Flood in a positive way that has not been possible for more than 200 years. In regard to this monograph, I believe it is urgent that as young-Earth creationists we all begin to pull together and work together to bring to fruition a coherent model of the Genesis Flood that draws upon the wealth of geological and geophysical observations now available. We simply cannot afford to neglect or misinterpret important pieces of the puzzle if we are to succeed in this enterprise.

References

1. Baumgardner, J.R., Computer modeling of the large-scale tectonics associated with the Genesis Flood; in: Walsh, R.E. (Ed.), *Proceedings of the Third International Conference on Creationism, Technical Symposium Sessions*, Creation Science Fellowship Inc., Pittsburgh, pp. 49–62, 1994.