

Heirtzler J R, Dickson G O, Herron E M, Pitman W C, III & Le Pichon X.

Marine magnetic anomalies, geomagnetic field reversals, and motions of the ocean floor and continents. *J. Geophys. Res.* 73:2119-36, 1968.

[Lamont Geological Observ., Columbia Univ., Palisades, NY]

**This paper summarizes the results of the three previous papers<sup>1</sup> in this series, which have shown the presence of a pattern of magnetic anomalies, bilaterally symmetric about the crest of the ridge in the Pacific, Atlantic, and Indian oceans. By assuming that the pattern is caused by a sequence of normally and reversely magnetized blocks that have been produced by sea-floor spreading at the axes of the ridges, it is shown that the sequence of blocks correspond to a common geomagnetic time scale. The pattern of opening of the oceans is discussed and the implications on continental drift are considered. [The SCJ<sup>®</sup> indicates that this paper has been cited over 560 times since 1968.]**

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August 6, 1979

"This highly cited paper is one of those that ushered in the era of 'plate tectonics' or 'the revolution in the earth sciences' which has excited earth scientists so much in the last ten years. Today, when reversals of the earth's magnetic field and continental drift are almost taken for granted, it is a bit difficult to appreciate its initial impact. In those days the permanency of the magnetic field and the positions of the continents were challenged by only a few persons who were thought to be more interested in intellectual arguments than in the realities of the world. In this paper the reality of both the magnetic field reversals and the motion of the continents was established. The paper went on to give a date for more than 170 magnetic field reversals during the last 80 million years and to plot exactly how the continents of the

world moved over that time.

"Man likes to look back over the millions of years that the earth has been here and to try to understand the changes that it has undergone, but it is difficult for him to come to grips with the concept of time on this scale. Of the three basic physical parameters—length, mass, and time—it is only with large amounts of time that he has no direct personal experience. Science had only provided a radiometric technique for the absolute dating of the past which could only be used for dating pieces of materials from here and there and not in a truly comprehensive way to get a worldwide view of the earth during the geologic past. With this paper man got his first kaleidoscopic view of the earth's history, with new oceans being formed and continents moving thousands of kilometers, which gave new knowledge about where mineral resources might be formed.

"This paper told how the world was reconfigured over so vast an expanse of geologic time that it left its authors, their colleagues, and even laymen awed at the knowledge that science can produce. The interplay of ideas and personalities among earth scientists during the 1960s is a story that has not yet been properly written and is too long to give here. Suffice it to say that a lot of good science was being done by several groups of dedicated people and the time was ripe for papers such as this to be written.

"After writing papers such as this probably all authors ask themselves the question: What would it take to do it again? Starting with the premise that the question can be answered one would have to say that you should sense where a significant answerable problem exists, that you have a reasonable intellect and are willing to work extremely hard, and that society will support you enough to let you proceed on this path. If the support is stable enough in the earth sciences over the next ten years we are likely to see many other new chapters in the revolution in the earth sciences, relating various other geophysical phenomena."

1. Pitman W C, III, Herron E M & Heirtzler J R. *J. Geophys. Res.* 73:2069-85, 1968..

2. Dickson G O, Pitman W C, III & Heirtzler J R. *J. Geophys. Res.* 73:2087-100, 1968.

3. Le Pichon X & Heirtzler J R. *J. Geophys. Res.* 73:2101-17, 1968.