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Melson W G & Van Andel T H. Metamorphism in the Mid-Atlantic Ridge, 22°N latitude. *Mar. Geology* 4:165-86, 1966.
[US National Museum, Washington, DC and Scripps Institution of Oceanography, La Jolla, CA]

Greenschist-facies metabasalts are described from dredge samples from the walls of the median valley of the Mid-Atlantic Ridge for the first time. This led to additions and revisions of the processes operating during sea-floor spreading. [The *SCI*® indicates that this paper has been cited in over 120 publications.]

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Rocks from the deep-sea floor were a critical part of the emerging theory of plate tectonics in the early 1960s, yet few samples had been dredged and fewer described. I was a graduate student at Princeton during that time. There, Harry Hess gave me a preprint proposing sea-floor spreading, which included the idea that St. Paul's Rocks, equatorial Atlantic, were a possible outcrop of hydrated suboceanic mantle (serpentinized periodotite).[1]

Vaughan T. Bowen, at Woods Hole, along with Geoff Nicholls and Geoff Thompson, had made a collection and dredged from around the rocks, and I arranged to see these samples in 1964. While at Woods Hole, Bowen also showed me a collection of what were assumed to be serpentinites dredged from 22°N. I found instead that the rocks were sheared and metamorphosed basalts: rocks not as yet described in detail from sea-floor spreading centers. Van Andel asked that I send the specimens loaned to me, as well as the thin sections I had made, to a long-time colleague of his at Scripps for more intensive study. Quite frankly, I viewed this as giving up acknowledgement for a potentially important discovery, and we arranged that I would continue the work. I was in my first year at the Smithsonian at the time, and I wanted such a paper to help me move toward a permanent position.

My initial descriptions were put into a draft of a paper on the marine geology of the region.[2] The metamorphic grade of these rocks increased with depth on the fault scarp, suggesting burial metamorphism followed by tectonic exposure. About this same time, Joe Cann and Fred Vine described related rocks, although less deformed and termed spilites, from the Carlsberg Ridge, Indian Ocean.[3] Van Andel then invited me on a detailed additional oceanographic survey of the region in 1965, during which we dredged additional metabasalts, revealing that the earlier samples were not, in fact, rare.

Since that time, metabasalts have been recovered from many rifted median valley settings in the Atlantic and Indian Oceans. Eventually Van Andel and I published a more extensive paper along with Thompson, who had determined and interpreted trace element abundances in the samples.[4] We interpreted the rocks as products of near-surface hydrothermal alteration, of the sort associated with geothermal fissure systems, similar to those found beneath southern Iceland, instead of a product of regional metamorphism as postulated in the above paper. This interpretation pointed to the probable presence of geothermal systems along sea-floor spreading centers, an indication now abundantly born out by the active geothermal "smokers" found, and under intensive study, at a number of sites.[5]

1. **Hess H H.** Mid-oceanic ridges and tectonics of the sea-floor. (Whittard W F & Bradshaw R, eds.) *Submarine geology and geophysics*. London: Butterworths, 1965. p. 317-34.
2. **Van Andel T H, Bowen V T, Sachs P L & Siever R.** Morphology and sediments of a portion of the Mid-Atlantic Ridge. *Science* 148:1214-6, 1965.
3. **Cann J R & Vine F J.** An area on the crest of the Carlsberg Ridge: petrology and magnetic survey. *Phil. Trans. Roy. Soc. London A* 259:198-217, 1966. (Cited 50 times.)
4. **Melson W G, Thompson G & Van Andel T H.** Volcanism and metamorphism in the Mid-Atlantic Ridge: 22°N latitude. *J. Geophys. Res.* 73:5925-41, 1968. (Cited 180 times.)
5. **Elthon D.** Metamorphism in oceanic spreading centers. (Emiliani C, ed.) *The oceanic lithosphere*. New York: Wiley, 1981. p. 285-303.

248