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Kay R, Hubbard N J & Gast P W. Chemical characteristics and origin of oceanic ridge volcanic rocks. *J. Geophys. Res.* 75:1585-613, 1970.
[Lamont-Doherty Geological Observatory, Columbia University, Palisades, NY]

Oceanic ridge basalts are the least accessible, but in many ways the most important, rocks on earth. We used novel geochemical data together with the recently proposed and quickly accepted theory of sea-floor spreading to construct a model that explained their origin. [The *SCI*® indicates that this paper has been cited in over 410 publications.]

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Our 1970 article came at a crossroads for the earth sciences. In the mid-1960s the concept of sea-floor spreading unified terrestrial geology and elevated the subject of our paper—oceanic ridge basalts—to an importance undreamed of only five years before. This basalt is earth's commonest magma that forms a 6 km-thick crustal layer under all the world's deep ocean basins.

Yet in 1960 the few basalt samples that had been dredged, at great expense, from the abyssal ocean depths held little interest for most earth scientists. However, Paul Gast, my thesis adviser at Minnesota and Columbia, was interested and had already accumulated some samples. Most prized among these were basalts dredged in 1947 with great foresight by Maurice Ewing, director of Columbia's Lamont Geological Observatory. These basalts had been virtually ignored by a generation of petrologists. Coincident with our work, Akiho Miyashiro, the famous Japanese petrologist, came to Lamont to collaborate with Ewing in the study of these rocks.

During our study we felt very fortunate to acquire access to samples newly dredged by Ken Deffeyes (from Princeton—but recently from Minnesota). I recall explaining the significance of our trace-element investigations to Princeton's Harry Hess, perhaps the world's most prominent petrologist at the time. He thought that I should do some field mapping, but, instead, I spent the next year in the laboratory developing our analytical techniques.

By happy coincidence, completion of our analytical work coincided with the need for a paper of broad scope. We felt that our geochemical results were of interest to geophysicists (the dominant group at Lamont), petrologists, and for that matter anyone interested in earth dynamics. Some topics in the paper reflect controversies that have been put to rest, e.g., do alkali basalts from oceanic islands have different sources than tholeiitic basalts? They do. Other topics were new and have become very popular, e.g., magma segregation,[1] primary magmas,[2] and the creation of large-scale compositional heterogeneities of mantle.[3-5] I believe the fact that we recognized these as important and discussed them quantitatively in relation to a specific model accounts for the success of our paper. In addition, we chose to publish in a journal that is one of the best in the earth sciences. Every author's prepublication nightmare actually happened to us; due to a mix-up in the editor's office, an early unrevised version was typeset by the journal. The corrected galley proof was very colorful.

None of the authors studied oceanic ridge basalts again, although we authored a review paper.[6,7] Gast and Hubbard investigated lunar rocks at NASA's Planetary and Earth Sciences Division in Houston (Gast was division chief). I have worked on island arc and alkaline basalts. Gast received several awards, both before and after his death in 1973, mainly in recognition of his lunar studies.

Our efforts at tectonic classification resulted in the term "oceanic ridge basalt" or ORB. More commonly these days, the acronym is MORB (M is mid-), which ignores the fact that some oceanic ridges are at the ocean margins.

1. **Ahern J L & Turcotte D L.** Magma migration beneath an ocean ridge. *Earth Planet. Sci. Lett.* 45:115-22, 1979.
2. **Sparks R S J, Meyer P & Sigurdsson H.** Density variations amongst mid-ocean ridge basalts: implications for magma mixing and the scarcity of primitive lavas. *Earth Planet. Sci. Lett.* 46:315-18, 1977.
3. **Dick H J B, Fisher R L & Bryan W B.** Mineralogic variability of the uppermost mantle along mid-ocean ridges. *Earth Planet. Sci. Lett.* 69:88-106, 1984.
4. **Schilling J-G, Zajac M, Evans R, Johnston T, White W, Devine J D & Kingsley R.** Petrologic and geochemical variations along the Mid-Atlantic Ridge from 29°N to 73°N. *Amer. J. Sci.* 283:510-86, 1983.
5. **Allègre C J.** Chemical geodynamics. *Tectonophysics* 81:109-32, 1982.
6. **Kay R W & Hubbard N.** Trace elements in oceanic ridge basalt. *Earth Planet. Sci. Lett.* 38:95-111, 1978. (Cited 90 times.)
7. --------------. Trace elements in oceanic ridge basalt. (Allègre C & Hart S, eds.) *Trace elements in igneous petrology.* Amsterdam: Elsevier Scientific, 1978. p. 95-116.

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