Dick Receives 2011 Harry H. Hess Medal

Henry J. B. Dick was awarded the 2011 Harry H. Hess Medal at the AGU Fall Meeting Honors Ceremony, held on 7 December 2011 in San Francisco, Calif. The medal is for "outstanding achievements in research on the constitution and evolution of Earth and other planets."

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Citation

The Harry H. Hess Medal recognizes "outstanding achievements in research in the constitution and evolution of Earth and other planets." It is thus most appropriate that Henry Dick receive the 2011 AGU Hess Medal.

In his seafloor spreading hypothesis, Harry Hess thought the ocean crust as serpentines derived from hydration of the rising hot mantle at ocean ridges. While a basaltic ocean crust is now accepted, Henry advocates the role of serpentines as a crustal constituent. In fact, it is Henry's painstaking studies of these serpentinized abyssal peridotites that have established our present-day understanding of the mantle melting and ocean crust formation at ocean ridges. It is fair to say that modern seafloor petrology, geochemistry, and tectonics would not be the same without Henry's many discoveries, creative efforts, and deep insights.

Abyssal peridotites are mantle melting residues for mid-ocean ridge basalt (MORB), but this was unknown before Dick and Fisher (1984).

Dick, Fisher, and Bryan (1984) showed that abyssal peridotites from "hot-spot-influenced" shallow ridges are more depleted than those from "hot-spot-uninfluenced" deep ridges, and this varying degree of depletion correlates with the chemistry of spatially associated MORB. This discovery marked a turning point for seafloor petrology research. Henry recently suggested that some of these near-ridge "hot spots" may be inherited from chemically depleted and physically buoyant asthenosphere.

It seems straightforward that mantle melting occurs in the form of near-fractional melting, but this was not obvious before the trace element study on abyssal peridotite minerals by Henry and his students (Johnson, Dick, and Shimizu, 1990).

Melt-rock reaction is known to be important during melt ascent in the mantle, but Dick (1976) was the first to document the reactions in the Josephine harzburgite and has shown further that this process is also important for magmatism at crustal levels.

Dick and Bullen (1984) pioneered applying the compositions of spinels in peridotites and basalts as a petrogenetic indicator to fingerprint tectonic settings of rock formation. This technique remains effective and widely used today. Dick (1976) was also the first to use spinels in alpine and abyssal peridotites to estimate oxygen fugacity, a fundamental tool for understanding mantle evolution.

Henry made passionate efforts to understand the lithological structure of the ocean crust through seagoing investigations. He has achieved drilling into the Moho via "offset drilling" (Dick and others, 1991, 2000) and shown differences of lower crustal gabbros between slow and fast spreading ridges, and both differ from ophiolite complexes, questioning the paradigm of ophiolites as representing normal oceanic lithosphere.

Dick, Thompson, and Bryan (1981) correctly concluded the significance of low-angle normal faults in exposing mantle peridotites and lower crust gabbros at slow spreading ridges, fundamental to the discovery and understanding of oceanic core complexes.

Dick, Lin, and Schouten (2003) recognized the "ultraslow spreading class of ocean ridges" that differ from the familiar fast and slow spreading ridges and offer new challenges for understanding how ocean ridges work.

Henry has achieved all that Harry Hess left behind and has done much more. At the age of 65, Henry continues to lead our field and to solve major scientific problems while discovering new ones. Indeed, few scientists have the scientific spirit of Harry Hess the way Henry does. Henry is the unmatched seafloor petrologist of our time and is a scientific giant who has mentored many. His iconoclastic courage sets a good example for being an original researcher, and his enthusiasm continues to affect a new generation of young scientists with the wonder of our planet.

Mr. President, members of the committee, and the Union, it is my great pleasure to present Henry Dick to you as the Harry Hess medalist for 2011.

—Yaoling Niu, Durham University, Durham, UK

Response

Mr. President, members of the award committee, my colleagues, nominators, friends, and family, it is a great pleasure to accept the Harry H. Hess Medal. This medal means a great deal. My undergraduate advisor at the University of Pennsylvania, Reg Shagam, was a student of Harry Hess. Hess's enthusiasm and excitement were uniquely transmitted to every student of his that I have ever met. He imbued them with remarkable passion for the Earth, and in turn they passed this on to their own students, and I am one of them.

First and foremost, Hess was a geologist and mineralogist who took field and mineralogical studies and wove "geopoetry" about our planet. Whether as a naval officer,

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mapping out the mid-ocean mountains during World War II, or as a Princeton professor trekking the hills in the Stillwater Complex in Montana, his work was based on hard data collected in the field by him and his students. The insights he gained changed the way we thought of and about our planet.

Hess turned our attention to the study of the ocean crust and helped inspire the Deep Sea Drilling Project and its successors, still today, after 40 years, arguably one of our most successful and important international scientific endeavors. Though many of its goals, such as full penetration of the ocean crust, are yet to be achieved, they can and will be obtained as long as we have the will. This leads me to the wonderful time I have had drilling and exploring the global ridge system, a task I took to heart from Bob Coleman's challenge to a group of young students at the 1971 Penrose Ophiolite Conference. It has been a fascinating and rewarding endeavor, rich with opportunity. I have been the proverbial boy in the candy shop. There is so much out there to discover that I must modestly reflect on my career with the old phrase, "Even a blind hog, if he roots long enough under an acorn tree, will find a nut or two."

Field geology often seems to be the stepchild of the Earth sciences: To paraphrase a famous comedian, "it don't get no respect." Yet in the oceans, whether dredging from a ship, operating a remotely operated vehicle, or gloriously diving in a submarine, it is arguably one of the most exciting spheres of our science. Mapping and sampling the ocean crust and analysis and study of the rocks and data acquired are enormously time-consuming and complex. Yet while they extend over three fifths of our planet, the oceans get a fraction of the resources of space exploration. Our efforts are extremely modest considering the scale of the project and its potential human impact. This is particularly true

for the basic chore of geologically surveying the ocean crust. Geologists have been tramping around on land for hundreds of years mapping and sampling; what has been done beneath the waves is absurdly small.

Yet dramatic finds are being made in the little-explored regions of the global ridge system. Many of the great ocean rises are now found to have discontinuous thin crust, marking locations where the seafloor is rifting over the site of ancient mantle plumes. There is the startling discovery by a small group of us, notably including Mathilde Cannat and Daniel Sauter, that the crust is not a continuous shell around the Earth but is missing across large swaths of the ocean floor. The implications for tectonics and geochemical cycles are profound and directly challenge conventional wisdom and interpretations. This is a discovery that most certainly would please Hess, who first proposed that the ocean crust was serpentinized mantle rock.

In closing, I would like to comment that I do not have sole ownership of this medal. There are many colleagues who have contributed to the work, discoveries, and ideas for which it has been awarded, and each of them owns a piece of it. In particular, I would mention Charlie Langmuir: The two of us have squabbled endlessly over the years, but together we have pioneered techniques for using major element chemistry as a key to understanding the dynamics of the mantle and crustal accretion beneath the 60% of our planet covered by ocean, and neither of us would have gone far on this trip without the other. Both to him and to my numerous friends and colleagues who have also contributed so much: Thank you.

—Henry J. B. Dick, Woods Hole Oceanographic Institution, Woods Hole, Mass.