Medalist

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.

—Yaoling Niu
Durham University, Durham, UK

Henry J.B. Dick

Harry H. Hess Medal

For his many discoveries, creative efforts, and deep insights that have led to the modern understanding of mantle melting and ocean crust formation along the global ocean ridges.