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Peering into the Cradle of Life: Scientific Drilling in the Barberton Greenstone Belt, South Africa

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The Barberton Greenstone Belt in South Africa is one of the best-preserved successions of mid-Archean (3.5-3.2 Ga) supracrustal rocks in the world, and a site where conditions and processes at the surface of the Archean Earth can be studied in detail. Despite generally good outcrop, complete field sections are not preserved, and crucial features such as the contacts of lava flows and continuous successions of critical sedimentary rock sequences are not exposed. Through diamond drilling we have obtained continuous sections and relatively unaltered samples from the volcano-sedimentary successions. The sedimentary sequences provide information about erosion and sedimentation on the early Earth, the composition and temperature of Archean seawater, and one possible site where life may have emerged and evolved. Investigation of spherule layers (including impact debris) provide information about the nature and magnitude of meteorite impact on the early Earth. The ultramafic to mafic volcanic rocks provide new insights into volcanic processes, dynamics of the crust and mantle, interaction between oceanic volcanic crust and the hydrosphere and biosphere.
The project supported by the International Continental Drilling Program and by scientists from 13 countries in five continents. Drilling started in July 2011 and is expected to finish in February 2012. Regular updates are posted on the ICDP web site < www.icdp-online.org>.
By December 2011, two 300m holes in komatiite had been completed. This drilling provided excellent sections through over 60 flows of komatiite or komatiitic basalt, including a thick inflated flow composed of highly magnesian, possibly hydrous komatiite. Drilling was continuing at two sites in sedimentary sequences. The first, at Buck Reef, has yielded over 600 m of banded chert retaining complex sedimentary and diagenetic structures; the second, in the Middle Fig Tree formation, has intersected 350 m of interbanded chert and ferruginous shale. Two additional hole will be completed by March 2012. The distribution of samples and post-drilling research will be coordinated by a steering committee from all member countries and a workshop to decide who does what on the core will be held in South Africa in mid 2012.