Drilling into the Cradle of Life: The Barberton Greenstone Belt Drilling project

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Sedimentary rocks from Archean greenstone belts provide information about the composition of the early atmosphere and ocean and the emergence and evolution of microbial life. Their host magmatic rocks reveal the composition and evolution of the Archean mantle and provide clues about the beginning of plate tectonic processes. One of the best preserved mid-Archean (3500-3200 million year old) successions of supracrustal rocks is the Barberton Greenstone Belt in South Africa and Swaziland. Although well-exposed, many surface outcrops are deeply weathered and discontinuous making geochemical analysis fraught with difficulty. To address this, an international drilling project was started in August 2011, supported by the International Continental Drilling Program (ICDP). Three drill cores have been extracted to date: one consisting of komatiite, komatiitic basalts and associated intrusive rocks; a second through cherts, banded ferruginous rocks, shale and felsic volcanic; and a third through turbiditic greywacke, mudstone and sideritic banded ferruginous chert. A fourth site through chert, barite and impact spherule layers is currently being drilled.

Initial logs and results show a range of lithologies that will provide key chemical and isotopic data for interpreting the nature of the earliest environmental conditions on Earth. Samples will be made available to participating scientists following a call for proposals in late 2012.

Key problems that will be tackled:

- Nature of earliest metabolic activity and microbial habitats
- Archean ocean temperature and composition
- Composition of the early atmosphere
- Estimate meteorite projectile flux
- origin of chert: hydrothermal vs precipitation from seawater

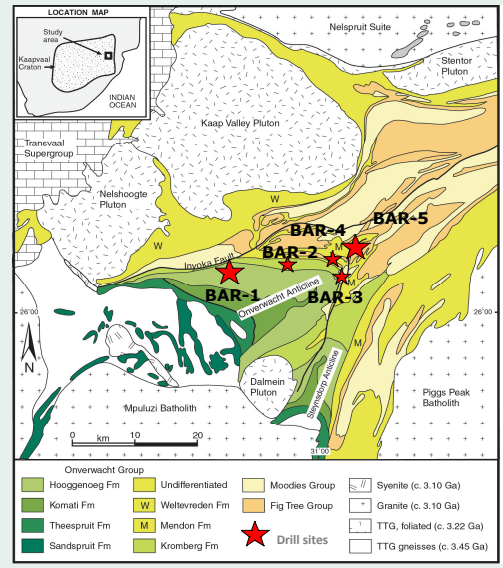
3 sites in sedimentary rocks

BAR-2 Buck Ridge | **BAR-3 Fig tree** | **BAR-4 Barite Valley**

- Archean mantle geodynamics
- 'Wet' versus 'hot' origin of komatiite
- Formation of the first oceanic and continental crust
- Alteration of oceanic crust; role of hydrothermal processes
- Archean magnetic field intensity and orientation

2 sites in volcanic rocks

BAR-1 Komatii Formation | **BAR-5 Mendon Formation**



Map of Barberton Greenstone Belt showing drill sites

Further information can be found at:

www.peeringintobarberton.com
www.icdp-online.org/front_content.php?idart=2709

Drilling chert and shale at Buck Ridge (BAR-2)

Komatiite and basalt cores at Tjakastad (BAR-1)

Banded iron formation in Fig Tree group (BAR-3)

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