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Discovery of Komatiite

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In the early nineteen sixties, the IUGG and the IUGS initiated an international co-operative programme to study the upper mantle of the earth. One of the 6 projects identified for study in South Africa was "Ultrabasic Rocks in Greenstone Belts" under the direction of Prof D.A. Pretorius and Dr. J. Ferguson of the University of the Witwatersrand. Morris and Richard Viljoen were appointed to carry out Ph.D. studies on a range of ultrabasic which had been mapped in the 3.5 billion year old Barberton greenstone belt and which had previously largely been ascribed to an intrusive igneous suite. Extensive detailed mapping however, provided unequivocal evidence for the widespread presence of dominantly ultrabasic lava flows in the well preserved, lowermost formations of the Barberton belt, including the following :-

- The presence of extensive successions of Mg-rich, pillowed basaltic lava successions
- Interlayered peridotite successions with discrete units with chilled contacts
- Presence of supercoiling texture (later called spinifex texture) in the upper part of discrete ultrabasic units (later confirmed as ultrabasic lava flows).
- Presence of flow top breccia and pillow-like structure in places in ultrabasic units
- Presence of cross cutting intrusive peridotite feeder dykes.

An extensive literature search revealed that the geochemistry of these variably altered olivine-clinopyroxenitic rocks was distinctive with no similarity to any known class of Mg-rich lava or ultrabasic igneous rock previously described. Some unique features of the Barberton ultrabasic units included a high Mg content ($\pm 34\%$ MgO) low Al and very low K and Na contents together with a high Ca /Al ratio. Based on the above evidence, a new class of high temperature ultrabasic volcanic rock was proposed in 1969 and the term komatiite after the Komati formation and Komati River was introduced. The associated Mg-rich basalts were also shown to be unique and to have affinities with the co-magmatic ultrabasic flows. They were termed basaltic komatiite (now komatiitic basalt).

Renowned geoscientists who contributed to the discovery of komatiite included Prof Albert Engel of the Scripps Oceanographic institute in San Diego and Prof Mike Ohara of the University of Edinburgh. Prof. Harry Hess of Princeton University, a world authority on ultrabasic rocks visited the Komati valley and shortly thereafter attended the upper Mantle symposium in Pretoria. He fully endorsed the evidence presented for the introduction of komatiite as a major new class of ultra-high temperature volcanic rock on a par with and completing the volcanic sequence of basalt, andesite and rhyolite. Soon after the Barberton discovery, komatiites were recognised in many other Archaean greenstone belts worldwide. A book on komatiite edited by Nick Arndt and Euan Nesbit was published following a Penrose Conference in Val D'Or, Canada in 1979, in which the discovery of komatiite was described as being "one of the most important petrological advances this century."

