SNOLAB

*****NOTICE OF SEMINAR*****

SPEAKER: Barbara Sherwood Lollar (Department of Geology, University of Toronto)

WHEN: Thursday January 21, 2010

TIME: 4:00 pm

LOCATION: SNOLAB Auditorium

ABSTRACT:

Tracers in the Deep: Isotopic and Geochemical evidence for H2-based chemoautotrophic life in the deep subsurface

The hypothesis that extinct or extant life elsewhere in the solar system may be chemoautotrophic, in contrast to the primary photosynthetic basis for life on Earth, has prompted recent research into Earth analogue ecosystems where chemosynthetic microbial communities thrive. Recent studies have focused on hot springs, caves, deep sea hydrothermal vents and basalt aquifers where H_2 autotrophic communities have been identified. In this talk, we will highlight some of the most H_2-rich groundwaters ever identified in ancient saline fracture waters located at 2-3 km depth in the Precambrian Shield rocks of Canada, South Africa and Finland. In these geologically old, hydrogeologically isolated environments where extensive water-rock reactions have produced high salinities through rock-mineral leaching, mM concentrations of dissolved H_2 originate from variety of geologic processes including both serpentinization (the hydration of Fe-Mg- rich ultramafic rocks) and radiolytic decomposition of water. This talk will also explore the controls on H_2 sinks - the most important of which is potential utilization of H_2 as an energy substrate by chemoautotrophic microbial communities in these deep subsurface groundwaters. The association of high concentrations of H_2 with ^{13}C-

enriched CH_4 end-members dominated by abiogenic gases produced by long-term water-rock reactions, in contrast to H_2 depletion in the ^{13}C-depleted methanogenic end-members suggests the possibility that the geosphere supports H_2 autotrophic communities of both sulfate-reducing bacteria and methanogens in the deep subsurface. Integrated geochemical, geologic and microbiological lines of investigation in these deep Earth analogue sites have important implications not only for understanding the basis for the Earth's deep biosphere, but for our understanding of the origin of life on Earth and the potential for extinct or extant life on other planets such as Mars.

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