

# THE MICROBIOLOGY GRADUATE PROGRAM



## PRESENTS:

### Prof. Barbara Sherwood Lollar

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#### EXPLORATION OF SUBSURFACE HABITABILITY AND MICROBIAL LIFE IN DEEP FRACTURE WATERS OF THE PRECAMBRIAN CONTINENTS



The 2018 Astrobiology Science Strategy for the Search for Life in the Universe emphasized the need for investigation of subsurface environments and subsurface processes related to planetary evolution, habitability and the search for life. Science has long relied on fluid inclusions - microscopic time capsules of fluid and gas encased in host rocks and fracture minerals - to access preserved remnants of the ancient atmosphere and hydrosphere. Until recently, groundwaters were thought to reflect only much younger periods of water-rock interaction (WRI) and Earth history. Recently, global investigations in the world's oldest rocks have revealed groundwaters flowing at rates  $> \text{L/min}$  from fractures at km depth in Precambrian cratons of Canada, Fennoscandia, and South Africa. With mean residence times ranging from millions to billions of years and geochemical signatures of Archean provenance, not only do these groundwaters provide unprecedented samples for investigation of the Earth's ancient hydrosphere and atmosphere, they allow exploration of the history and biodiversity of extant life in the Earth's subsurface.

These  $\text{CH}_4$  and  $\text{H}_2$  rich fracture waters host extant microbial communities of dominated by  $\text{H}_2$ -utilizing sulfate reducers and, in some cases, methanogens. Recent estimates of global  $\text{H}_2$  production via WRI including radiolysis and serpentinization show that the Precambrian continents are a source of  $\text{H}_2$  for life on par with estimates calculated for the Earth's marine lithosphere. Yet, this deep terrestrial habitable zone has barely been investigated. Beyond Earth, these findings imply that chemical water-rock reactions will help define the habitability of the Mars subsurface and that of ocean worlds or icy bodies such as Europa and Enceladus. This talk will address some of the highlights of recent exploration of the energy-rich deep hydrogeosphere, and the connections to deep subsurface life on Earth and other planets

Host: Prof. Thomas E. Hanson, [tehanson@udel.edu](mailto:tehanson@udel.edu), 831-3404

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## Time and Location

10/16/19

Room 102 DBI

3:30 – 4:30pm

Reception to follow