Dr. Philip Fralick

Lakehead University Research Chair on Martian Astrobiology
Department of Geology

Start Date: July 15, 2010

Website: http://geology.lakeheadu.ca/pfralick
Key Words Describing Areas of Research:
Precambrian Sedimentology, Precambrian Stratigraphy, Biogeochemistry, Iron Formations

The role of bacteria in the fractionation of Fe isotopes in Precambrian iron formations and its use as a proxy for identifying past life on Mars.
Work in this area may, one day, provide answers to fundamental questions such as: Does life exist on other worlds beside Earth? Can the biochemistry of life be organized in ways foreign to life on Earth?

Currently, my work has mostly entailed categorizing the relationships between organisms and their physical and chemical surroundings on the early Earth. Working in the time period between 1500 and 2800 million years ago, when life was microbial, results in the problem that fossilized remnants of life are very rare and, where present, are commonly simple spheres encased in chert, which do not provide information as to their biochemical capabilities. Fortunately, the presence of microbial life affects some easily quantifiable geochemical systems. For example, the oxygen that we and other eukaryotic-based organisms use was put in the atmosphere roughly two and a half billion years ago by photosynthesizing cyanobacteria. Also, the isotopic ratios of elements such as carbon and sulfur can be fractionated during passage through an organism.

At present, one of the groups of researchers I work with is investigating if the fractionation of iron isotopes can be used as a proxy for life. We have sampled two Precambrian iron formations that were deposited in shallow water settings, possibly with the involvement of biogeochemical processes. We will ascertain the ratio of the iron isotopes in these samples and, from this, evaluate whether they can be used as a proxy

for biological involvement in the precipitation of the iron. If results are positive this technique would prove valuable in evaluating the past presence of life on Mars.