Delineating primary and secondary organic carbon in neoproterozoic glacial sediments

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How do we begin to understand what early life was like on Earth about 700 million years ago as our planet shifted from an oxygen-free and probably ice-covered realm to the oxygen-rich world that we know today?

One geochemist who decodes the early record of life on Earth has found a method featuring a combination of chemical analyses for a significantly clearer picture of this dynamic environment. Alison Olcott Marshall of the University of Kansas presented her findings today at the Goldschmidt Conference in Knoxville, Tenn. The conference is attended by several thousand geochemists and features new scientific discoveries regarding the Earth, energy and the environment. It is hosted by the University of Tennessee, Knoxville, and Oak Ridge National Laboratory.

Marshall is particularly interested in the time called Snowball Earth, a period at the end of the Precambrian Era when geochemists speculate that the world was covered from pole to pole with glacial ice and the existing organisms lived exclusively in water. At that time life was still primarily single-cell organisms. So Marshall looks at chemical fossils to recreate the environment. The chemical complexes left from the cell walls of these organisms are more abundant and more easily classified than body fossils within the samples.

Marshall's research carries her to southeast Brazil, where there is stable sedimentary rock from the late Precambrian era. Her samples come from exploratory drilling that reached eight hundred meters down into

the core of black shale that was at
the bottom of a sea 700 million years ago.

"The one caveat with biomarkers (chemical fossils) is that there is always a danger of contamination," Marshall said. Her initial tests using an instrument that looks at chemical compounds by molecular weight often had questionable results due to the possibility of contamination from material of a later period. However, by using another type of high resolution analysis called Raman spectroscopy, she also measured the subtle nuances of vibration that occur at the molecular level. Her high resolution results revealed two previously undetected distinctions in time generations.

Provided by University of Tennessee at Knoxville

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