

Graduate Student and Post-Doc Opportunities in Astrobiology

- ❖ When and how did life evolve on Earth or other planets such as Mars?
- ❖ What are the chemical, isotopic, and mineralogical fingerprints of life that are left in the ancient rock record and how are they preserved?
- ❖ How does the evolution of life on Earth fit into temporal changes in the surface environments of ancient Earth and Mars?

These are some of the over-arching questions that the **Wisconsin Astrobiology Research Consortium** (WARC) aims to address. With a renewal of major funding for the next five years (2013-2017) from the *NASA Astrobiology Institute* (NAI), we are assembling an

interdisciplinary team of graduate students and post-docs to conduct field- and laboratory-based research on the chemical, mineralogical, and isotopic signatures of paleoenvironments and life. We have openings for students and post-docs from diverse backgrounds, including geology, chemistry, biology, astronomy, and engineering. A major focal point of WARC research is on isotope geochemistry, particularly *in situ* analytical approaches via SIMS and ultra-fast laser ablation. In addition to field-based studies, we have an ambitious experimental program that will provide the essential interpretive framework for studies of natural environments, including modern biogeochemical systems, as well as the ancient rock record. For those interested in blending education and research, there are opportunities to interface with established outreach programs at Madison and NASA-JPL.

Below is a list of PI's at UW-Madison, George Washington University, Montana State University, NASA-JPL, UCLA, the University of Kentucky, and the University of Puerto Rico. In addition, WARC has collaborations with researchers in Europe, Australia, South Africa, and Canada. Beyond WARC, graduate students and post-docs will be able to participate in research and activities sponsored by the *NASA Astrobiology Institute*, which is comprised of NASA and university teams spread across the US that involve close to 1,000 scientists, staff, and students.

Interested potential students and post-docs are encouraged to contact any of the people below for further information. For UW-Madison, applications for graduate admission (Fall 2013 semester) are due January 7, 2013. Applications for post-doctoral fellowships are currently open, and post-doc positions are available immediately.

University of Wisconsin – Madison

- **Clark Johnson, WARC PI** [clarkj@geology.wisc.edu]
 - Interests include application of stable (C, S, Mg, Si, Ca, Fe, and Mo) and radiogenic (Rb-Sr, Sm-Nd, Lu-Hf, and U-Th-Pb) isotope geochemistry to determining ancient paleoenvironments and the evolution of microbial metabolisms in the Precambrian Earth and on Mars.
- **Brian Beard** [beardb@geology.wisc.edu]
 - Research interests in isotope geochemistry include development of new stable isotope systems, including the calibration of isotopic fractionation factors between minerals and fluids and development of new analytical techniques to measure these isotope compositions. Geochronology and petrogenesis of Martian igneous rocks.
- **Brooke Norsted** [brooke@geology.wisc.edu]
 - Assistant Director of the Geology Museum. Education and public outreach.
- **Eric Roden** [eroden@geology.wisc.edu]
 - Research areas include geomicrobiology and biogeochemistry, with an emphasis on the physiology and ecology of iron-reducing and oxidizing bacteria, and the cycling of Fe through the activity of these organisms; microbial mineral transformations; and novel lithotrophic metabolic pathways.
- **John Valley** [valley@geology.wisc.edu]
 - Determining the surface conditions of the ancient Earth (up to 4.4. b.y. ago) through studies of the oldest terrestrial zircons using light stable isotopes such as Li and O; determining the genesis and biogenicity of proposed Archean microfossils and host cherts through O, C, S, and Si isotope studies; developing new insights into the fine-scale isotopic variability of ancient samples using the new Wisc-SIMS ion microprobe facility.



- **Huifang Xu** [hfxu@geology.wisc.edu]
 - Investigations include studies of the surface and interior properties of minerals, with an emphasis on phase formation and reactivity of minerals in biologic and abiologic systems as studied by X-ray diffraction (XRD), transmission electron microscopy (TEM) (TEM), transmission electron microscopy (STEM), and computer modeling using density function theory (DFT).

George Washington University

- **Pascale Ehrenfreund** [pehren@gwu.edu]
 - The interdisciplinary research program led by Dr. Ehrenfreund includes interstellar and planetary chemistry with a current main emphasis on investigation of organic molecules in comets, meteorites and on planetary surfaces, and to calibrate/optimize instrumentation for life detection on Mars (Exomars 2013).

Montana State University

- **Eric Boyd** [eboyd@montana.edu]
 - Microbial ecology and evolution. Geomicrobiology of hydrothermal and hot spring systems, with an emphasis on Yellowstone.

NASA-JPL

- **Max Coleman** [max.coleman@jpl.nasa.gov]
 - Integration of different relevant scientific disciplines to understand how natural systems work, especially as applied to astrobiology and sedimentary systems; specialties include stable isotope geochemistry (C, O, S, Cl). Joint appointment at JPL in Planetary Habitability Science and the Center for Life Detection.
- **Evan Neidholdt** [Evan.L.Neidholdt@jpl.nasa.gov]
 - Research interests in developing instrumentation for *in situ* detection of life on other planetary bodies. Development work on mass spectrometry, pyrolysis, and GCMS.
- **Kay Ferrari** [kay.a.ferrari@jpl.nasa.gov]
 - Education and public outreach. Project Manager for Solar Systems Ambassadors Program.

University of Kentucky - Lexington

- **Chris Romanek** [c.romanek@uky.edu]
 - Research specialty in stable isotope and sedimentary geochemistry of carbonate minerals; biomineralization and geomicrobiology; planetary geochemistry; isotope tracers in biological and inorganic systems; mass spectrometry, electron-beam imaging/elemental analysis, and other micro-analytical techniques.

University of California – Los Angeles

- **Bill Schopf** [schopf@ess.ecla.edu]
 - Astrobiology and Precambrian paleobiology: antiquity and Precambrian evolution of living systems; interrelationships of atmospheric, biologic and metabolic evolution; organic and isotopic geochemistry of Precambrian sediments and microscopic fossils and their relevance to biochemical evolution; Raman spectroscopy, 2D- and 3-D Raman imagery, and 3-D confocal laser scanning microscopy of rock-embedded Precambrian and Phanerozoic fossils.

University of Puerto Rico – Mayagüez

- **Aaron Cavosie** [aaron.cavosie@upr.edu]
 - Application of accessory mineral geochemistry to study the evolution of the Earth, including formation of the oceans, emergence of continental crust, and searching for evidence of the early meteorite impact bombardment.