Washington University in St. Louis
Arts & Sciences

The Faculty of the Department of

Earth & Planetary Sciences

Jan Amend, *Associate Professor Microbial Geochemist*

Jan Amend's group combines analytical geochemistry, laboratory culturing, molecular biology, and calculations of reaction energetics to investigate the role of thermophilic archaea and bacteria in hydrothermal systems. Their current field sites are in southern Italy, Papua New Guinea, and Yellowstone National Park.

Ray Arvidson, *Department Chair, Planetary Geologist*

Ray Arvidson is a planetary geologist who focuses on use of sedimentary rock records and current surface processes to understand past and current environmental conditions on the terrestrial planets. He currently focuses on use of landed and orbital measurements to characterize present and past conditions on Mars, studying the role of climate and water. Analog studies of key sites on Earth are also examined to better understand planetary processes. Field sites are or have included hydrothermally altered cinder cones on Mauna Kea, Hawaii, steam vents in Kilauea, Hawaii, and the evaporative acid-sulfate fluvial system in Rio Tinto, Spain.

Jeff Catalano, *Assistant Professor, Environmental Geochemist/Mineralogist*

Jeff Catalano studies geochemical processes occurring at mineral-water interfaces using analytical geochemistry, atomic force microscopy, and synchrotron-based X-ray spectroscopic and diffraction methods. He is currently interested in how these processes affect biogeochemical iron cycling and the fate of contaminants in the environment.

Bob Criss, *Professor Geochemist*

Bob Criss and his associates use stable isotope techniques and field measurements to study rivers, springs, and floods. Criss also investigates hydrothermal systems, ore deposits, heat flow, and caves, and develops theoretical equations for hydrologic and isotopic phenomena.

Bob Dymek, *Professor Petrologist*

Bob Dymek is a petrologist, a geologist, and the editor of *American Mineralogist*. His research focuses on the mineralogy, chemistry, and origin of Precambrian rocks, especially anorthosites of various types.

http://epsc.wustl.edu

Bruce Fegley, *Professor Planetary Scientist*

Bruce Fegley's research involves experimental and theoretical studies of chemical processes in the early solar system, on planetary surfaces, and in planetary atmospheres. The theoretical study of the chemistry of extra-solar planets and brown dwarfs is an exciting current research area in Fegley's group. He is a principal investigator in several NASA programs and is the author of over 115 scientific papers and three books.

David Fike, *Assistant Professor Isotope Geochemist*

David Fike uses geochemical techniques, particularly stable isotopes of carbon, sulfur, and nitrogen, to investigate the history of biogeochemical cycling as preserved in the rock record, with the aim to identify environmental changes (e.g., oxygenation of the Earth) and understand how these relate to evolutionary changes in the biosphere. In addition, he is interested in applying the same kinds of techniques to query the environmental history of Mars and other solar system bodies.

William McKinnon, *Professor Planetary Geophysicist*

William McKinnon focuses his research on the outer solar system, particularly the icy satellites of the giant planets and dwarf planets in the Kuiper Belt such as Pluto. It is an extraordinarily rich arena in which to recapitulate all of geology, but from a fresh (and frosty) perspective. His research addresses internal structure, origin and evolution, tectonism and volcanism, impact mechanics and cratering history, and the potential for life.

Frederic Moynier, *Assistant Professor, Isotope Cosmochemist*

Frederic Moynier studies the abundance of stable as well as radiogenic isotopes in meteorites to answer questions related to the formation and the evolution of the Solar System.

Jill Pasteris, *Professor Applied Mineralogist*

Jill Pasteris applies such techniques as Raman microprobe spectroscopy to problems of environmental mineralogy and biomineralization. Her present work on biomineralization centers on biological apatite (bones, teeth) and involves collaborations with orthopaedic researchers, engineers, synthetic chemists, and X-ray crystallographers. Her group's environmental mineralogic projects involve application of bone material to the sequestration of toxic heavy metals and the characterization of synthetic metal-oxide nanoparticles for potential environmental and medical use.

Frank Podosek, *Professor Isotope Geochemist*

Frank Podosek studies the history of planetary materials that is encoded in the isotopic compositions of its fundamental elements. This ranges from when it was formed, to what sort of reservoir it was in contact with, to what kind of star it was born in.

Bill Smith, *Professor*
Planetary Physicist

Bill Smith's research centers upon development and application of high-reliability instruments for space, airborne, and ground-based environmental remote sensing. He tackles difficult problems of remote sensing in applications that range from the bottom of the oceans to outer space.

Jen Smith, *Assistant Professor*
Geoarchaeologist

Jen Smith's research centers on reconstructing the landscapes and climates around archaeological sites towards understanding how people influenced and were influenced by their environment in prehistory. She is particularly interested in the use of terrestrial carbonate sediments (spring/fluvial and lacustrine) as paleoclimate archives, and in the evolution of North African climate. Her current field projects are in Egypt, Croatia, Dubai, and Ethiopia.

Slava Solomatov,
Associate Professor
Theoretical Geophysicist

Slava Solomatov studies early planetary differentiation and evolution, mantle convection, plate tectonics, and plumes. He uses both analytical and computational techniques often requiring the use of high-performance computing clusters.

Bob Tucker, *Associate Professor*
Geologist

Bob Tucker studies U-Pb geochronology, regional geology, and tectonics with particular emphasis on the Appalachians of North America, the Caledonides of Europe, and the Precambrian and Cenozoic rocks of Madagascar. He uses radiogenic isotopes and U-Pb geochronology as a means to calibrate geological time (particularly the lower Paleozoic periods), and to constrain the rate of formation and exhumation of continental crust during collisional orogeny.

Doug Wiens, *Professor*
Seismologist

Doug Wiens uses seismic imaging to investigate tectonic processes in the crust and upper mantle. He is particularly interested in studying mantle flow and the processes of melt generation in island arcs and back arc spreading centers, as well as the seismological structure of Antarctica. He also uses seismic waves to study exotic seismic sources, such as deep earthquakes and large glacier slip events.

Michael Wysession, *Associate Professor, Seismologist*

Michael Wysession uses seismic waves as a means of investigating the structure, temperature, composition, and dynamics of the mantle. Particular areas of interest include seismic attenuation in the mantle and the dynamics of the core-mantle boundary region.

Anne Hofmeister, *Research Professor, Mineral Physicist*

Anne Hofmeister's work entails measuring how matter interacts with light and heat, and in developing theoretical models to explain these phenomena on scales from the microscopic to the cosmic. One application is to constrain the thermal state of Earth's interior, which has implications for interior workings and planetary evolution. Other applications have included human bone growth and identification of dust in astrophysical environments.

Brad Jolliff, *Research Associate Professor, Petrologist*

Brad Jolliff studies planetary geology, geochemistry, mineralogy, and petrology. His interest is in using sample analysis, remote and *in situ* sensing, and laboratory and field studies of terrestrial analogs to understand planetary processes, the distribution of rocks and minerals, and the geologic history of the Moon and Mars. He uses the electron microprobe and laser Raman spectroscopy to determine mineralogy and mineral chemistry, and to interpret rock histories.

Randy Korotev, *Research Associate Professor Lunar Geochemist*

Randy Korotev uses the chemical composition of lunar materials as a tool for understanding lunar geology. His research focuses on meteoroid impacts as a geologic process on the Moon, modification of the Moon by large and small impacts, and the nature of the early lunar crust. With his colleagues, he measures the chemical composition of lunar samples and meteorites using a variety of analytical techniques.

Katharina Lodders, *Research Associate Professor, Cosmochemist*

Katharina Lodders' research is in cosmochemistry, planetary sciences, and astronomy. She uses theory and experiments to learn about the chemistry in stars and stellar environments. There is cool chemistry in the cloudy atmospheres of newly discovered brown dwarfs and exoplanets, and the formation of dust in giant stars and supernova ejecta is hot stuff in understanding the dust released to the interstellar medium and the origin of stardust preserved in meteorites.

Julie Morris, *Research Associate Professor, Isotope Geochemist*

Julie Morris's research combines trace element and stable, radiogenic, and cosmogenic isotopes to understand physical and chemical processes in subduction zones. Recent work focuses on element cycling through subduction zones by characterizing element fluxes of both the altered incoming crust and the full width of the volcanic arc. These studies have implications for the transport of water through subduction zones, the behavior of the seismogenic zone, and the long-term evolution of the crust-mantle system.

Ernst Zinner, *Research Professor Astrophysicist*

The main focus of Ernst Zinner's research is the study of stardust, tiny grains that condensed in stellar atmospheres and were preserved in primitive meteorites. A major component in his studies is the isotopic analysis of individual grains in the ion microprobe (NanoSIMS). Their isotopic compositions provide information on stellar nucleosynthesis and the evolution of the elements in the Galaxy.