Graduate Student Internships

Example Topics of Interest

Organic Geochemistry
Questions that address fundamental questions regarding the nature of carbon-based compounds in astromaterials include: What is the role of extraterrestrial biotic and abiotic carbon compounds in forming the building blocks for life? And how does life begin and evolve? This encompasses research in exobiology, the search for habitable environments in our solar system, and laboratory and field research into the origins and early evolution of life on Earth.

Experimental Petrology
Investigations using high-temperature, and/or high-pressure apparatus to simulate conditions that prevail during magmatic and planetary processes including differentiation, partial melting, and core formation. Experimental petrologic studies include constraints on temperatures and extents of melting and crystallization, element partitioning between coexisting phases, effects of parameters such as oxygen fugacity and volatile contents, and crystallization histories of igneous rocks.

Experimental Impact
Impact is the fundamental process by which terrestrial planetary surfaces are modified and it imparts characteristic compositional and structural changes arising from the great energies delivered by the impactors. Because impacts are the most pervasive process shaping surface landforms in the solar system, understanding the consequences of planetary impacts bears on both planetary science and human exploration of the inner solar system.

Mars Surface/Near Surface
This research focuses on improving our understanding of surficial features, compositions, and processes on Mars in an effort to interpret and understand data returned from robotic missions to Mars. Studies range from detailed sample analyses of martian meteorites, to experimental and theoretical studies, to the interpretation of surface data returned by landed robotic Mars missions and the interpretation of remote sensing data from orbital spacecraft through the study of terrestrial analog materials and laboratory experimentation.

Isotopes, Geochemistry, Geochronology
These studies address basic questions of the nature and timing of Solar System formation, planetary evolution and differentiation, and the ages of key geologic events in the histories of the Moon and Mars, by employing measurements of radiogenic, stable, and non-traditional stable metal isotopes, and of trace-elemental abundances of astromaterials (Apollo lunar samples, lunar and martian meteorites, chondrites, achondrites, and nebular components) to determined their origin and evolution. Isotope and trace-element compositions of these materials are used to track interaction among protoplanetary and planetary reservoirs and to constrain the timing of events leading to the formation of astromaterials. These investigations focus on isotopic and geochemical signatures recorded by: (1) nebular materials that were imparted by the processes and events during the formation and evolution of the protoplanetary disk, (2) samples from the Moon, Mars, and asteroids due to magmatic differentiation processes, and (3) martian, lunar, and chondritic materials related to processes active on their surfaces.

Interplanetary Dust, Stardust, and Primitive Materials
This research investigates the mineralogy, chemistry, and isotopic compositions of chondritic meteorites, cometary samples returned by the Stardust spacecraft, interplanetary dust particles, and presolar grains from meteorites and cometary samples.

Lunar Surface/Near Surface

This research investigates the mineralogy and petrology of the lunar surface. Investigations include the origins and evolution of volatiles in lunar samples, comparison of crustal lithologies with remotely sensed data, and isotopic and trace element studies of samples and experiments. These data are used to constrain processes of space weathering, crustal differentiation, and contribute to overall understanding of lunar geologic history.