Graduate Fellowship Available in Isotope Paleoecology and Paleoclimatology

The Department of Earth and Planetary Sciences at Northwestern University invites applications for a Graduate Student Fellowship in the area of isotope paleoecology and paleoclimatology. Applicants should have an interest in the development and application of novel isotopic proxies for reconstructing past terrestrial ecosystems and climates. Sample research projects are:

Paleohydrology during past global warming events

Current global warming is expected to bring far reaching hydrologic consequences, which are difficult to anticipate. The geologic record offers a wealth of information on the earth's response to past global warming events that can greatly improve our understanding of the climate system. The Paleocene-Eocene Thermal Maximum (PETM) was a period of abrupt and extreme global warming that is associated with a massive release of carbon to the ocean-atmosphere system. Changes in patterns of precipitation associated with this warming are poorly understood. This project will reconstruct the hydrologic conditions in the Bighorn Basin, WY, during the PETM using compound-specific hydrogen isotope composition of leaf wax lipids (see below).

Mechanistic model of hydrogen isotope fractionation in plant lipids

Compound-specfic hydrogen isotope ratios of plant lipids have great potential as a paleo-aridity index. Dryer conditions lead to greater evaporation from soils and leaves leading to concentration of the heavy isotope or hydrogen, (^{2}H or D) in leaf waters and lipids. Leaf wax lipids are extremely well preserved on geologic timescales, and serve as molecular fossils. Understanding the environmental, ecological, leaf anatomical and biochemical controls on the hydrogen isotope composition of leaf wax lipids is vital to interpreting past records in terms of climate. Analysis of modern plants from a natural environments and controlled greenhouse experiments will form the foundation of a mechanistic model of how hydrogen isotope ratios record hydrologic conditions enabling the reconstruction of paleohydrology in the geologic past.

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