

Department of Physics and Astronomy Colloquium Series

Tuesday, April 23rd, 2024 at 2:30pm in PSE 317

Speaker: Dr. Katherine R. Bermingham

Institution: Department of Earth and Planetary Sciences, Rutgers University

Title: What is the Earth made of?

Abstract:

Earth likely formed from the sequential addition of Solar System-derived bodies sourced from various heliocentric distances. Understanding the origin of Earth, therefore, requires knowledge of where in the Solar System Earth's building blocks accreted. The silicate Earth, however, has been mixed for over 4.5 billion years, owing to geodynamic processes such as differentiation and convective stirring. Undoubtedly, these processes would have led to the attenuation of any original discrete chemical fingerprints that may have been inherited from the building blocks. Nevertheless, mass-independent nucleosynthetic (i.e., *genetic*) isotope variations that are well documented in bulk meteorites, may serve as sensitive tracers to identify specific types of building blocks that may have left a record in the mantle. Conflicting estimates, however, are reported for the proportions of inner and outer Solar System materials added during late-stage accretion (i.e., Moon-forming event onwards). Based on siderophile element compositions, some Mo isotope studies conclude that the genetics of this accretion stage were sourced roughly 50% from the inner Solar System and 50% from the outer Solar System. By contrast, the isotopic compositions of pre-3.65 Ga (Eoarchean) rocks that may sample an ancient mantle domain deficient in late-accreted Ru, suggest that materials added to the mantle prior to late accretion were dominantly from the inner Solar System. New terrestrial and extraterrestrial sample data will be presented to discuss a revised estimate of the Mo isotopic composition of the bulk silicate Earth and the implications for the genetics of Earth's late-stage accretion.