

## **Secrets of the Solar System: Using meteorites and returned samples to reveal planet-forming environments**

**Dr. Marina Gemma**

Meteorites are the largest source of tangible chemical evidence we have about celestial objects other than Earth. Cosmochemists analyze the elements and isotopes in this extraterrestrial material to reveal the nature and evolution of chemical reservoirs in our solar system and the processes that govern them. What was the solar system environment like before the planets existed? What processes led to and sustained planet formation? Does the composition of planets reflect initial solar system chemistry? Meteorites allow us to investigate these questions and help reveal not only the secrets of our solar system, but also those of the planetary systems beyond our own.

From the lunar samples returned by the Apollo missions to the pieces of asteroids returned by JAXA's Hayabusa missions, sample return missions have fortified our understanding of how rocky bodies formed and evolved in the early solar system. On September 24<sup>th</sup>, 2023, we will receive even more pieces of the early solar system puzzle - NASA's OSIRIS-Rex mission will return samples from the near-Earth asteroid Bennu, releasing the sample capsule for landing in the Utah desert. What secrets still remain to be revealed? In this talk, I will review what the different components and types of meteorites can tell us about solar system history, what we are hoping to learn from the returned Bennu samples, and explore connections between meteorites and asteroids.

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Marina Gemma is a planetary scientist who received her PhD from Columbia University in 2022. She completed her PhD research in the Department of Earth and Planetary Sciences at the American Museum of Natural History, where she studied the mineralogy, multi-dimensional petrology, and trace element geochemistry of primitive carbonaceous chondrite meteorites in order to reveal the chemical environment and astrophysical processes at play in the early solar system. As a postdoctoral researcher in the Department of Geosciences at Stony Brook University, she is systematically investigating the role of particle size and compositional variation on the spectral characteristics of ordinary chondrite meteorites in an effort to better interpret remotely sensed asteroid spectra.