

THE OSIRIS-REX ASTEROID SAMPLE RETURN MISSION.

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The primary objective of the Origins, Spectral Interpretation, Resource Identification, Security-Regolith Explorer (OSIRIS-REx) mission is to return to Earth at least 60 g of pristine regolith and 26 cm² of fine-grained surface material from a carbonaceous asteroid named Bennu. In addition, the mission will study the Yarkovsky effect, a non-Keplerian force that changes the orbit of this potentially hazardous asteroid over time. Bennu is a primitive, B-type asteroid that is volatile- and organic-rich; its samples will provide us with extensive insight into presolar history and over a timeframe that includes planet formation and the origin of life. OSIRIS-REx carries a complement of instruments that will comprehensively characterize the global geology of Bennu. The OSIRIS-REx Camera Suite (OCAMS) will be the first instrument to observe Bennu on approach, and will map the texture and surface features of the asteroid at scales down to sub-centimeter. The OSIRIS-REx Laser Altimeter (OLA) will provide the shape model of the asteroid. The OSIRIS-REx Visible and Infrared Spectrometer (OVIRS) will map the global distribution of minerals and organics, and the OSIRIS-REx Thermal Emission Spectrometer (OTES) will map the mineralogy and temperature/thermophysical properties of the asteroid. A student-led experiment, the Regolith X-ray Imaging Spectrometer (REXIS), will map Bennu's chemistry. Together, the data from these instruments and a radio science experiment will provide ground truth for telescopic observations, guide the selection of a sampling site, provide context for the interpretation of the returned samples, and characterize the Yarkovsky effect.

References: [1] Lauretta, D. S. et al. (2015) *Meteorit. Planet. Sci.*, 50, 834-849. [2] Lauretta, D. S. (2015) *Handbook of Cosmic Hazards and Planetary Defense*, Ch. 44, 543-567.