

February 26. 2021

## **The OSIRIS-REx Asteroid Sample Return Mission**

**Prof. Deanne Rogers**

The OSIRIS-REx (Origins, Spectral Interpretation, Resource Identification, Security-Regolith Explorer) mission launched in 2016 and arrived at asteroid Bennu in 2018. After ~2 years of orbital reconnaissance, the spacecraft successfully collected a sample of Bennu's regolith in October 2020, and will return the sample to Earth in 2023. Detailed studies of a pristine sample of Bennu's carbon-rich regolith will help us to understand early solar system processes, such as planet formation, and perhaps how life began. Another mission objective is to characterize the potential harm that asteroids pose towards Earth. I will describe the details and major findings of the mission thus far, and describe what we can expect from the mission in the coming months.

Deanne Rogers is an Associate Professor of Geosciences at Stony Brook University. She uses remote sensing techniques, statistical methods and laboratory spectroscopy to investigate planetary surface processes. She is a Participating Scientist Collaborator on the OSIRIS-REx asteroid sample return mission, and is a Co-Investigator on the Mars Odyssey mission. She is a member of the NASA Solar System Exploration Research Virtual Institute (SSERVI) sub-node at Stony Brook University and was a collaborator on the Mars Exploration Rover mission from 2004-2006. Rogers was named a NASA Planetary Science Division Early Career Fellow in 2008, and serves on the National Academies' Committee on Planetary Protection and on the editorial board for the Journal of Geophysical Research--Planets. She teaches courses in remote sensing, natural hazards, environmental geology, and geomorphology.

March 26. 2021

## **Studying the Earth's interior with synchrotron X-rays**

**Prof. Donald Weidner**

The deep Earth is revealed by measuring the speed of sound waves created by earthquakes. In order to decipher the chemical and physical state of any particular region of the Earth's interior, we must know the sound speeds in candidate Earth materials at the conditions of pressure and temperature that exist in the region of interest. Synchrotrons become the corner stone of studying materials at these extreme condition because they can penetrate portions of the pressurizing system and give us direct information about the sample properties. As an example, we will look in detail at the experimental approach to measure the compressibility of partially molten rocks at seismic frequencies and deep Earth conditions.

Dr. Weidner received his undergraduate education from Harvard University and PhD from Massachusetts Institute of Technology. He is a SUNY Distinguished Professor in the Department of Geosciences where he has been a faculty member for over 40 years. He is currently Director of the Mineral Physics Institute. Dr. Weidner's research focuses on understanding the deep Earth by understanding the rocks and minerals that make up this inaccessible region. He has developed several new experimental tools to this end. He currently is involved in synchrotron research on samples at high pressure and temperature. His group runs a beamline at the Advanced Light Source in Argonne National Laboratory near Chicago and is building one at the National Synchrotron Light Source II at Brookhaven National Laboratory. He is winner of two international awards; the James B. Macelwane award of the American Geophysical Union in 1981 "For significant contributions to the geophysical sciences by an outstanding early career scientist" and the Inga Lehmann award, also of the American Geophysical Union in 2011 "For outstanding contributions to the understanding of the structure, composition, and dynamics of the Earth's mantle and core".

April 23, 2021

### **Useful impurities in minerals and how to find them with a big magnet and a radio**

#### **Prof. Brian Phillips**

Carbonate minerals such as calcite are ubiquitous in nature, being the main component of limestone and similar rocks that are exposed over about 20% of Earth's land surface. Precipitation of carbonate minerals locks up CO<sub>2</sub> while creating a record of environmental conditions. As crystals grow they take up impurities which can hold clues to the conditions at the time and place the mineral formed. I will describe the types of impurities and processes that govern their uptake in a mineral, along with our efforts to understand them using nuclear magnetic resonance (NMR) spectroscopy. This technique is similar to MRI but measures the pitch of atomic nuclei as they hum in a strong magnetic field, which can reveal the impurity's signature and location.

Brian Phillips is a Professor in the Department of Geosciences at Stony Brook University. He has been on the faculty at Stony Brook University since 2002, where he investigates the atomic arrangement of minerals and related materials using primarily Nuclear Magnetic Resonance (NMR) spectroscopy. His research focuses particularly on bonding of atoms adsorbed to mineral surfaces and how impurities are incorporated in minerals. He is a Fellow of the Mineralogical Society of America.