We will find organic materials on Asteroid Bennu, says OSIRIS-REx principal investigator

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OSIRIS-REx

(Phys.org)—In September 2016, NASA plans to launch its first-ever asteroid sample return mission loaded with tasks that will help us better understand the composition of asteroids, their origin, and possibly even Earth's origin. The Origins-Spectral Interpretation-Resource Identification-Security-Regolith Explorer (OSIRIS-REx) mission designed to study asteroids, which are the leftover debris from the solar system formation process, could teach us a lot about the history of the sun and planets.

The spacecraft, equipped with scientific instruments to map the near-Earth asteroid Bennu and to detect minerals and organic molecules that could be the signs of microbial life, is slated to reach its target in 2018 and return a sample to Earth in 2023. It will bring back at least a 2.1-ounce sample to study.

One of the instruments, the OSIRIS-REx Visible and Infrared Spectrometer (OVIRS) is designed to measure visible and near infrared light from the asteroid, to identify which chemicals are present on the space rock.

The mission's principal investigator, Dante Lauretta of the University of Arizona, Tucson, and the rest of the team are convinced that OSIRIS-REx will succeed in finding organic materials on Bennu.

"We definitely believe we will find organic materials on Bennu and OVIRS's job is to find and identify these organics," Lauretta told Phys.org.

Bennu is a carbon-rich asteroid that records the earliest history of our solar system because its composition probably has remained unchanged since it formed some four billion years ago. It could contain natural resources such as water, organics and precious metals—precursors to the origin of life. So could we even find primitive, microbial lifeforms on Bennu?

Lauretta debunks this suggestion. He is convinced it is unlikely to find life in such a harsh space environment.

"We are also confident that microbial life does not exist on Bennu. A body the size of Bennu has too little atmosphere and gravity to protect any known life form from the ravages of space," Lauretta noted.

To better identify chemicals on Bennu, the OVIRS instrument will split the light from the asteroid into its component wavelengths, similar to a prism that splits sunlight into a rainbow, but over a much broader range of wavelengths. Different chemicals express unique spectral signatures by absorbing sunlight and can be identified in the reflected spectrum.

"In particular, we are looking to find the areas of Bennu rich in organic molecules to identify possible sample sites of high science value, but the instrument will also help us understand the general composition of Bennu," Lauretta said. "Besides OVIRS, OSIRIS-REx has four other science instruments on board. They will all survey Bennu to determine its form, composition and make-up."

OTES (OSIRIS-REx Thermal Emission Spectrometer), from Arizona State University, will provide mineral and temperature information by collecting infrared spectral data from Bennu. According to Lauretta, thermal data from OTES will allow scientists to determine the mineral composition and temperature distribution of Bennu for global maps and local candidate sample-site areas.

Another instrument named OCAMS (OSIRIS-REx Camera Suite), built by the University of Arizona, is a suite of three cameras that will provide global image mapping and sample site imaging. It will also record the entire sampling procedure.

"These cameras will give us the best up-close visuals of the asteroid that we have to date," Lauretta revealed.

OSIRIS-REx Laser Altimeter or OLA, is a scanning LIDAR (remote sensing technology that measures distance by illuminating a target with a laser and analyzing the reflected light), developed by the Canadian Space Agency. It will provide the mission with high-resolution topographical information about Bennu and will also help with sample site selection.

The fifth asteroid-exploring instrument - REXIS (Regolith X-ray Imaging Spectrometer), was built jointly by the Massachusetts Institute of Technology (MIT) and the Harvard College Observatory. REXIS will determine the elements that are present on Bennu and will complement the mineral mapping provided by OVIRS and OTES.

The OSIRIS-REx spacecraft is now in the assembly, testing, and launch operations phase. To be fully ready for a demanding trip and scientific operations at its target asteroid, all the instruments need to be thoroughly tested after installation to ensure that they interact properly with all of the other systems on the spacecraft.

"OTES was installed in late June and the OVIRS instrument was delivered in early July. OCAMS and REXIS will be installed in late summer and OLA will be delivered in the fall," Lauretta said.

After all the instruments are installed, the spacecraft will then go through system level environmental testing until next May, when it is scheduled to be shipped to Cape Canaveral, Florida. There, it will be mated to the

Atlas V rocket and readied for our launch in September 2016.