

# NASA going to asteroid, bringing back samples

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This NASA image shows an artist's impression of an asteroid belt in orbit around a star. The US space agency on Wednesday announced plans to send the first unmanned spacecraft to an asteroid to collect samples and return them to Earth for further study.

(PhysOrg.com) -- NASA is going to send a spacecraft to an asteroid and bring back samples to Earth.

NASA will launch a spacecraft to an asteroid in 2016 and use a robotic arm to pluck samples that could better explain our solar system's formation and how life began. The mission, called Origins-Spectral Interpretation-Resource Identification-Security-Regolith Explorer, or OSIRIS-REx, will be the first U.S. mission to carry samples from an asteroid back to Earth.

"This is a critical step in meeting the objectives outlined by President Obama to extend our reach beyond low-Earth orbit and explore into deep space," said NASA Administrator Charlie Bolden. "It's robotic missions like these that will pave the way for future human space missions to an asteroid and other deep space destinations."

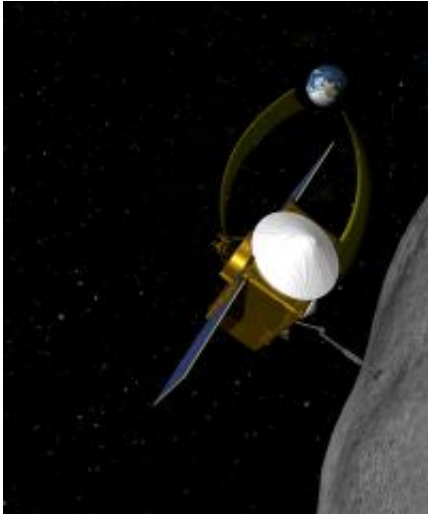
NASA selected OSIRIS-REx after reviewing three concept study reports for new scientific missions, which also included a sample return mission from the far side of the Moon and a mission to the surface of Venus.

Asteroids are leftovers formed from the cloud of gas and dust -- the solar nebula -- that collapsed to form our sun and the planets about 4.5 billion years ago. As such, they contain the original material from the solar nebula, which can tell us about the conditions of our solar system's birth.

After traveling four years, OSIRIS-REx will approach the primitive, near Earth asteroid designated 1999 RQ36 in 2020. Once within three miles of the asteroid, the spacecraft will begin six months of comprehensive surface mapping. The science team then will pick a location from where the spacecraft's arm will take a sample. The spacecraft gradually will move closer to the site, and the arm will extend to collect more than two ounces of material for return to Earth in 2023. The mission, excluding the launch vehicle, is expected to cost approximately \$800 million.

The sample will be stored in a capsule that will land at Utah's Test and Training Range in 2023. The capsule's design will be similar to that used by NASA's Stardust spacecraft, which returned the world's first comet particles from comet Wild 2 in 2006. The OSIRIS-REx sample capsule will be taken to NASA's Johnson Space Center in Houston. The material will be removed and delivered to a dedicated research facility following

stringent planetary protection protocol. Precise analysis will be performed that cannot be duplicated by spacecraft-based instruments.



Conceptual image of OSIRIS-REx. Credit: NASA/Goddard/University of Arizona

RQ36 is approximately 1,900 feet in diameter or roughly the size of five football fields. The asteroid, little altered over time, is likely to represent a snapshot of our solar system's infancy. The asteroid also is likely rich in carbon, a key element in the organic molecules necessary for life. Organic molecules have been found in meteorite and comet samples, indicating some of life's ingredients can be created in space. Scientists want to see if they also are present on RQ36.

"This asteroid is a time capsule from the birth of our solar system and ushers in a new era of planetary exploration," said Jim Green, director, NASA's Planetary Science Division in Washington. "The knowledge from the mission also will help us to develop methods to better track the orbits of asteroids."

The mission will accurately measure the "Yarkovsky effect" for the first time. The effect is a small push caused by the sun on an asteroid, as it absorbs sunlight and re-emits that energy as heat. The small push adds up over time, but it is uneven due to an asteroid's shape, wobble, surface composition and rotation. For scientists to predict an Earth-approaching asteroid's path, they must understand how the effect will change its orbit. OSIRIS-REx will help refine RQ36's orbit to ascertain its trajectory and devise future strategies to mitigate possible Earth impacts from celestial objects.

Michael Drake of the University of Arizona in Tucson is the mission's principal investigator. NASA's Goddard Space Flight Center in Greenbelt, Md., will provide overall mission management, systems engineering, and safety and mission assurance. Lockheed Martin Space Systems in Denver will build the spacecraft. The OSIRIS-REx payload includes instruments from the University of Arizona, Goddard, Arizona State University in Tempe and the Canadian Space Agency. NASA's Ames Research Center at Moffett Field, Calif., the Langley Research Center in Hampton Va., and the Jet Propulsion Laboratory in Pasadena, Calif., also are involved. The science team is composed of numerous researchers from universities, private and government agencies.

This is the third mission in NASA's New Frontiers Program. The first, New Horizons, was launched in 2006. It will fly by the Pluto-Charon system in July 2015, then target another Kuiper Belt object for study. The second mission, Juno, will launch in August to become the first spacecraft to orbit Jupiter from pole to pole and study the giant planet's atmosphere and interior. NASA's Marshall Space Flight Center in Huntsville, Ala., manages New Frontiers for the agency's Science Mission Directorate in Washington.

The mission will cost about \$1 billion.

Provided by NASA

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