



# NASA's OSIRIS-REx Mission

## Why in News

Recently, **NASA's OSIRIS-REx spacecraft departed from asteroid Benu**, and started its two-year long journey **back to Earth**.

- **OSIRIS-REx is NASA's first mission to visit a near-Earth asteroid**, survey its surface and collect a sample from it.

## Key Points

### ▪ About OSIRIS-REx Mission:

- It is the **United States' first asteroid sample return mission**, aiming to collect and carry a pristine, unaltered sample from an asteroid back to earth for scientific study.
- The **OSIRIS-REx (Origins, Spectral Interpretation, Resource Identification, Security, Regolith Explorer) spacecraft was launched in 2016** for the journey to **Benu**.
- The mission is essentially a **seven-year-long voyage** and will **conclude** when **at least 60 grams of samples are delivered back to the Earth (in 2023)**.
- As per the [National Aeronautics and Space Administration \(NASA\)](#), the mission promises to bring the largest amount of extraterrestrial material back to the Earth since the [Apollo era](#).
  - **Apollo** was the NASA program that resulted in American astronauts' making a total of 11 space flights and walking on the moon (1968-72).
- The spacecraft **contains five instruments meant to explore Benu** including cameras, a spectrometer and a laser altimeter.
- Recently, the **spacecraft's robotic arm called the Touch-And-Go Sample Acquisition Mechanism (TAGSAM)**, made an attempt to "TAG" the asteroid at a sample site and [collected a sample](#).

### ▪ Significance:

- Scientists will use the asteroid samples **to study the formation of the solar system and of habitable planets such as Earth**.
- NASA will also **distribute a part of the samples to laboratories worldwide** and will **reserve about 75% of the samples for future generations** who can study it with technologies not yet created.

### ▪ Asteroid Benu:

- Benu is **an ancient asteroid**, currently **more than 200 million miles from Earth**.
- It is about **as tall as the Empire State Building (US)** and is **named after an Egyptian deity**.
- The asteroid was **discovered** by a team from the NASA-funded **Lincoln Near-Earth Asteroid Research team in 1999**.
- It is known that this asteroid is a **B-type asteroid**, implying that it contains significant amounts of carbon and various other minerals.

- Because of its high carbon content, it reflects about 4% of the light that hits it, which is very low when compared with a planet like Venus, which reflects about 65% of the light that hits it. Earth reflects about 30%.
- **Around 20-40% of Bennu's interior is empty space** and scientists believe that it was formed in the first 10 million years of the solar system's formation, implying that it is **roughly 4.5 billion years old**.
- There is a slight **possibility** that Bennu, which is **classified as a Near Earth Object (NEO)**, might **strike the Earth** in the next century, between the **years 2175 and 2199**.
  - **NEOs** are comets and asteroids nudged by the gravitational attraction of nearby planets into orbits which allows them to enter the Earth's neighbourhood.
- Bennu is believed to have been **born in the Main Asteroid belt between Mars and Jupiter** and because of gravitational tugs from other celestial objects and the slight push asteroids get when they release absorbed sunlight, the asteroid is coming closer to Earth.
- Bennu **offers scientists a window into the early solar system** as it was first taking shape billions of years ago and tossing ingredients that could have helped seed life on Earth.
- Significantly, Bennu hasn't undergone drastic changes since its formation over billions of years ago and therefore it contains chemicals and rocks dating back to the birth of the solar system. It is also relatively close to the Earth.

## Asteroids

- These are **rocky objects that orbit the Sun**, much smaller than planets. They are also **called minor planets**.
- According to NASA, **9,94,383 is the count of known asteroids**, the remnants from the formation of the solar system over 4.6 billion years ago.
- Asteroids are **divided into three classes**:
  - **First**, those found in the **main asteroid belt between Mars and Jupiter**, which is estimated to contain somewhere between **1.1-1.9 million asteroids**.
  - The **second group** is that of **trojans**, which are **asteroids that share** an orbit with a **larger planet**.
  - The **third classification** is **Near-Earth Asteroids (NEA)**, which have orbits that pass close by the Earth. Those that cross the Earth's orbit are called **Earth-crossers**.
    - More than 10,000 such asteroids are known, out of which over 1,400 are classified as **Potentially Hazardous Asteroids (PHAs)**.
    - **PHAs** are currently defined based on parameters that measure the asteroid's potential to make **threatening** close approaches to the Earth.
    - Specifically, all asteroids with an Earth **Minimum Orbit Intersection Distance (MOID) of 0.05 au or less** and an **absolute magnitude (H) of 22.0 or less** are **considered PHAs**.

**Source: IE**