



Near-Earth Asteroid Ryugu

Why in News?

A sample of a space rock called Ryugu that was carried to Earth in 2020 by the Japanese space agency's asteroid sample-return mission, Hayabusa 2 may hold the answers to the **origin of the Earth**.

- It is the first time several grams of **asteroid** samples have been brought back to Earth.

What is Asteroid Ryugu?

- Asteroid Ryugu is a **diamond-shaped space rock**. The asteroid's name means "dragon palace" in Japanese and refers to a magical underwater castle in a Japanese folktale.
- Ryugu was discovered in 1999 by the **Lincoln Near-Earth Asteroid Research (LINEAR) project**, a collaborative, U.S.-based project to catalogue and track space rocks.
- The asteroid is about 2,952 feet (900 meters) in diameter.
- Ryugu is orbiting the sun between Earth and Mars and **occasionally crosses Earth's orbit, which means the space rock is classified as "potentially hazardous,"** though the body poses no imminent danger to our world.

What are the Key Highlights?

- **Findings:**
 - Roughly 5 % of materials that assembled to form Earth more than 4.5 billion years ago could have come **from space rocks similar to near-Earth asteroid Ryugu**.
 - These asteroid samples represent the **first solids to be formed in the solar system**. This means they could be the building blocks of Earth.
 - Ryugu has **copper and zinc isotope ratios similar to a very rare group of meteorites** that are likely the most primitive (ones with the closest composition to the Sun).
 - They are primitive because **they likely formed in the outer solar system, where volatile elements are preserved**.
 - In contrast, materials created closer to the Sun may **have lost a part of their volatile inventory due to evaporation**.
- **Significance:**
 - These samples could help evaluate the role of **Ryugu-like objects in depositing volatile elements** to terrestrial planets.
 - Volatile elements such as hydrogen, carbon, nitrogen and oxygen are thought to have played a key role in forging complex organic molecules — ingredients essential to build habitable worlds like Earth.
 - It can also help to evaluate whether **Ryugu-type materials also contributed to the origin of Mars**.

What are Asteroids?

- **About**
 - Asteroids are **also known as minor planets**.
 - They are **rocky remnants left over from the early formation** of our solar system about

4.6 billion years ago.

- Most asteroids are **irregularly shaped**, though a few are nearly spherical.
- Many asteroids are known to have a small companion moon (some have two moons).
- There are **also binary (double) asteroids, in which two rocky bodies of roughly equal size orbit each other**, as well as triple asteroid systems.

▪ **Classification of Asteroids:**

- **Main Asteroid Belt:** The majority of known asteroids orbit within the asteroid belt between Mars and Jupiter.
- **Trojans:** These asteroids share an orbit with a larger planet, but do not collide with it because they gather around two special places in the orbit (called the L4 and L5 Lagrangian points). There, the gravitational pull from the sun and the planet are balanced.
 - Lagrange Points are **positions in space where the gravitational forces of a two-body system like the Sun and the Earth produce enhanced regions** of attraction and repulsion. These can be used by spacecraft to reduce fuel consumption needed to remain in position.
- **Near-Earth Asteroids:** These objects have orbits that pass close by that of Earth. Asteroids that actually cross Earth's orbital path are known as Earth-crossers.

UPSC Civil Services Examination, Previous Year Questions (PYQs)

Q. What is the difference between asteroids and comets? (2011)

1. Asteroids are small rocky planetoids, while comets are formed of frozen gases held together by rocky and metallic material.
2. Asteroids are found mostly between the orbits of Jupiter and Mars, while comets are found mostly between Venus and Mercury.
3. Comets show a perceptible glowing tail, while asteroids do not.

Which of the statements given above is/are correct?

- (a) 1 and 2 only
- (b) 1 and 3 only
- (c) 3 only
- (d) 1, 2 and 3

Ans: (b)

Source: DTE

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