Asteroid 2001 FO32

Why in News

The **National Aeronautics and Space Administration (NASA)** has predicted that the asteroid **'2001 FO32' is the largest to pass by Earth in 2021.** It will be at its closest on 21st March.

- It will provide a rare opportunity for astronomers to get a good look at a rocky relic that formed at the dawn of our solar system.

Key Points

- **About the 2001 FO32 Asteroid:**
  - **Discovery:** It was discovered 20 years ago and ever since the scientists have been tracking its orbital path around the Sun very accurately.
    - It was **discovered in March 2001 by the Lincoln Near-Earth Asteroid Research (LINEAR) program** in Socorro, New Mexico.
    - **1998 OR2 was the last notably large asteroid** that passed close to earth on 29th April, 2020. While 2001 FO32 is somewhat smaller than 1998 OR2, it will be **three times nearer to Earth.**
  - **Orbit:** It is in a highly **eccentric orbit around the Sun.** It **completes one orbit every 810 days** (about 2¼ years). The orbit is tilted 39° to Earth's orbital plane.
    - This orbit takes the asteroid closer to the Sun than Mercury, and twice as far from the Sun as Mars.
  - **Speed:** The asteroid will pass by at about 1,24,000 kph. It is faster than the speed at which most asteroids encounter Earth.
    - The reason for the asteroid's unusual speed is its close approach to the earth.
  - **No Threat of Collision:**
    - The near-Earth asteroid will make its closest approach at a distance of about 2 million kilometers or 5 1/4 times the distance from Earth to the Moon.
      - The distance is close in astronomical terms, that's why it has been designated a **"potentially hazardous asteroid".**
      - There is no threat of a collision with our planet now or for centuries to come.
  - **Next Close Approach:** The asteroid will not come this close to Earth again until 2052, when it will pass by at about seven lunar distances, or 2.8 million km.
- **Significance:**
  - It will provide an opportunity for astronomers to get a more precise understanding of the asteroid's size and albedo (i.e. how bright, or reflective, its surface is), and a rough idea of its composition.
  - When sunlight hits an asteroid's surface, minerals in the rock absorb some wavelengths while reflecting others. By studying the spectrum of light reflecting off the surface,

astronomers can measure the chemical “fingerprints” of the minerals on the surface of the asteroid.

- **Other Asteroids Seen in News:**
    - **Asteroid 2020 ND**
    - **163348 (2002 NN4)**
    - **Asteroid 2018VP1**
    - **Asteroid 16 Psyche**
    - **Asteroid Bennu**

Asteroids

- Asteroids orbit the Sun and are small bodies in the solar system.
- They are made up of metals and rocks.
- They tend to have shorter and elliptical orbits.
- They do not produce a coma or tail atmosphere.
- The asteroid belt is a torus-shaped region in the Solar System, located roughly between the orbits of the planets Jupiter and Mars.

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.

Potentially Hazardous Asteroid

- It means that an asteroid has the potential to make threatening close approaches to the Earth.
- Specifically, all asteroids with a **Minimum Orbit Intersection Distance (MOID)** of 0.05 AU (which is about 7,480,000 Km) or less and an **Absolute Magnitude (H)** of 22.0 (about 150 mt in diameter) or less are considered PHAs.
    - **Minimum Orbit Intersection Distance** is a method for calculating the minimum distance between two almost overlapping elliptical orbits.
    - The **Astronomical Unit (AU)** is the distance between the Earth and the Sun and is roughly 150 million km.
    - The **absolute magnitude** is a measure of the star's luminosity i.e. the total amount of energy radiated by the star every second.

Source: IE