



Bernardinelli-Bernstein Comet

For Prelims: Bernardinelli-Bernstein Comet, Comet, NASA, Hubble Space Telescope, C/2014 UN271, Pluto, Jupiter, Oort Cloud, Kuiper belt, Halley's Comet, Oort cloud.

For Mains: Space Technology, Scientific Innovations & Discoveries.

Why in News?

Recently, the [National Aeronautics and Space Administration's \(NASA\) Hubble Space Telescope](#) has confirmed that the **huge Bernardinelli-Bernstein comet** is indeed the **largest icy comet nucleus** ever seen by astronomers.

- The nucleus is **called the C/2014 UN271** which has an estimated **diameter of almost 129 kilometres**.
- The nucleus is **around 50 times larger** than that of most known comets, and its mass is estimated to be around 500 trillion tonnes.

What is the Hubble Space Telescope?

- It was launched by **NASA in 1990** and is named in honour of Edwin Hubble, a revered American astronomer of the early 20th century.
- The telescope is a **space-based observatory** and has **made significant observations** related to interstellar objects, including **moons around Pluto** and **a comet crashing into Jupiter**.
- The telescope has now been in operation for over thirty years.
- In December 2021, NASA's [James Webb Space Telescope](#), a revolutionary instrument built to peer the farthest yet into the cosmos, was launched.
 - It is also considered a **successor of the Hubble Telescope** and will extend and complement its discoveries.

What is the Bernardinelli-Berstein Comet?

- The [comet](#) was **discovered by astronomers Pedro Bernardinelli and Gary Bernstein** in archival images from the Dark Energy Survey at an astronomical observatory in Chile.
 - It was **discovered in November 2010** and has been intensively studied since.
- The comet **has been travelling towards the sun for over a million years** and it is believed to have originated in the [Oort Cloud](#).
 - Oort Cloud is a **distant region of the solar system** that is predicted to be the source of most comets.
 - The Oort Cloud is **still only a theoretical concept** as the comets that constitute it are too faint and distant to be directly observed. It was **first hypothesised** by Dutch astronomer Jan Oort in **1950**.

- The Bernardinelli-Berstein comet **follows a 3-million-year-long elliptical orbit** and has an **estimated temperature of minus 348 degrees Fahrenheit**.
 - It is **warm enough to sublime carbon monoxide (CO)** from the surface to produce the dusty coma.

What are the Key Highlights about CO?

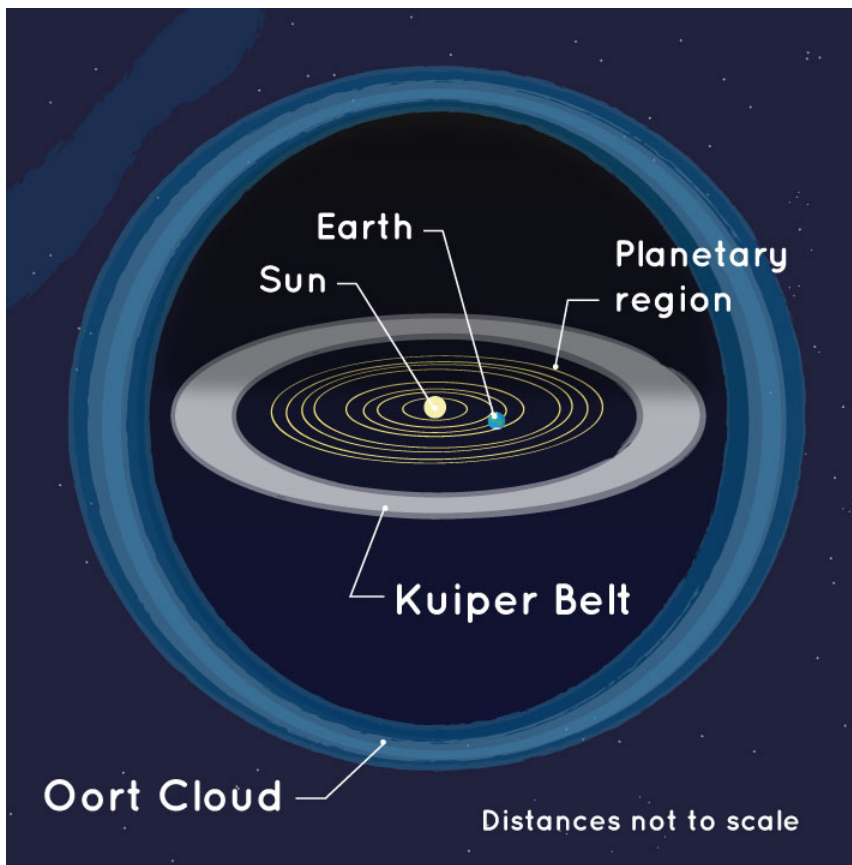
- **Carbon monoxide (CO)** is a colourless, odourless, tasteless and highly toxic gas that is slightly less dense than air.
- It is **short-lived** (stay only a few months) in the atmosphere.
- It is **produced from the exhaust of internal combustion engines** and incomplete combustion of various other fuels.

What is a Comet?

- Comets are **large objects made of dust and ice** that orbit the Sun.
 - The word comet comes from the **Latin word 'Cometa'** which means 'long-haired'.
- The earliest known record of a comet sighting was made by an **astrologer in 1059 BC**.
- **Comets or 'dirty snowballs'** are mostly made of dust, rocks and ice and can range in their width from a few miles to tens of miles wide.
- **When they orbit closer to the sun**, they heat up and **release debris of dust and gases**.
 - The **solid portions of comets consisting** mostly of water, ice and embedded dust particles are inactive when far away from the sun.
 - When near the sun, **the icy cometary surfaces vaporize** and throw off large quantities of gas and dust thus forming the enormous atmosphere and tails.
 - The released **gases form a glowing head that can often be larger than a planet** and the debris forms a tail that can stretch out to millions of miles.
 - Each time a comet passes the sun, it loses some of its material and it will eventually disappear completely as a result.
 - **Comets may be occasionally pushed into orbits closer to the Sun** and the Earth's neighbourhood due to forces of gravity.

Where do Comets Come From?

- According to NASA, while **there are millions of comets orbiting the sun**, there are more than 3,650 known comets as of now.
 - **Predictable Comets:**
 - The predictable comets are the **short-period comets** which take less than 200 years to orbit around the sun.
 - These can be found in the [Kuiper belt](#), where many comets orbit the sun in the realm of Pluto.
 - One of the **most famous short-period comets** is called [Halley's Comet](#) that reappears every 76 years. Halley's will be **sighted next in 2062**.
 - **Less Predictable Comets:**
 - The **less-predictable comets** can be found in the [Oort cloud](#) that is about 100,000 AU (Astronomical Unit which is the distance between the Earth and the Sun and is roughly 150 million km) from the sun or 100,000 times the distance between the Earth and the sun.
 - **Comets in this cloud can take as long as 30 million years** to complete one rotation around the sun.



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)

- **Asteroids** are small and rocky objects that orbit the Sun. Although asteroids orbit the Sun like planets, they are much smaller than planets.
- There are lots of asteroids in our solar system. Most of them are found in the main **asteroid belt—a region between the orbits of Mars and Jupiter**.
- Comets are **cosmic snowballs of frozen gases, rock and dust** that orbit the Sun. When a comet's orbit brings it close to the Sun, it heats up and spews dust and gases into a giant glowing head larger than most planets. The dust and gases form a tail that stretches away from the Sun for millions of miles. **Hence, statements 1 and 3 are correct.**
- There are likely billions of **comets orbiting our Sun in the Kuiper Belt** (a region extending from the orbit of Neptune to about 50 AU from the Sun) and even more distant Oort Cloud. Hence, statement 2 is not correct. **Therefore, option (b) is the correct answer.**

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