



Saturn's Mysterious Rings & Extreme Tilt

Why in News?

According to a recent study, a pre-existing moon named **Chrysalis** likely left Saturn with its bright rings and extreme tilt.

What are the Key Highlights of the Study?

- **Substantial Tilt:** [Saturn](#) has a tilt of 26.73 degrees and is unlikely to have had a tilt during its formation stages.
 - Currently, **Neptune, Uranus and Saturn have a substantial tilt**, suggesting that this feature did not arise during the formation stages.
- **Reason for Tilt:** Various theories suggest that Saturn got its tilt **due to gravitational interactions with its neighbour Neptune**.
 - But the new study argues that Saturn is no longer under Neptune's gravitational influence.
 - Further, it stated that instead, Titan — Saturn's largest satellite — may have been responsible, as per observations from [NASA's Cassini spacecraft](#), which orbited Saturn from 2004-2017.
 - **Titan's Migration:** Titan is migrating from Saturn at about 11 centimetres per year, 100 times faster than previous estimates.
 - Titan's fast **migration caused the planet to tilt further**, reducing Neptune's gravitational influence on Saturn.
 - **Role of Former Moon (Chrysalis):** Scientists **conducted simulations of the planet's axis of rotation** and how it has changed over time, **it revealed that a former moon could be involved**, as removing the moon gives Saturn its tilt, according to the model.
 - Chrysalis likely orbited Saturn for several billion years, roughly 160 million years ago, Chrysalis became unstable and came too close to its planet. This encounter likely pushed the moon away or destroyed it.

What do we Know about Saturn?

- Saturn is the **sixth planet from the Sun and the second largest planet** in our solar system.
- Adorned with thousands of beautiful ringlets, Saturn is unique among the planets.
- It is not the only planet to have rings—made of chunks of ice and rock—but none are as spectacular or as complicated as Saturn's.
- **Saturn** has the highest number of satellites or moon, i.e., 82 in the solar system.
- Like fellow gas giant Jupiter, Saturn is a massive ball made mostly of hydrogen and helium.
- **Few missions** have visited Saturn: **Pioneer 11** and **Voyagers 1** and 2 flew by, But **Cassini** orbited Saturn 294 times from 2004 to 2017.

UPSC Civil Services Examination Previous Year Question (PYQ)

Prelims

Q Which of the following pairs is/are correctly matched? (2014)

	Spacecraft	Purpose
1.	Cassini-Huygens	Orbiting the Venus and transmitting data to the Earth
2.	Messenger	Mapping and investigating the Mercury
3.	Voyager 1 and 2	Exploring the outer solar system

Select the correct answer using the code given below:

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

Ans: (b)

Exp:

- **Cassini-Huygens was sent to study Saturn and its moons.** It was a joint collaboration between NASA and European Space Agency. It was launched in 1997 and entered Saturn's orbit in 2004. The mission ended in 2017. **Hence, pair 1 is not correctly matched.**
- Messenger, a spacecraft by NASA was sent to map and investigate Mercury. It was launched in 2004 and entered Mercury's orbit in 2011. The mission ended in 2015. **Hence, pair 2 is correctly matched.**
- Voyager 1 and 2 were launched by NASA in 1977 to explore the outer solar system. Both the spacecrafts are still operational. Hence, pair 3 is correctly matched. **Therefore, option (b) is the correct answer.**

Source: DTE

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