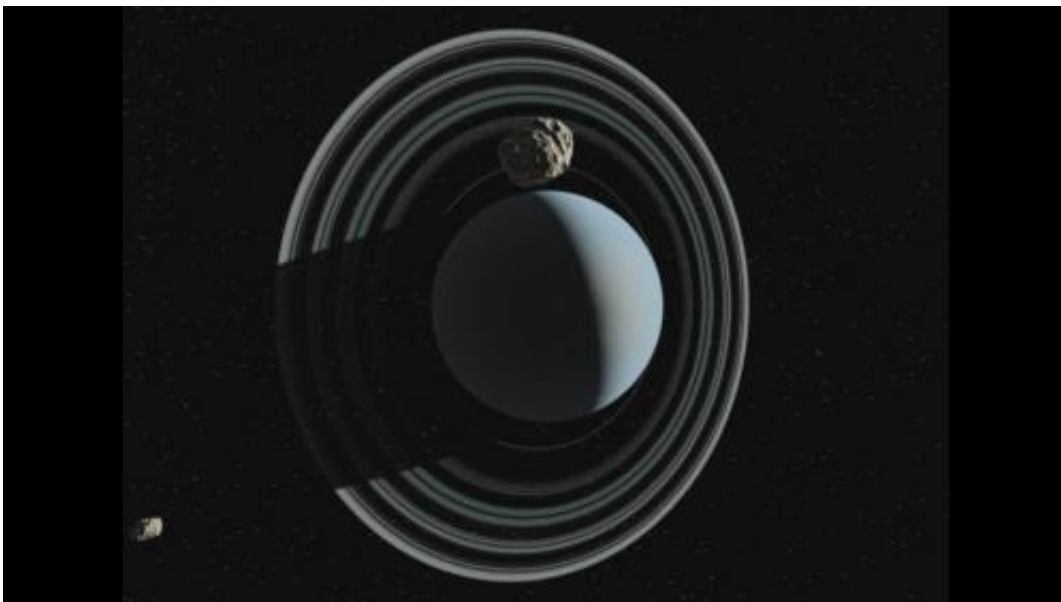


# Three centaurs follow Uranus through the solar system

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Credit: SINC

Astrophysicists from the Complutense University of Madrid have confirmed that Crantor, a large asteroid with a diameter of 70 km has an orbit similar to that of Uranus and takes the same amount of time to orbit the Sun. Researchers have demonstrated for the first time that this and a further two objects of the group of the Centaurs are co-orbital with Uranus.

Uruguayan [astronomer](#) Tabaré Gallardo suggested in 2006 that the

asteroids Crantor and 2000 SN331 complete their orbits of the [Sun](#) in the same time period as [Uranus](#) - an [orbit](#) of approximately 84 Earth years. Now two researchers at the Complutense University of Madrid (UCM, Spain) have confirmed that in the case of Crantor this is true.

"The simulations we have carried out in the Data Processing Centre of the UCM indicate that 2000 SN331 does not have 1:1 commensurability with Uranus, but Crantor does, which means it orbits the Sun in exactly the same time period as the planet," Carlos de la Fuente Marcos, one of the authors of the study, explains to SINC.

In addition, Crantor's orbit has a very similar semi-major axis to that of Uranus, although its [eccentricity](#) and inclination vary. The trajectories, figures and animations are published in the journal *Astronomy & Astrophysics*.

"This 70 km-wide [asteroid](#)'s orbit is controlled by the Sun and Uranus but is unstable due to disturbances from nearby Saturn," states De la Fuente Marcos.

The researcher also reveals that they found another object, which has been named 2010 EU65 and moves in a similar orbit to Crantor's, "although much more stable because its trajectory is less eccentric."

Similarly, the latest data of a third asteroid, 2011 QF99 - the discovery of which was made public only a few weeks ago - also indicate that its orbit is in line with that of Uranus.

According to the Minor Planet Center, the regulating organization for the naming of asteroids and comets, the three objects that "follow" Uranus belong to the group of the Centaurs. These icy planetoids endowed with a mythological name orbit the Sun between Jupiter and Neptune.

"Crantor, 2010 EU65 and 2011 QF99 are the first bodies to be documented as co-orbiting with Uranus," affirms De la Fuente Marcos, "although with distinct movements and trajectories."

## Horseshoe and tadpole orbits

From the point of view of an observer rotating along with Uranus, both Crantor and 2010 EU65 have "horseshoe" orbits, since they acquire this form as they move towards and away from the planet. In fact, these two centaurs periodically have close encounters with Uranus.

However, 2011 QF99 maintains a more stable, Trojan or "tadpole" orbit, which means that it moves 60 degrees in front of Uranus. This asteroid always maintains a relatively large distance from the planet.

The scientists calculate that the orbits of these three objects associated with Uranus could remain stable for a few million years. In astronomical terms this is not very long. With the Data Processing Centre's simulations, the same team has identified three new Mars Trojan asteroids with stable orbits of up to 10,000 million years.

**More information:** Fuente Marcos, C. and Fuente Marcos, R. Crantor, a short-lived horseshoe companion to Uranus, *Astronomy & Astrophysics* 551: A114, March 2013.

Fuente Marcos, C. and Fuente Marcos, R. Crantor, Three new stable L5 Mars Trojans, *Monthly Notices of the Royal Astronomical Society Letters* 432: 31-35, May 2013.

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