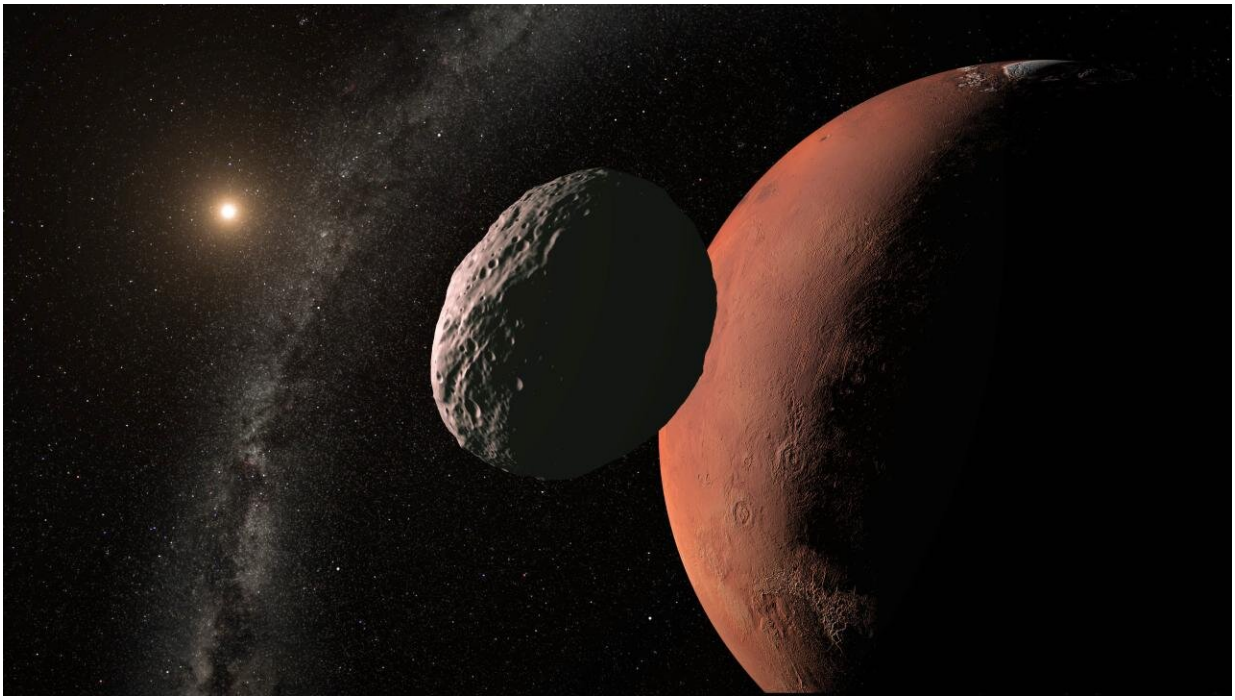
Astronomers confirm a new 'Trojan' asteroid that shares an orbit with Mars

March 21 2024



An artist's impression of an asteroid near Mars. Credit: Gabriel Pérez Díaz (SMM, IAC)

Using observations made with the Gran Telescopio Canarias (GTC) a study led from the Instituto de Astrofísica de Canarias (IAC) and the Universidad Complutense de Madrid (UCM) has confirmed that the asteroid 2023 FW14, discovered last year, is accompanying the red planet in its journey round the sun, ahead of Mars and in the same orbit.

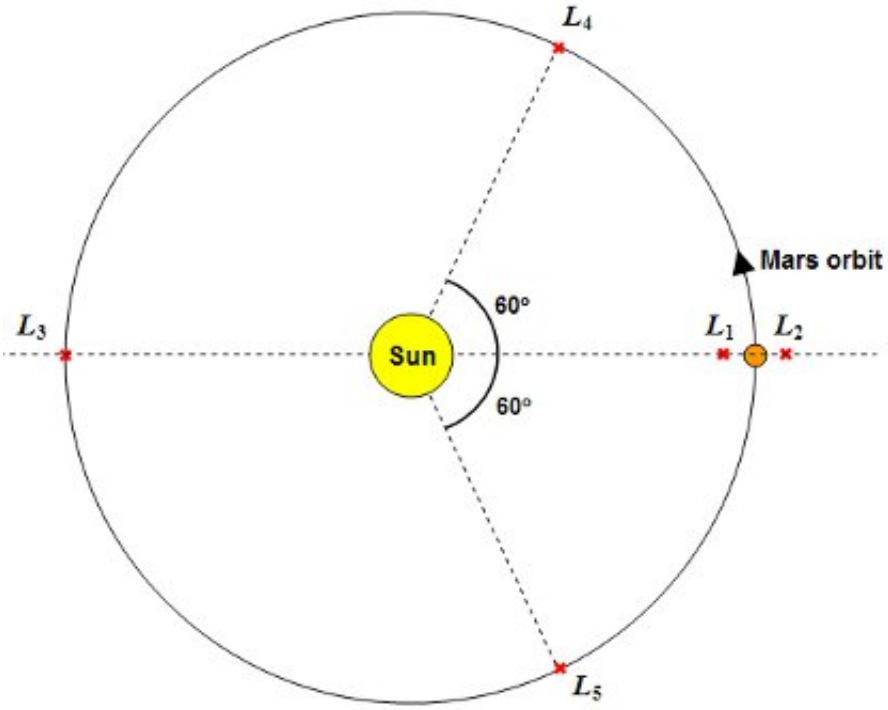
With this new member, the group of Trojans that accompany Mars has increased in number to 17. But it shows differences in its orbit and chemical composition which may indicate that it is a captured asteroid, of a primitive type. The results are published in *Astronomy & Astrophysics*.

A team from the Instituto de Astrofísica de Canarias (IAC) and the Universidad Complutense de Madrid (UCM) has observed and described for the first time the object 2023 FW14, a Trojan asteroid that shares its orbit with Mars. After Jupiter, the red planet has the largest number of known Trojans, totaling 17 with this new identification.

The Trojan asteroids are small bodies in the solar system that share the orbit of a planet, occupying one of the points of stable equilibrium called the Lagrange points, situated 60º in front of (L_4) and 60º behind (L_5) the planet.

Although the majority of the Martian asteroids seem to have accompanied the planet since the epoch of its formation, 2023 FW14 arrived at its Trojan trajectory around a million years ago, and it may leave it in some 10 million years, according to the numerical results obtained by the study.

"While the orbital evolution of the 16 previously known Trojans shows long-term stability, the orbit of the new one is not stable," explains Raul de la Fuente Marcos, a researcher in the Department of Earth Science and Astrophysics at the UCM, who has led the study. "There are two possibilities for its origin: it could be a fragment of the Trojan 1999 UJ7, or it may have been captured from the population of asteroids close to the Earth that cross the orbit of Mars."



Representation of the Lagrange points, and in particular L4 and L5, where the Trojan asteroids are located in the orbit of Mars. Credit: Marspedia

The spectrum obtained with the Gran Telescopio Canarias (GTCI) at Roque de los Muchachos Observatory on the Island of La Palma has allowed the researchers to determine the chemical composition of 2023 FW14, showing new differences compared to the rest of the Martian Trojans.

"Although the spectrum of 2023 FW14 obtained with the GTC is somewhat different from that of the other L_4 Trojan 1999 UJ7, both of them belong to the same composition group, they are asteroids of a primitive type, in contrast to the L_5 Trojans, all of them rocky and rich in silicates," says Julia de León, an IAC researcher, and co-author of the article.

Increasing the number of known Martian Trojans allows researchers to deepen their understanding of these objects, whose existence was first predicted from mathematical calculations. "Studying real Trojans rather than only those predicted mathematically allows us to test the reliability of our theoretical models," concludes de la Fuente Marcos.

More information: R. de la Fuente Marcos et al, Dynamics of 2023 FW14, the second L4 Mars trojan, and a physical characterization using the 10.4 m Gran Telescopio Canarias, *Astronomy & Astrophysics* (2024). DOI: 10.1051/0004-6361/202449688

Provided by Astronomy & Astrophysics