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Planetary science: The Trojan is out there

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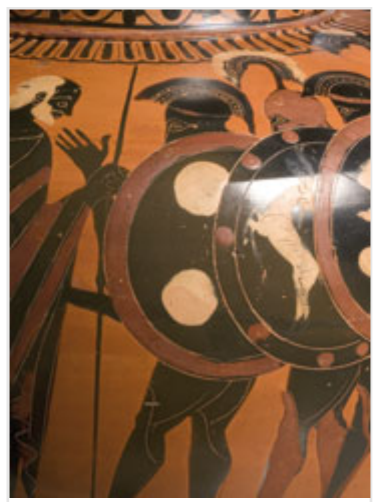
In 1772, Joseph-Louis Lagrange calculated that a small body could be trapped in the orbit of a larger one, if it were positioned either 60° ahead of or 60° behind the larger object. Those positions, now bearing the symbols L_4 and L_5, are two of the series of five so-called Lagrange points in space (the others were defined earlier by Leonhard Euler). At a Lagrange point, any small body — say, a satellite — if subject only to gravity is stationary with respect to two larger bodies — such as a planet and the Sun.

It wasn't until 1906 that the first object trapped at L_4 or L_5 was found: Max Wolf discovered 588 Achilles, an asteroid at L_4 in the Sun-Jupiter system. And only now — M. Connors *et al*. *Nature* **475**, 481–483 (2011) — has Earth been shown to have a similar 'Trojan' asteroid of its own.

Following Wolf's discovery, more asteroids were found at both L_4 and L_5 around Jupiter, and they are now more than four thousand in number. By convention, and hence the origin of the term 'Trojan asteroid', each is named after a hero of the Trojan War from Greek mythology (a scene of which appears on the Greek vase, pictured); heroes of the Greek camp are clustered at L_4 (Agamemnon, Odysseus, Ajax, Menelaus) and those of Troy at L_5 (Priamus, Troilus, and so on) — although two early discoveries, the Greek Patroclus and Trojan Hektor, were in fact assigned to the wrong camps.



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Trojan asteroids have since been identified at Mars and Neptune. Two of Saturn's moons, Tethys and Dione, have Trojan moons. But no Trojans had ever been seen in Earth's orbit: as seen from Earth, they would dwell in the daylight sky, making detection difficult. However, in data from NASA's Wide-field Infrared Survey Explorer (WISE), backed up by further ground-based observations, Martin Connors and colleagues have found an object that fits the bill.

The asteroid, somewhat less romantically named as 2010 TK_7, is several hundred metres in diameter and is librating about L_4, 60° ahead of Earth in its orbit. Its motion is typical of a Trojan asteroid, and its orbit stable over at least 10,000 years. However, the chaos of its motion is such that attempts to map its motion far into the future or the past are not accurate. Connors *et al*. have run simulations with varying parameters to investigate the possibilities — including that of 'jumping' to another Lagrange point, as the Jupiter Trojan 1868 Thersites is thought to have done. More will be learned through further observations, but its dynamics are such that the origin and ultimate fate of 2010 TK_7 will probably never be known.

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