

A Triple Asteroid System

Artist's impression of the triple asteroid system.

One of the thousands of minor planets orbiting the Sun has been found to have its own mini planetary system. Astronomer Franck Marchis (University of California, Berkeley) and his colleagues at the Observatoire de Paris¹ have discovered the first triple asteroid system – two small asteroids orbiting a larger one known since 1866 as 87 Sylvia².

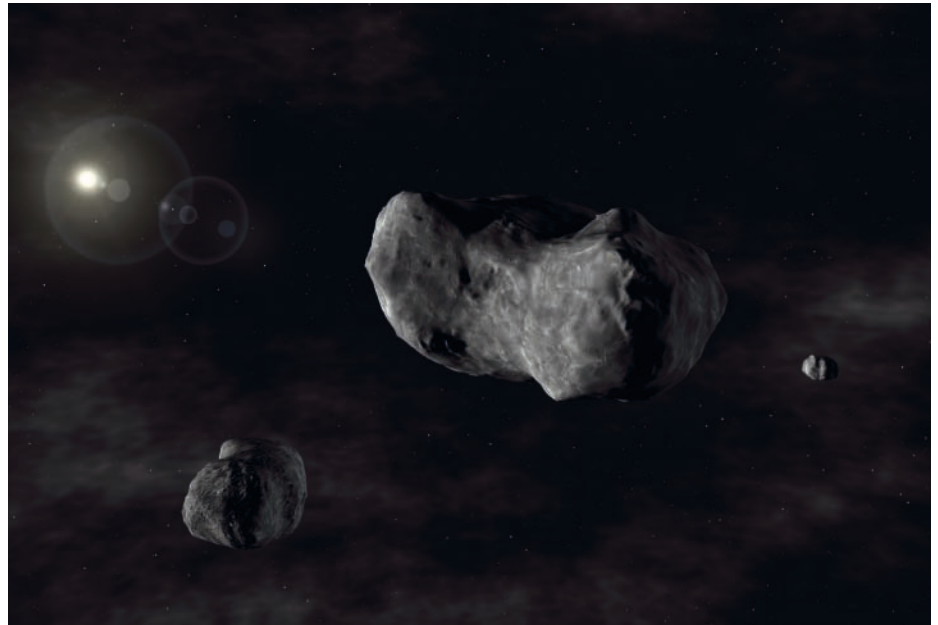
“Since double asteroids seem to be common, people have been looking for multiple asteroid systems for a long time,” said Marchis. “I couldn't believe we found one.”

The discovery was made with NACO on the VLT. Using the observatory's Service Observing Mode, Marchis and his colleagues obtained images of many asteroids over a six-month period.

One of these asteroids was 87 Sylvia, which has been known to be double since 2001, from observations made by Mike Brown and Jean-Luc Margot with the Keck telescope. The astronomers used NACO to observe Sylvia on 27 occasions, over a two-month period. On each of the images, the known small companion was seen, allowing Marchis and his colleagues to precisely compute its orbit. But on 12 of the images, the astronomers also found a closer and smaller companion. 87 Sylvia is thus not double but triple!

Because 87 Sylvia was named after Rhea Sylvia, the mythical mother of the founders of Rome, Marchis proposed naming the twin moons after those founders: Romulus and Remus. The International Astronomical Union has approved the names.

Sylvia's moons are considerably smaller, orbiting in nearly circular orbits and in the same plane and direction. The closest



and newly discovered moonlet, orbiting about 710 km from Sylvia, is Remus, a body only 7 km across and circling Sylvia every 33 hours. The second, Romulus, orbits at about 1360 km in 87.6 hours and measures about 18 km across.

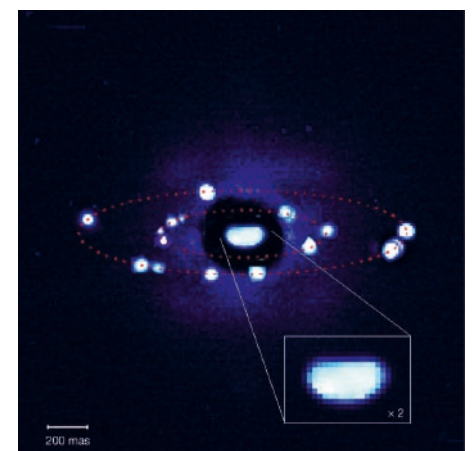
The asteroid 87 Sylvia is one of the largest known from the asteroid main belt, and is located about 3.5 times further away from the Sun than the Earth, between the orbits of Mars and Jupiter. The wealth of details provided by the NACO images show that 87 Sylvia is shaped like a lumpy potato, measuring 380 × 260 × 230 km. It is spinning at a rapid rate, once every 5 hours and 11 minutes.

The observations of the moonlets' orbits allow the astronomers to precisely calculate the mass and density of Sylvia. With a density only 20% higher than the density of water, it is likely composed of water ice and rubble from a primordial asteroid. “It could be up to 60 per cent empty space,” said co-discoverer Daniel Hestroffer. “It is most probably a ‘rubble-pile’ asteroid”, Marchis added. These asteroids are loose aggregations of rock, presumably the result of a collision. The new asteroid formed later by accumulation of large fragments while the moonlets are probably debris left over from the collision that were captured by the newly formed asteroid and eventually settled into or-

bits around it. “Because of the way they form, we expect to see more multiple asteroid systems like this.”

Marchis and his colleagues reported their discovery in the August 11 issue of the journal *Nature*, simultaneously with an announcement that day at the Asteroid Comet Meteor conference in Armação dos Búzios, Rio de Janeiro state, Brazil.

(Based on ESO Press Release 21/05)



A composite image showing the positions of Remus and Romulus around 87 Sylvia on nine different nights as seen on NACO images. It clearly reveals the orbits of the two moonlets. The inset shows the potato shape of 87 Sylvia. The field of view is 2 arc-sec. North is up and East is left.

¹ The team is composed of Franck Marchis (University of California, Berkeley, USA) and Pascal Descamps, Daniel Hestroffer, and Jerome Berthier (Observatoire de Paris, France).

² 87 Sylvia is the 87th minor planet discovered. It was first observed from the Observatory of Madras (India) on May 16, 1866, by the Government Astronomer Norman R. Pogson. It was common in the early days to assign a name – mostly feminine – from the mythology to newly found asteroids. Pogson selected a name from the list furnished to him by Sir John Herschel.