

## Figures

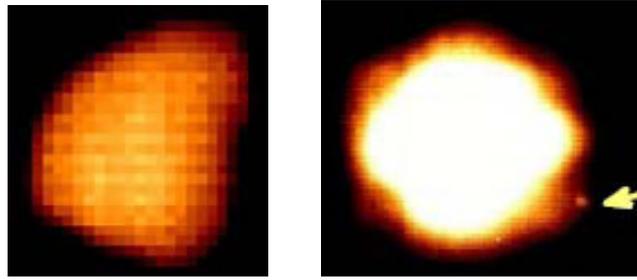
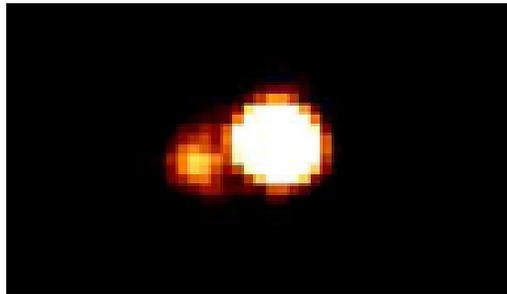
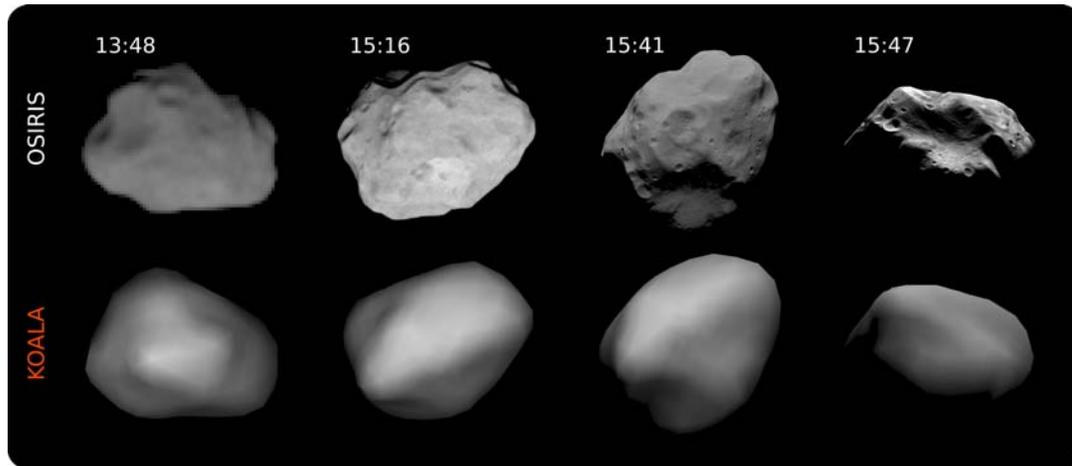


Figure 1. Representative image revealing asteroid Daphne's irregular shape (left) and discovery image of the satellite of (41) Daphne (right). Both images were obtained 2008 Mar 28 UT, using AO on Keck II. The picture on the left is 0.25 arcsec wide and has been processed to show the shape of Daphne, the primary asteroid. The picture on the right is 1.0 arcsec across and has been contrast-enhanced (now washing out the primary) to show the faint satellite. The pair has a separation of only 0.4 arcsec and has a 10 magnitude brightness difference (moon is 10,000 times fainter than the asteroid), the largest difference of any solar system binary known. Daphne is a large main-belt asteroid (about 200 km across).



**Figure 2.** K-band image of near-Earth Asteroid (35107) 1991 VH taken with Keck AO on 2008 Aug 9 UT. Separation of the objects was only 0.08 arcsec, corresponding to only 3 km (2 miles!), clearly the most closely separated solar-system pair (in terms of both angular and physical separation) ever imaged from a ground-based optical telescope. This is the type of system we might be expecting with 2005 YU55, although radar has already studied the system and has not reported any moons. This is the only optical picture ever taken of a binary near-Earth asteroid (NEA). Radar has produced images of many NEAs, including binaries.



**Figure 3.** Our (KOALA) pre-flyby determinations of the size/shape/pole of asteroid (21) Lutetia were very close to the spacecraft (Rosetta) measured parameters. Here is a comparison of our model, finished prior to flyby, with the Rosetta OSIRIS images. KOALA is our newly developed technique that combines AO imaging with lightcurves and occultation observations. We determined these shape models from images that were only 0.10" in size. Lutetia is a large main-belt asteroid, about 100 km across. It is possible that 2005 YU55 will show an apparent size (because it is so close) that is twice as large as this asteroid, allowing us to get good images from Keck.