Catching and classifying Ceres

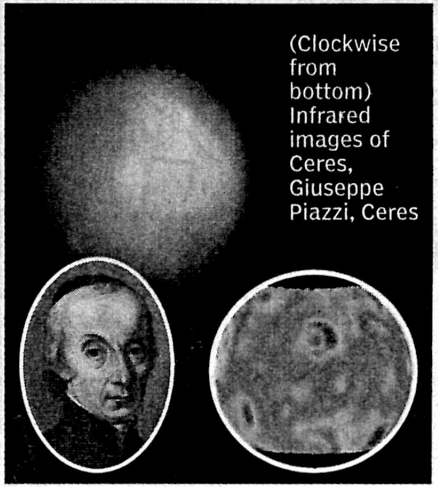
Jayant Narlikar & Thanu Padmanabhan



There is an object in the solar system which has been thought of as a comet, planet, asteroid, minor planet and finally now, a dwarf planet. (This should tell you that classifying a celestial object is not as easy as one might imagine). This is Ceres which is a member of the asteroid belt that exists between Mars and Jupiter.

Ceres was first discovered on January 1, 1801 by Italian astronomer Giuseppe Piazzi while he was searching for a star. He managed to get a set of 24 observations on this object, tracking it in the sky and reported that he has probably discovered a comet but hoped that it might be something 'better than a comet.' Later on, with more observational evidence for its orbit coming in, astronomers including Piazzi, termed it as a planet. In the September 1801 issue of *Monatliche Correspondenz*, Piazzi argued strongly in favour of Ceres being thought of as the 'missing planet' between Mars and Jupiter predicted by the Titus-Bode law. Ceres — named after the Roman goddess of plants — did fit the bill since it was orbiting at a distance of 419 million kilometres from the Sun close to that expected by the law.

The situation, however, changed with the discovery of a large number of other small bodies between Mars and Jupiter — starting with Pallas discovered by Heinrich Olbers just a year after the discovery of Ceres. It was obvious right from the beginning that if Ceres and Pallas were planets, they are indeed very peculiar ones. For one thing, they both were very tiny and could only be seen through telescopes unlike for example, Mars or Jupiter. Their small, point-like, structure was more similar to stars which made William Herschel coin the term asteroid in 1802. Astronomers discovered two more asteroids — Juno in 1804 and Vesta in 1807 — and by the end of 1851, there were 15 known bodies orbiting between Mars and Jupiter. Today, we know of about 10,000 asteroids in this region.



(Clockwise from bottom) Infrared images of Ceres, Giuseppe Piazzi, Ceres

In the initial stages, it was also thought that asteroids could be fragmented bodies arising due to the break-up of a planet. This hypothesis, however, is hard to defend since all known asteroids put together will be less massive than the Moon. Rather, all these might be part of a failed planet, i.e., a planet that did not form.

Ceres itself has a mass of 9.4 x 1020 kg which accounts for about a third of all asteroid mass. It has a rocky inner core and an outer mantle and possibly, a weak atmosphere. We will know a lot more about Ceres when the NASA mission DAWN reaches Ceres in 2015 for a better look.

Next week: Discovery of Neptune: A triumph for science

Astrophysicist Jayant Narlikar and theoretical physicist Thanu Padmanabhan will contribute to DNA's special series through 2009, designated the International Year of Astronomy.