Ceres and Vesta are the two most massive residents of the asteroid belt. Vesta is a rocky body, while Ceres is believed to contain large quantities of ice. The profound differences in geology between these two protoplanets that formed and evolved so close to each other form a bridge from the rocky bodies of the inner solar system to the icy bodies, all of which lay beyond in the outer solar system. At present, most of what we now know about Vesta and Ceres comes from ground-based and Earth-orbiting telescopes like NASA's Hubble Space Telescope. The telescopes pick up sunlight reflected from the surface in the ultraviolet, visible and near-infrared, and by emitted radiation in the far-infrared and microwave regions.

Vesta

Vesta	
Discovered	March 29, 1807 by Heinrich Wilhelm Olbers of Germany (fourth asteroid discovered)
Dimensions	About 578 by 560 by 458 kilometers (359 by 348 by 285 miles)
Shape	Nearly spheroid, with a massive chunk out of the south pole
Rotation	Once every 5 hours, 20 minutes

The asteroid's official name is "4 Vesta" because it was the fourth asteroid discovered. About the length of Arizona, it appears to have a surface of basaltic rock -- frozen lava -- which oozed out of the asteroid's presumably hot interior shortly after its formation 4.5 billion years ago, and has remained largely intact ever since. Telescopic observations reveal mineralogical variations across its surface.

This meteorite is a sample of the crust of the asteroid Vesta, which is only the third solar system object beyond Earth where scientists have a laboratory sample (the other extraterrestrial samples are from Mars and the Moon). The meteorite is unique because it is made almost entirely of the mineral pyroxene, common in lava flows. Image credit: R. Kempton (New England Meteoritical Services)

Vesta has a unique surface feature which scientists look forward to peering into. At the asteroid's south pole is a giant crater - 460 kilometers (285 miles) across and 13 kilometers (8 miles) deep. The massive collision that created this crater gouged out one percent of the asteroid's volume, blasting over one-half million cubic miles of rock into space.

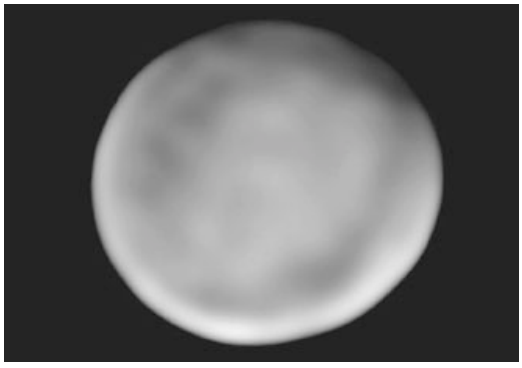
What happened to the one percent that was propelled from its Vesta home? The debris, ranging in size from sand and gravel to boulder and mountain, was ejected into space where it began its own journey through the solar system. Scientist believe that about 5 percent of all meteorites we find on Earth are a result of this single ancient crash in deep space.

To get an idea of the size of the crater on Vesta's south pole, the longest dimension of the main-belt asteroid Eros (which the Near Earth Asteroid Rendezvous Shoemaker spacecraft studied in 2000) is 30 kilometers long. That entire asteroid would quite easily be lost in the awesome maw of the crater near Vesta's south pole. Or, as another analogy, if Earth had a crater that was proportionately as large as the one on Vesta, it would fill the Pacific Ocean.

Ceres

Ceres	
Discovered	January 1,1801 by Giuseppe Piazzi of Italy (first asteroid/dwarf planet discovered)
Size	975 by 909 kilometers (606 by 565 miles)
Shape	Spheroid
Rotation	Once every 9 hours, 4.5 minutes

The object is known by astronomers as "1 Ceres" because it was the very first minor planet discovered. As big across as Texas, Ceres' nearly spherical body has a differentiated interior - meaning that, like Earth, it has denser material at the core and lighter minerals near the surface. Astronomers believe that water ice may be buried under Ceres' crust because its density is less than that of the Earth's crust, and because the dust-covered surface bears spectral evidence of water-bearing minerals. Ceres could even boast frost-covered polar caps.



View of Ceres from Keck Observatory. Image credit: NASA/JPL

Astronomers estimate that if Ceres were composed of 25 percent water, it may have more water than all the fresh water on Earth. Ceres' water, unlike Earth’s, is expected to be in the form of water ice located in its mantle.

<http://www.nasa.gov/mission_pages/dawn/ceresvesta/>