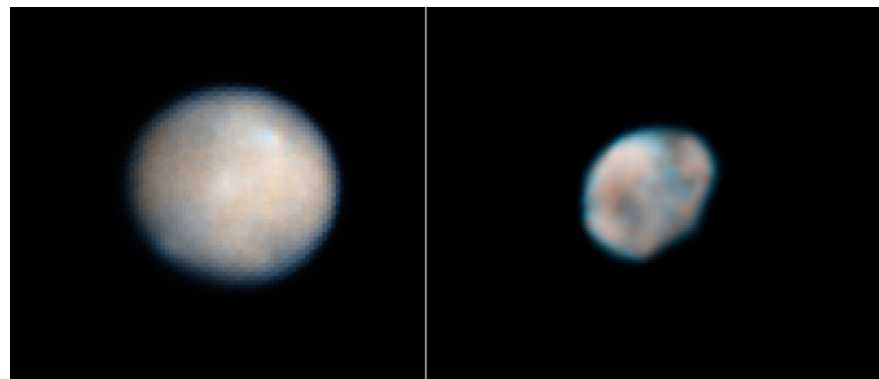


## Ceres, Now a Dwarf Planet, Is Scheduled for Exploration



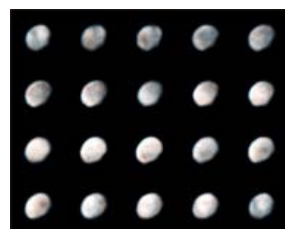
NASA

The Dawn spacecraft is to visit the asteroids Ceres, left, and Vesta, right.

By KENNETH CHANG  
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Part of the fallout from the “Is-Pluto-a-planet?” debate is that the asteroid Ceres is no longer just a rock among hundreds of thousands of rocks in the asteroid belt between Mars and Jupiter.

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NASA

**THE B-LIST** Images from the Hubble Space Telescope show points in Vesta's rotation.

Ceres is now also a dwarf planet. At almost 590 miles wide, it is big enough that its gravity has made it round, but not big enough to be considered a planet. Like Pluto, it fails part of the planet definition passed by the International Astronomical Union: it has not “cleared the neighborhood around its orbit.”

Ceres's new celebrity on the solar system B-list will perhaps bring more prominence to NASA's Dawn spacecraft, scheduled to be launched on Saturday atop a Delta II rocket. The spacecraft is to visit Vesta, the third largest asteroid, in October 2011, and depart in April 2012 to Ceres. It would arrive at Ceres in February 2015.

When Ceres was discovered on Jan. 1, 1801, it was declared a bona fide planet, because it filled a gap where astronomers had expected a planet. But then astronomers discovered another apparently planetary body, and another, and another. Eventually, they decided to reclassify all of these as asteroids, Ceres included.

In recent times, asteroids have not attracted much attention except for when one has veered into an orbit that looks like it might slam into Earth. Otherwise, asteroids are typically regarded as the slacker detritus of the solar system, leftover bits that did not show enough initiative to get together to form a real planet.

For planetary astronomers like Christopher T. Russell, a professor of geophysics and space physics at the University of California, Los Angeles, who is Dawn's principal investigator, that is precisely why he wants a closer look, to see the protoplanet pieces before they came together into a rocky planet like Earth, Mars or Venus.

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“What we’re interested in is what our ancestors were like,” Dr. Russell said “We’re interested in what these early bodies did and how they evolved because those are the building blocks basically of the Earth.”

Asteroids turn out to be a fairly diverse bunch.

Vesta, irregularly shaped and 330 miles wide, is bone-dry rock with an inner core of iron. That composition may be the result of Vesta forming earlier; greater amounts of radioactive elements generated hotter temperatures, which evaporated the water away and melted the rocks, allowing the iron to migrate to the center. People on Earth have already seen lots of pieces of Vesta; about one-in-twenty of the meteorites that have been found on Earth carry a chemical signature that indicates they came from Vesta.

By contrast, under Ceres’ outer coating of dust the asteroid appears to have a thick layer of ice, perhaps 60 miles deep, wrapped around a ball of rock. But there is no iron core. It is still by far the largest asteroid, with about a third of all of the mass in the asteroid belt.

Dawn’s instruments include a camera and two spectrometers that can detect the presence of elements and different minerals. One target of interest is a 285-mile-wide crater in the southern hemisphere of Vesta, where the scientists hope to see if the mix of minerals is different underground.

“We’re going to use the craters as a probe to drill in the objects,” Dr. Russell said.

In May, the Hubble Space Telescope took a series of pictures of Vesta to map out the southern hemisphere, showing areas of different brightness and color, which may hint at regions of ancient volcanic eruptions.

But first, the spacecraft needs to get off the launching pad. Some last-minute glitches delayed the take-off date from June 20 to July 7. But if there are any more delays, NASA might have to pull the Dawn off the launching pad to make room for the Mars Phoenix probe, which must launch by Aug. 25 or Mars and Earth will be out of alignment for two years.

The NASA team meets today to decide whether to continue preparations for a Saturday launching of Dawn.

Dawn has its own time and cost constraints. Taking it off the launching pad could cost NASA up to \$25 million. And after November, Ceres and Vesta move too far apart so that Dawn would never be able to get from Vesta to Ceres, Dr. Russell said.

Then again, the Dawn mission has already followed an arduous path. Dr. Russell had been proposing variations of an asteroid mission since 1994. His first proposal was to send a spacecraft to the Moon and then to Vesta. But then NASA chose to pursue the Lunar Prospector mission and he figured one moon mission was enough for the space agency. All those delays had a silver lining when he realized that Vesta and Ceres came close enough so that one mission could visit both. Dawn was approved in 2000.

The project hit some technological snags, in part because of the newfangled ion engine it uses. Unlike chemical rockets that fire for short amounts of time, an ion engine, which shoots out a jet of charged atoms, delivers very low thrust but fires continuously.

Because of the delays and cost overruns, NASA canceled the mission last year. NASA’s [Jet Propulsion Laboratory](#), which built the spacecraft, appealed the decision, and Michael D. Griffin, NASA’s administrator, revived it.

“We got two years behind schedule,” Dr. Russell said. “We’re just going to make it. Fortunately, that opportunity to go to both of the asteroids was large enough that even NASA didn’t slip us out of that opportunity.”

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