Dawn spacecraft enters orbit around Vesta

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DLR scientists create first 3D images

After almost four years traveling through space, the NASA Dawn spacecraft reached its destination and entered orbit around the asteroid Vesta on 16 July 2011. On board Dawn, among other instruments, is a Framing Camera for imaging the surface of the asteroid. Using data from this camera system, scientists at the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) will create detailed maps and elevation models of this celestial body, which is located in the main asteroid belt between Mars and Jupiter, and help shed some light on the history of the Solar System.

A mountain, impact craters, areas with furrows and bulges – the first stereo images from DLR are already revealing excellent views of the surface of the asteroid Vesta in 3D. The data that Dawn is obtaining from its orbit at a distance of 16,000 kilometres from Vesta, is still not adequate for high-precision elevation models, but it is being used to test the data handling process. "We are just getting an initial impression and now know what to look out for when the camera starts surveying the asteroid from lower orbits," says Ralf Jaumann, Head of the Planetary Geology Department at the DLR Institute of Planetary Research in Berlin. In August, the spacecraft will start collecting data at an altitude of 2770 to 2720 kilometres above the asteroid's surface and, over the course of a year, will spiral downwards to an altitude of a little under 200 kilometres. As has been done on missions to Mars, the Moon or Mercury, DLR researchers in Berlin will then map the surface of the still unexplored asteroid and develop a 3D terrain model. "To accomplish this, we are currently familiarising ourselves with the special features on Vesta's surface and are preparing ourselves for the data processing." So far, the scientists have been generating the first anaglyph images, or stereograms, in which the asteroid can be seen in 3D using red-green glasses, and projecting the images obtained with Dawn's camera system onto a sphere to enable initial orientation on Vesta.

For planetary researchers, Vesta – the first of two destinations for the Dawn mission – is an exciting research object. Discovered on 29 March 1807 by German astronomer Heinrich Olbers, the asteroid underwent a period of melting and cooling following its formation some 4.5 billion years ago. Since then, however, its appearance and composition have hardly changed. Hence, Vesta offers a snapshot of some of the oldest geological processes in the Solar System. At that time, Jupiter's strong gravitational pull prevented other planets from forming in what we know today as the Asteroid Belt, where Vesta is located. "By exploring Vesta, we are learning more about the birth of the planets," explains Jaumann. "We have the opportunity to find out what happened when the first planets were formed from a cloud of gas and dust."

With a mean diameter of 520 kilometres, the irregularly shaped Vesta is one of the larger asteroids. In previous images – for example, those acquired by the Hubble Space Telescope – scientists discovered a large, circular depression with a diameter of roughly 460 kilometres with a vast mountain in the centre at the asteroid's South Pole. This deep 'hole' is probably the result of a collision with another asteroid. The fragments resulting from impacts on Vesta orbit the Sun as meteorites; some have even made their way to Earth.

Vesta is now providing the first opportunity to study an asteroid at close quarters over an extended period of time. Along with the German Framing Camera, Dawn is also carrying the Visible and Infrared Spectrometer, an instrument developed by the Italian National Institute for Astrophysics (Istituto Nazionale di Astrofisica; INAF) and the Gamma Ray and Neutron Detector (GRaND) instrument, built by the Los Alamos National Laboratory. "As a planetary geologist, one question excites me above all: will we discover evidence of early volcanic activity on Vesta,

that is, the first signs of geological 'life' on a planet?" says DLR scientist Ralf Jaumann. "With this spacecraft, we are flying into the dawn of the Solar System."

About the mission

The Dawn mission to the asteroids Vesta and Ceres is managed by NASA's Jet Propulsion Laboratory, a division of the California Institute of Technology in Pasadena, for NASA's Science Mission Directorate, Washington. The University of California, Los Angeles, is responsible for overall Dawn mission science. The Dawn Framing Cameras have been developed and built under the leadership of the Max Planck Institute for Solar System Research, Katlenburg-Lindau, Germany, with significant contributions by DLR German Aerospace Center, Institute of Planetary Research, Berlin, and in coordination with the Institute of Computer and Communication Network Engineering, Braunschweig. The Framing Camera project is funded by the Max Planck Society, DLR, and NASA/JPL.

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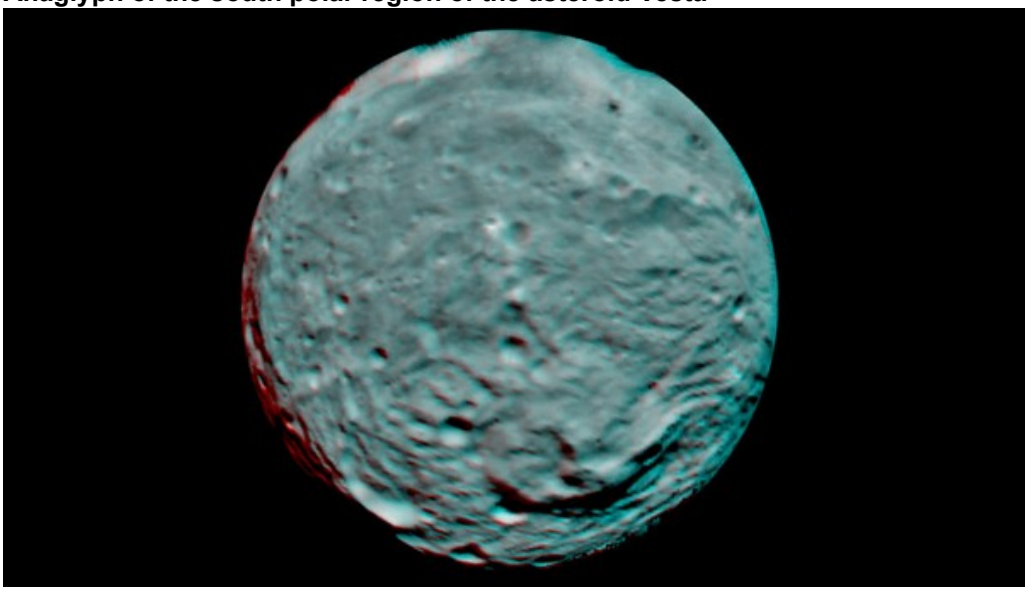
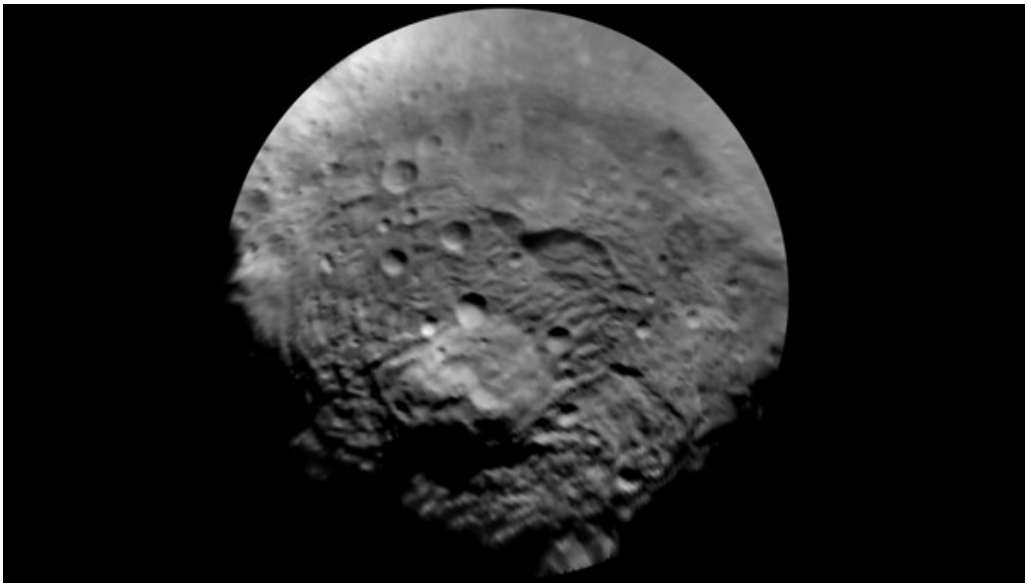
Anaglyph of the south polar region of the asteroid Vesta



This anaglyph image of the south polar region of the asteroid Vesta was put together from two clear filter images, taken on July 9, 2011 by the framing camera instrument aboard NASA's Dawn spacecraft. Each pixel in this image corresponds to roughly 2.2 miles (3.5 kilometers). The anaglyph image shows the rough topography in the south polar area, the large mountain, impact craters, grooves, and steep scarps in three dimensions. The diameter of Vesta is about 330 miles (530 kilometers). Use red-green (or red-blue) glasses to view in 3-D (left eye: red; right eye: green (or blue)).

Credit: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA.

Vesta's South Pole



This image, taken by the framing camera instrument aboard NASA's Dawn spacecraft, shows the south polar region of this object, which has a diameter of 330 miles (530 kilometers). The image was taken through the clear filter on July 9, 2011, as part of a rotation characterization sequence, and it has a scale of about 2.2 miles (3.5 kilometers) per pixel. To enhance details, the resolution was enlarged to .6 miles (1 kilometer) per pixel. This region is characterized by rough topography, a large mountain, impact craters, grooves and steep scarps. The original image was map-projected, centered at 55 degrees southern latitude and 210 degrees eastern longitude.

Credit: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA.

Shot of Vesta on 17 July 2011

NASA's Dawn spacecraft obtained this image with its framing camera on July 17, 2011. It was taken from a distance of about 9,500 miles (15,000 kilometers) away from the protoplanet Vesta. Each pixel in the image corresponds to roughly 0.88 miles (1.4 kilometers).

Credit: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA.

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