Asteroid Vesta in 3D - seemingly close enough to touch

01 December 2011

No asteroid or rocky planet looks quite like the asteroid Vesta, which the US Dawn spacecraft has been orbiting since July 2011; countless craters, furrows and slopes define the landscape of this celestial body. The German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) has produced a 3D film from the imagery recorded by the cameras on board the spacecraft. This film makes it possible, for the first time ever, for this asteroid to appear close enough to reach out and touch. Viewed through red-blue glasses, this film takes the viewer on a flight over Snowman Crater and over one of the highest mountains in the Solar System. Planetary scientists involved in the Dawn Mission are not yet able to explain all the phenomena being observed. "Vesta presents many mysteries," says DLR planetary researcher Ralf Jaumann.

As Vesta rotates before the gaze of the viewer, it appears to be very heavily indented. This dwarf planet in the Main Asteroid Belt is strewn with craters, deep trenches and steep slopes – the legacy of countless collision impacts on the crust of the asteroid. In this film, the spacecraft approaches the asteroid, flies along one of the gigantic gouges near the equator and gives the viewer a close look at the immense indentation caused by a collision impact near the asteroid's south pole. "We sit in the cockpit and the 3D glasses give us a better impression of the topography of our destination," says DLR cartographer Stephan Elgner in the voiceover of the animation he was responsible for creating. To accomplish this, researchers at the DLR Institute of Planetary Research used imagery acquired by the German camera system on board Dawn from a distance of about 2700 kilometres above the asteroid's surface.

Snowman guards a secret

Towards the end, the spacecraft takes its audience down close to the crater known as 'Snowman'. Three circular indentations are arranged in the characteristic three-snowball shape of a snowman. The impact craters into which viewers of this 3D film can gaze are between five and 10 kilometres deep. The smallest of these craters is the oldest one, while the largest, with a diameter of more than 50 kilometres, is the youngest. This information can be derived from the overlaps at the intersections of the three circular indentations. But the genesis of the Snowman is just one of the many secrets that Vesta harbours. "We are not sure whether these three craters were created millions of years apart, or if a single projectile broke into three large sections to form three craters at the same time," explains Jaumann, a planetary geologist on the international Dawn team.

The virtual flight then continues to a mountain three times the height of Mount Everest, making it one of the highest in the Solar System. This majestic peak rises above the south pole - if you stood on its summit and gazed down into the lowest point in the 500-kilometre crater, the height difference would be an impressive 29,400 metres. The age of this mountain in the Rheasilvia Basin is still a mystery for the scientists. Even here, deep craters lie one beside the other. These constitute yet another of the secrets that planetary researchers would like to uncover. "Vesta's craters all look extremely unusual - very different, for example, to those we are familiar with on large rocky bodies such as Mars or Earth's Moon," says Jaumann.

Transition to low orbit

In mid-December, the Dawn spacecraft will fly even lower over Vesta to investigate the asteroid from an altitude of just 210 kilometres. Then, the surface of the asteroid will be imaged again with the German camera system. "We will be able to identify even smaller geological structures," enthuses the DLR planetary geologist. The spacecraft will be observing a surface that is concealed by a thick layer of finely powdered material. "The images will have a resolution

of 20 metres, and may even show individual boulders or perhaps the remains of solidified lava flows." The planetary researcher looks forward to the next phase of the mission: “Much more will be revealed!"

The mission

NASA's Jet Propulsion Laboratory (JPL), which is a division of the California Institute of Technology based in Pasadena, California, manages the Dawn mission to Vesta and Ceres for NASA's Science Mission Directorate in Washington DC. The University of California, Los Angeles, is responsible for overall Dawn mission science. The camera systems on the spacecraft have been developed and built under the leadership of the Max Planck Institute for Solar System Research, Katlenburg-Lindau, Germany, with significant contributions by the DLR Institute of Planetary Research, Berlin, and 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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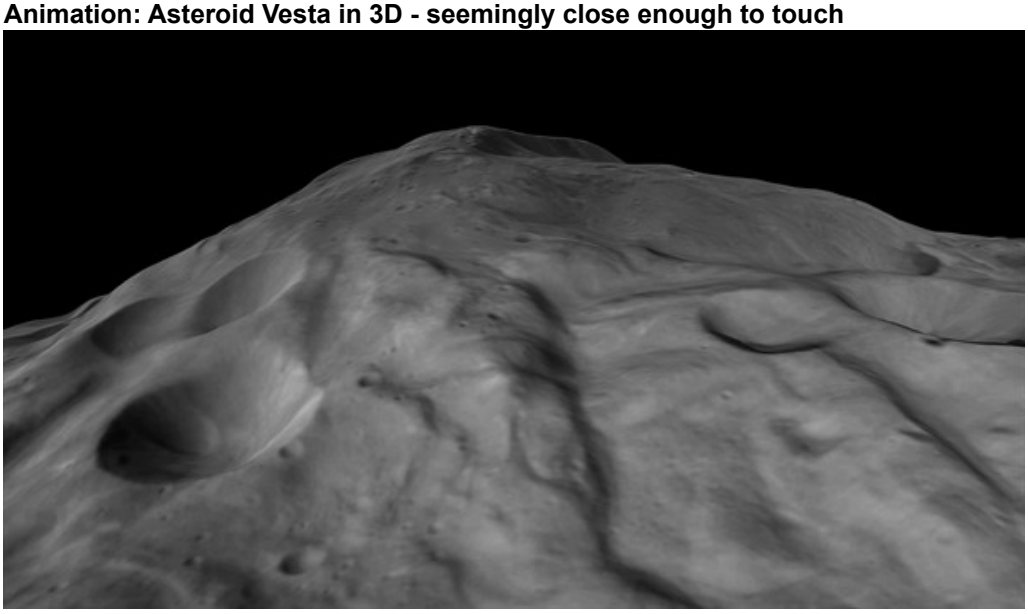
Animation: Asteroid Vesta in 3D - seemingly close enough to touch



For this 3D film, researchers at the DLR Institute of Planetary Research used imagery acquired by the German camera system on board NASA's Dawn spacecraft from a distance of about 2700 kilometres above the asteroid's surface. Viewed through red-green glasses, the asteroid’s surface appears in 3D, pock-marked with countless craters. The journey takes visitors to the equatorial region, then the 'Snowman' craters, followed by one of the highest mountains in the Solar System.

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

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