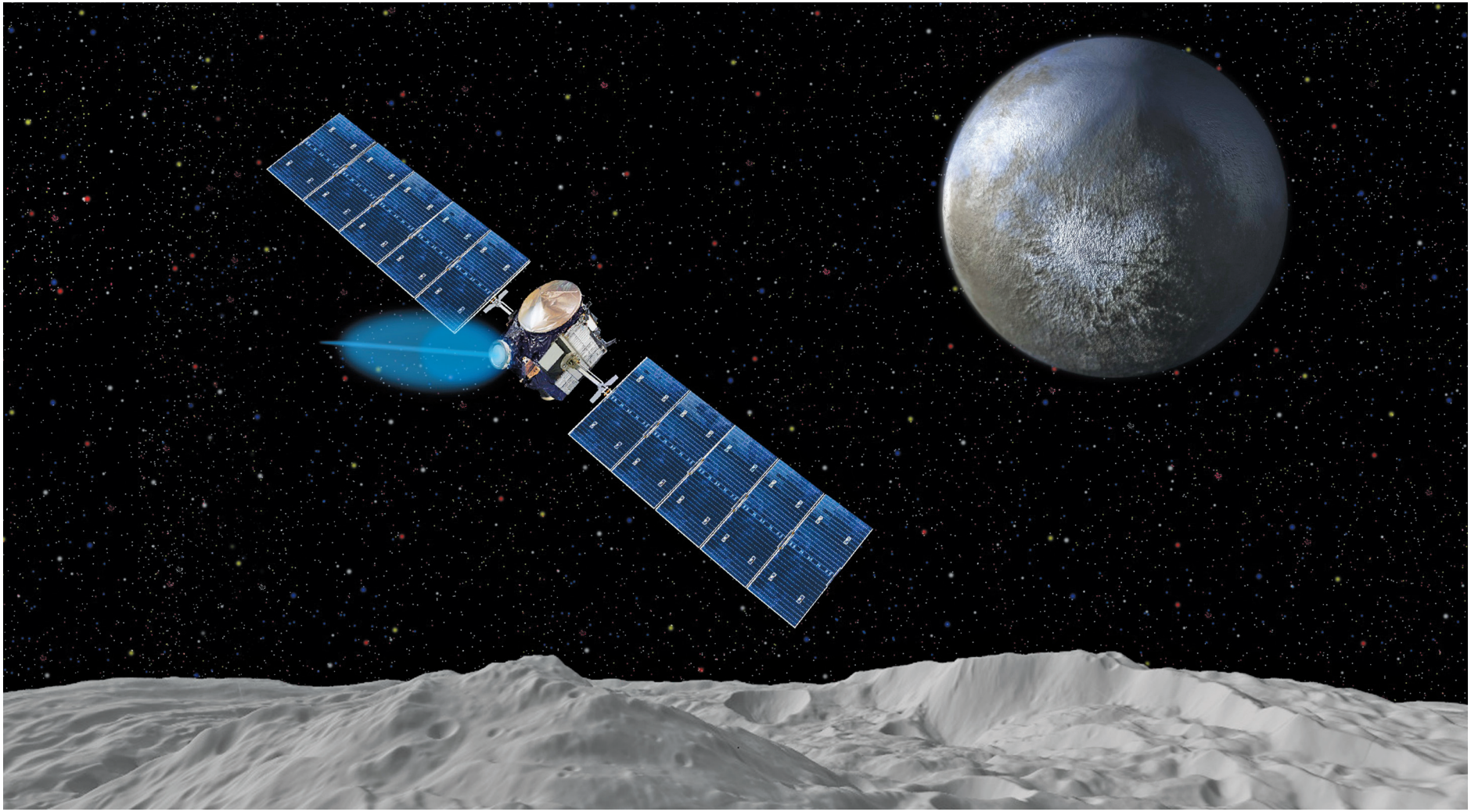
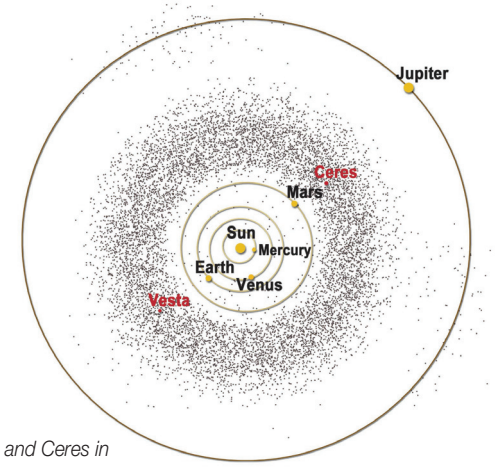


Dawn Mission to Vesta and Ceres

Launched in September 2007, NASA's Dawn spacecraft arrived at asteroid Vesta on July 15, 2011 PDT (July 16, 2011 EDT), and began exploring this amazing new world. In August 2012, Dawn will leave Vesta and begin its journey to dwarf planet Ceres. At each target, Dawn acquires color photographs, compiles a topographic map, maps the elemental composition, maps the mineralogical composition, measures the gravity field and searches for moons. The data gathered by the Dawn spacecraft will enable scientists to understand the conditions under which these objects formed, determine the nature of the building blocks from which the terrestrial planets formed and contrast the formation and evolution of Vesta and Ceres. Vesta and Ceres are two of the largest surviving protoplanet bodies that almost became planets.

Studying these two distinct objects with the same complement of instruments onboard the same spacecraft allows scientists to conduct historical research in space, compare the different evolutionary path each object took and create a picture of the early solar system overall. Dawn's quest to understand the conditions that existed when our solar system formed provides context for the understanding of the observation of planetary systems around other stars.



Vesta and Ceres in the asteroid belt.

WHY VESTA AND CERES?

Vesta and Ceres straddle a boundary in the asteroid belt between primarily rocky bodies and ice-bearing bodies. They present contrasting stories of fire and ice. Vesta is a dry, differentiated object, shaped by volcanism, with a surface that shows signs of resurfacing. About the length of Arizona, Vesta appears to have a surface of basaltic rock — frozen lava — that 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. Ceres, by contrast, has a primitive surface containing water-bearing minerals, and may possess a weak atmosphere.

Vesta is shown by Dawn to have perhaps an early history of volcanism.

Image credit: NASA/ JPL-Caltech/UCLA/ MPS/DLR/IDA

NEW VIEWS OF OLD WORLDS

The Dawn spacecraft is the first mission intended to orbit two solar system (or extraterrestrial) targets. To carry out its scientific mission, the spacecraft uses four separate science studies whose data are combined to characterize these bodies. Dawn carries a pair of visible-light cameras known as the framing cameras, a visible and infrared mapping spectrometer and a gamma ray and neutron spectrometer. Radio and optical navigation data provide data relating to the gravity field and thus bulk properties and internal structure of the two bodies. Data returned from the Dawn spacecraft could provide opportunities for significant breakthroughs in our own knowledge of how the solar system formed while comparing the different evolutionary paths Vesta and Ceres took in that development.

INNOVATIVE PROPULSION SYSTEM ABOARD

Dawn's futuristic, hyper-efficient ion propulsion system allows it to go into orbit around two different solar system bodies, a spacecraft first. The demanding mission profile would have been impossible without the ion engines — and the trip just to Vesta without ion propulsion would have required 10 times more propellant, a much larger spacecraft and a dramatically larger launch vehicle. Ion propulsion was proved on NASA's Deep Space 1 mission, which tested it and 11 other technologies while journeying to an asteroid and a comet. The electrical power system provides power for all onboard systems, including the ion propulsion system when thrusting. Each of the two solar arrays is 27 feet (8.3 meters) long by 7.4 feet (2.3 meters) wide. On the front side, 18 square meters (21.5 square yards) of each array is covered with 5,740 individual photovoltaic cells. The cells can convert about 28 percent of the solar energy that hits them into electricity. At Earth, the two wings combined could generate over 10,000 watts. A nickel-hydrogen battery and associated charging electronics provided power during launch and continues to provide power at any time the solar arrays are directed away from the sun.

MISSION

Launch — September 27, 2007

Launch site — Cape Canaveral Air Force Station, Fla., Pad 17B

Launch vehicle — Delta II Heavy 2925H-9.5 including Star 48 upper stage

Mars gravity assist — February 17, 2009

Vesta arrival — July 16, 2011 PDT (July 16, 2011 EDT)

Vesta's distance to Earth at time of Dawn arrival — 117 million miles (188 million kilometers)

Distance traveled by spacecraft launch to Vesta — 1.7 billion miles (2.8 billion kilometers)

Vesta departure — August 2012

Ceres arrival — February 2015

Distance spacecraft will travel from Vesta to Ceres — 930 million miles (1.5 billion kilometers)

Total distance spacecraft will travel from Earth to Vesta to Ceres — 3 billion miles (4.9 billion kilometers)

End of mission: July 2015

PROGRAM AND PROJECT MANAGEMENT

NASA's Jet Propulsion Laboratory, Pasadena, Calif., manages Dawn's mission to Vesta and Ceres for NASA's Science Mission Directorate in Washington. JPL is a division of the California Institute of Technology in Pasadena. Dawn is a project of the directorate's Discovery Program, managed by NASA's Marshall Space Flight Center in Huntsville, Ala. UCLA is responsible for overall Dawn mission science. Orbital Sciences Corp. in Dulles, Va., designed and built the spacecraft. The German Aerospace Center, the Max Planck Institute for Solar System Research, the Italian Space Agency and the Italian National Astrophysical Institute are international partners on the mission team. Principal Investigator Dr. Chris Russell (UCLA) leads the mission and an international team of scientists.

FOR MORE INFORMATION

Visit the Dawn website — http://dawn.jpl.nasa.gov

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