

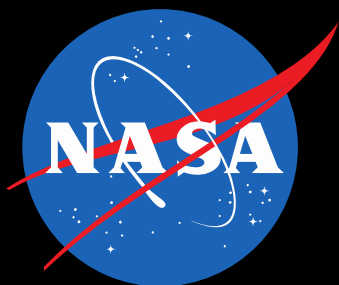
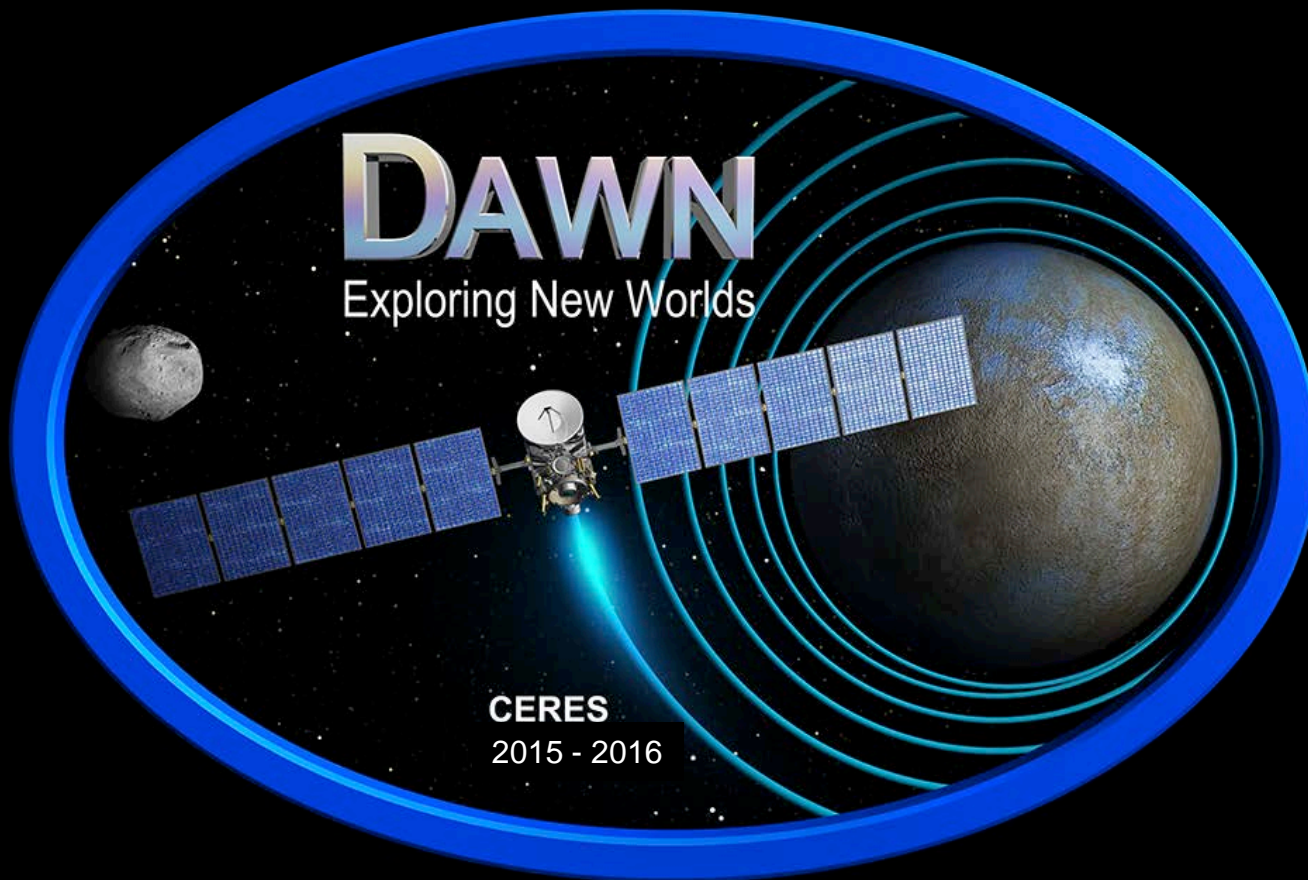


Jet Propulsion Laboratory
California Institute of Technology

DAWN

Exploring New Worlds





UCLA



JPL
Jet Propulsion Laboratory
California Institute of Technology



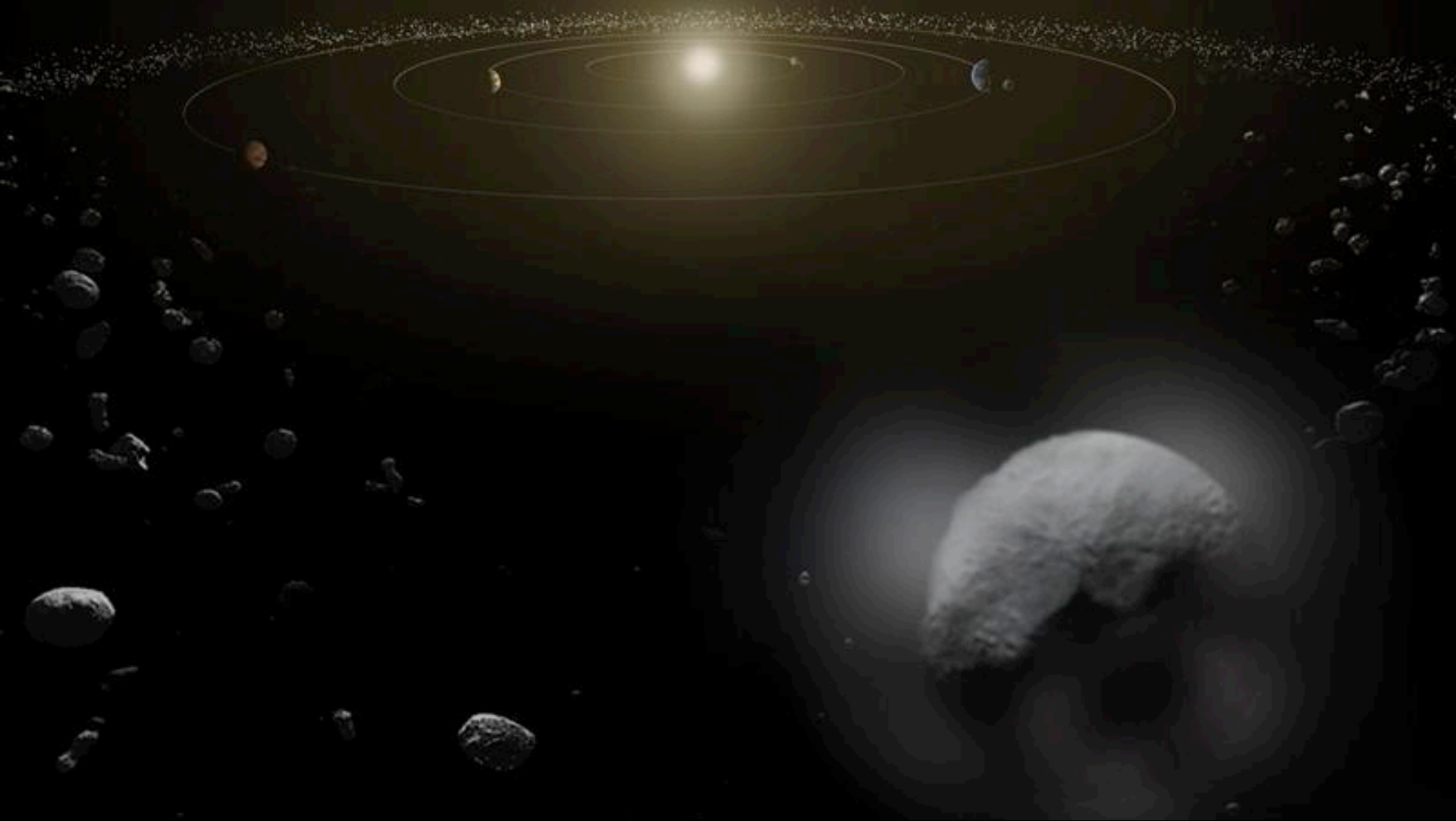
Orbital ATK



THE MAIN ASTEROID BELT

Ceres and Vesta

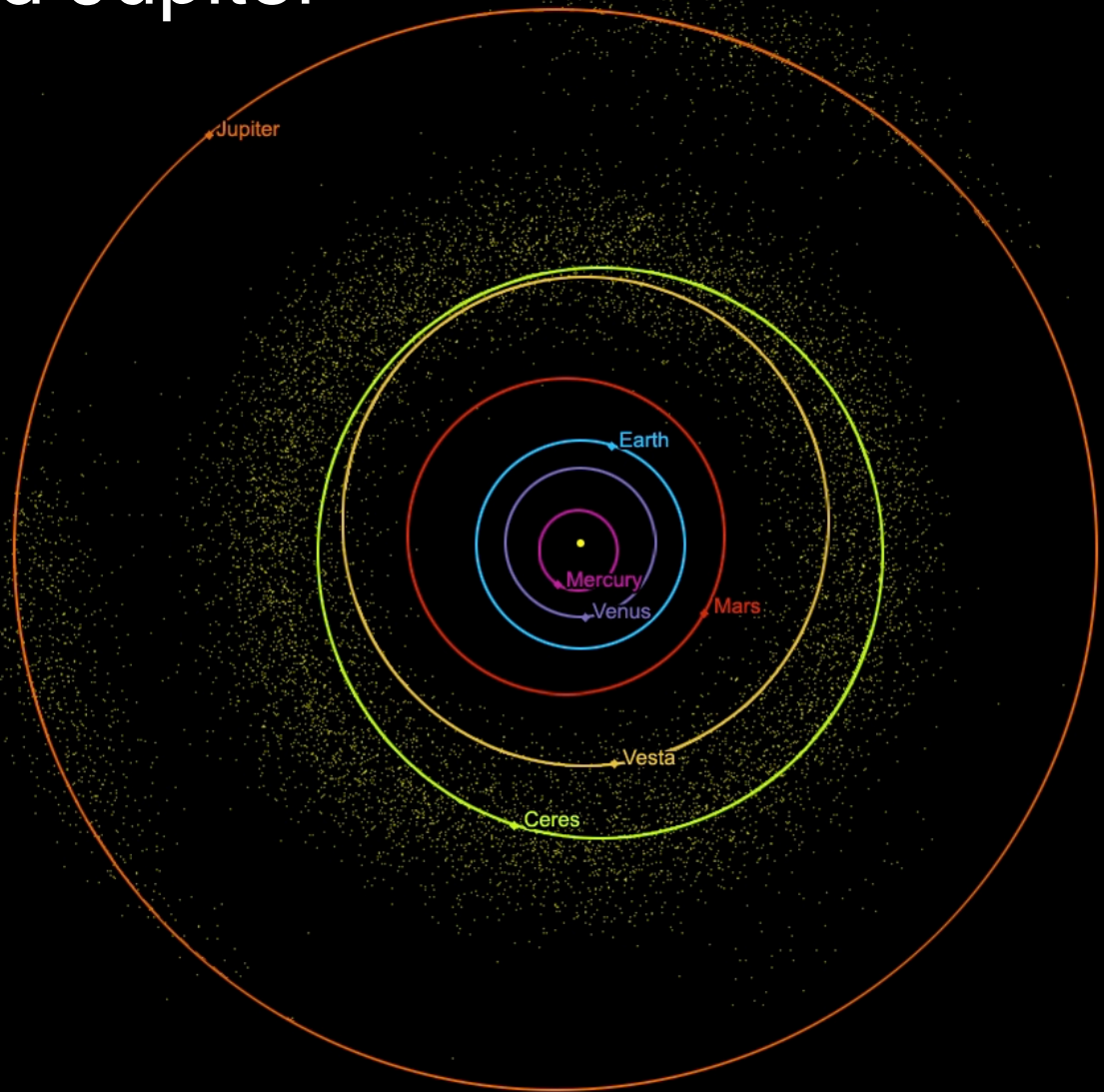
Dawn Probes Deep into the Heart of the Main Asteroid Belt to Discover Secrets of the Early Solar System



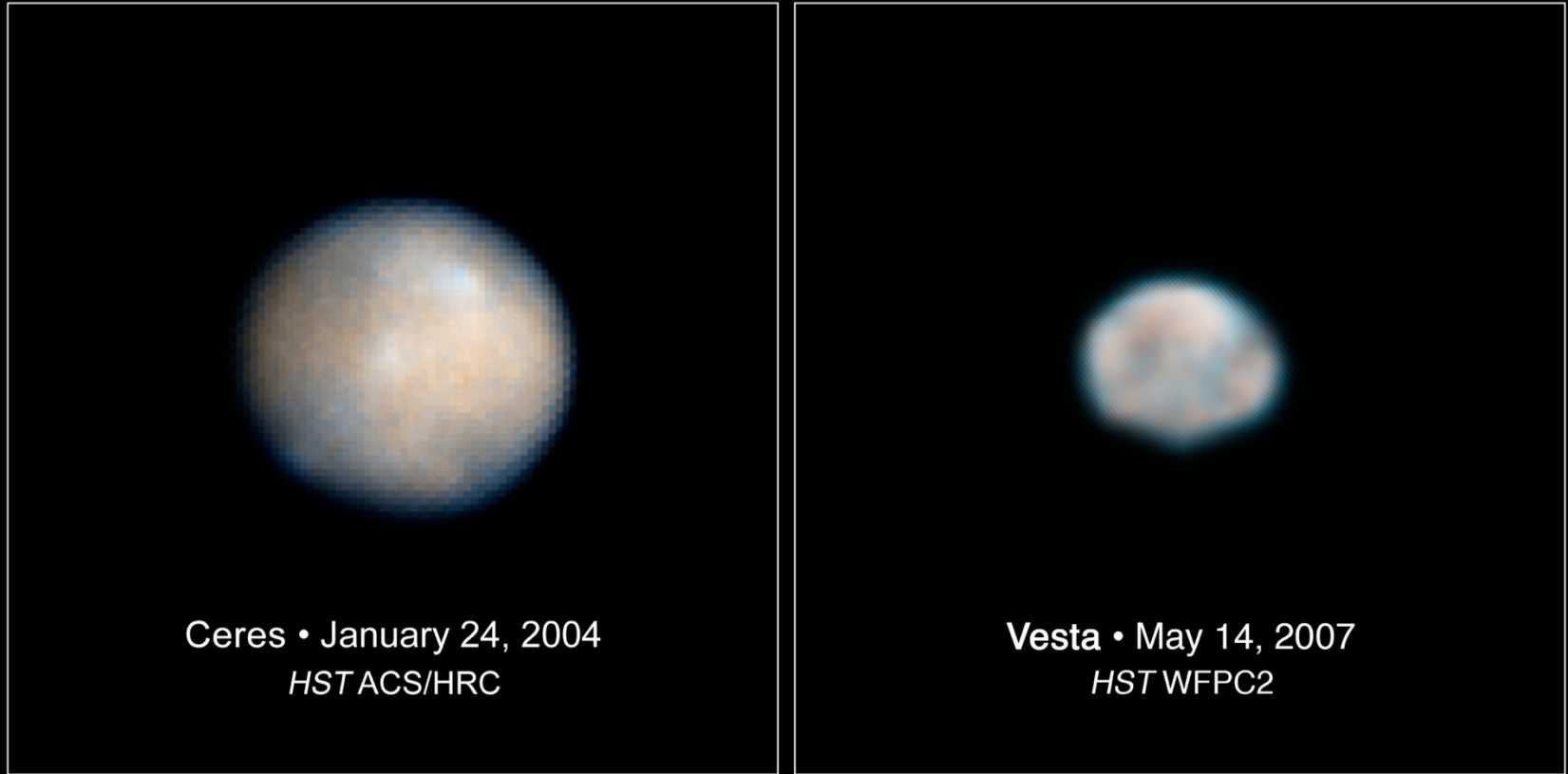
The Main Asteroid Belt

Between Mars and Jupiter

Ceres and Vesta represent the original building blocks of the terrestrial planets, preserved as fossils from the dawn of the solar system



Ceres and Vesta are the Most Massive Residents of the Main Belt



Ceres • January 24, 2004
HST ACS/HRC

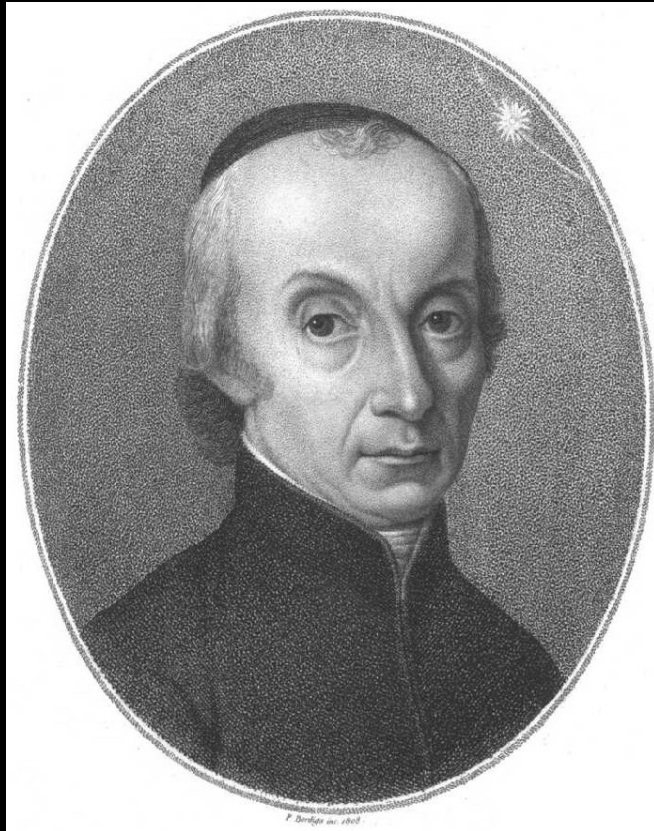
Vesta • May 14, 2007
HST WFPC2

NASA, ESA, J. Parker (Southwest Research Institute), and L. McFadden (University of Maryland)
STScI-PRC07-27a

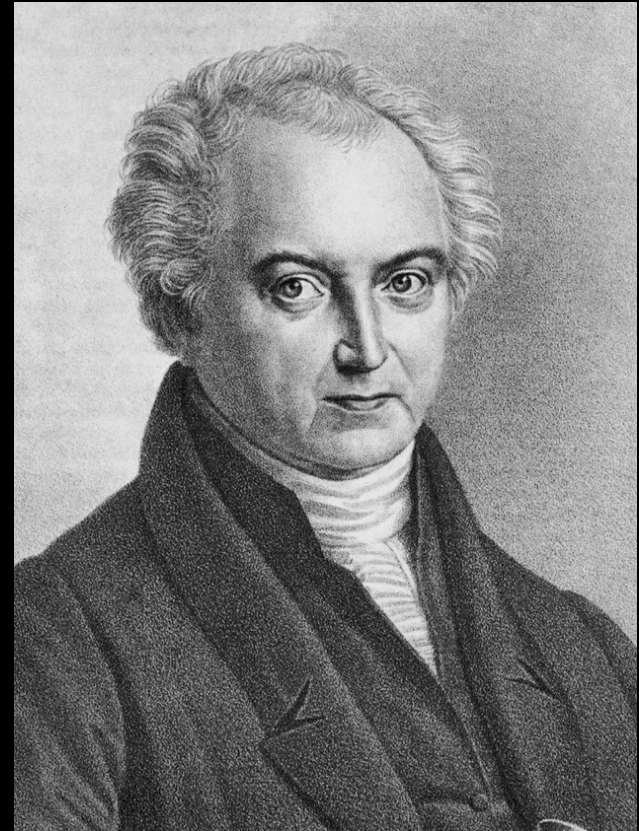
Best images prior to Dawn are from
Hubble Space Telescope

We Have Known About Them for Two Centuries

Giuseppe Piazzi discovered
Ceres in 1801



Heinrich Olbers discovered
Vesta in 1807



They were first called planets, and later, asteroids

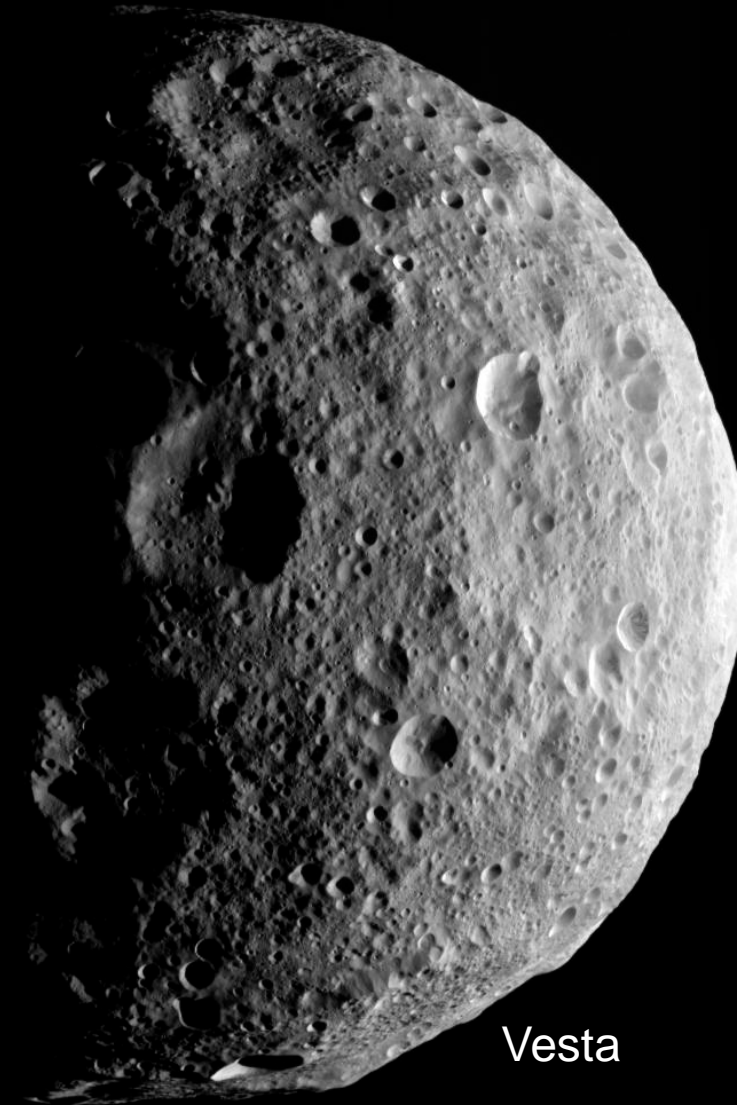
What Are They Made Of?

Vesta

- Is rocky, dry, and bright
- Has an iron core, mantle and crust made of basalt

Ceres

- Is icy, wet, and dark
- Is expected to have a rocky core, an ice mantle, and dusty surface



Vesta

DAWN

A Journey to the Beginning of the Solar System

Dawn is Part of NASA's Commitment to Explore the Solar System and Beyond

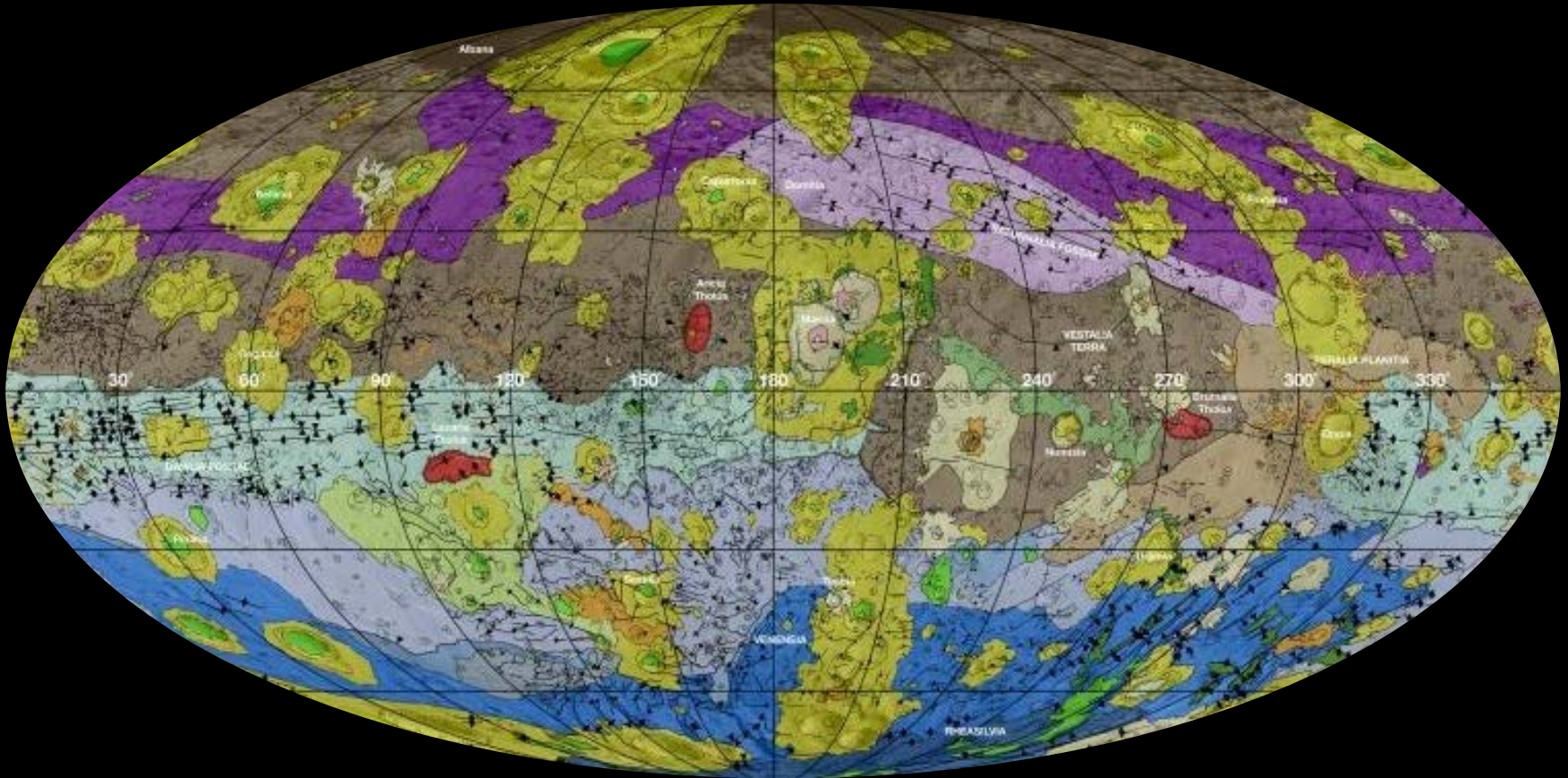


Dawn is the 9th mission in NASA's competed, low-cost Discovery Program

Dawn's Mission is to Understand Ceres and Vesta,
and Discover What They Can Tell Us about How
the Terrestrial Planets Formed



Dawn's Observation Campaign



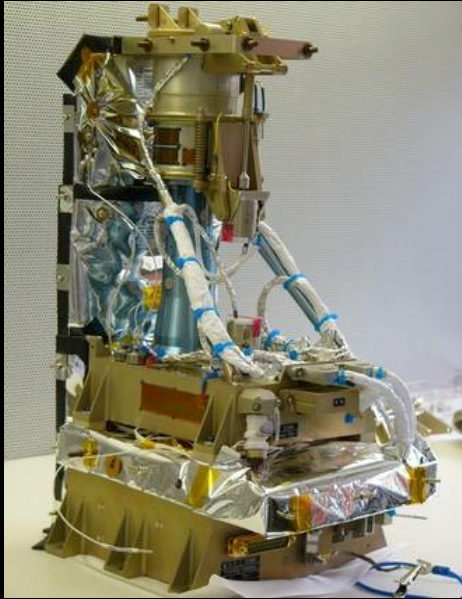
Dawn orbits each body, mapping the surface composition and topography, as well as the gravity

Dawn Spacecraft



Orbital ATK built the Dawn spacecraft

Dawn Instruments



Camera

Provided and operated by the German Aerospace Agency and the Max Planck Institute for Solar System Research



Gamma Ray and Neutron Spectrometers

Provided by Los Alamos National Labs and operated by the Planetary Science Institute



Visible and Infrared Mapping Spectrometers

Provided by the Italian Space Agency and the Italian National Institute for Astrophysics, and operated by the Italian Institute for Space Astrophysics and Planetology

Dawn is Enabled by Ion Propulsion



Ion propulsion allows us to go places that would otherwise be extremely expensive or impossible within NASA's constraints

Dawn was the Largest Interplanetary Spacecraft that NASA has Launched



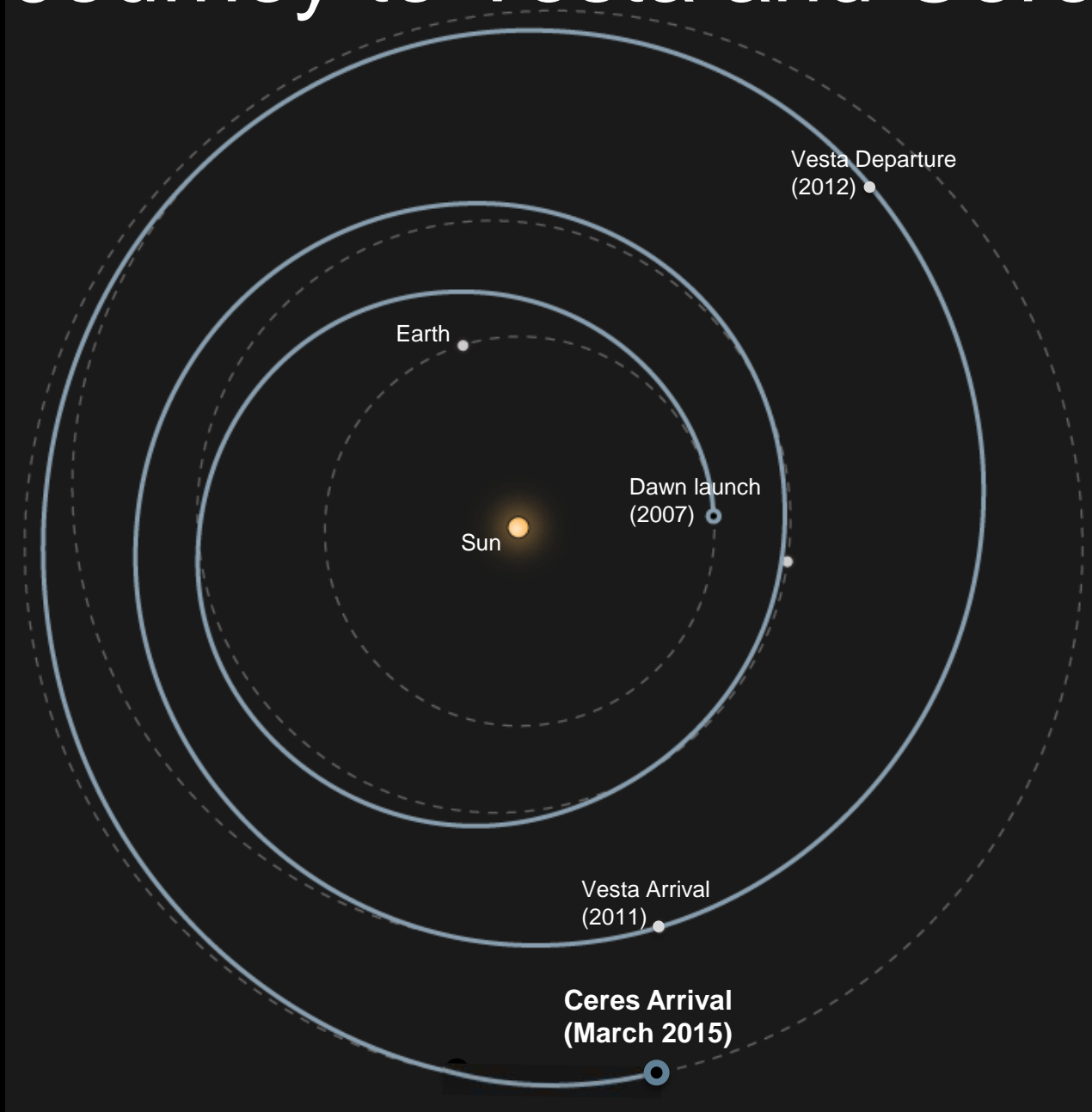
Dawn Aboard the Delta-II Rocket



Dawn Launch – Sept 27, 2007



The Journey to Vesta and Ceres



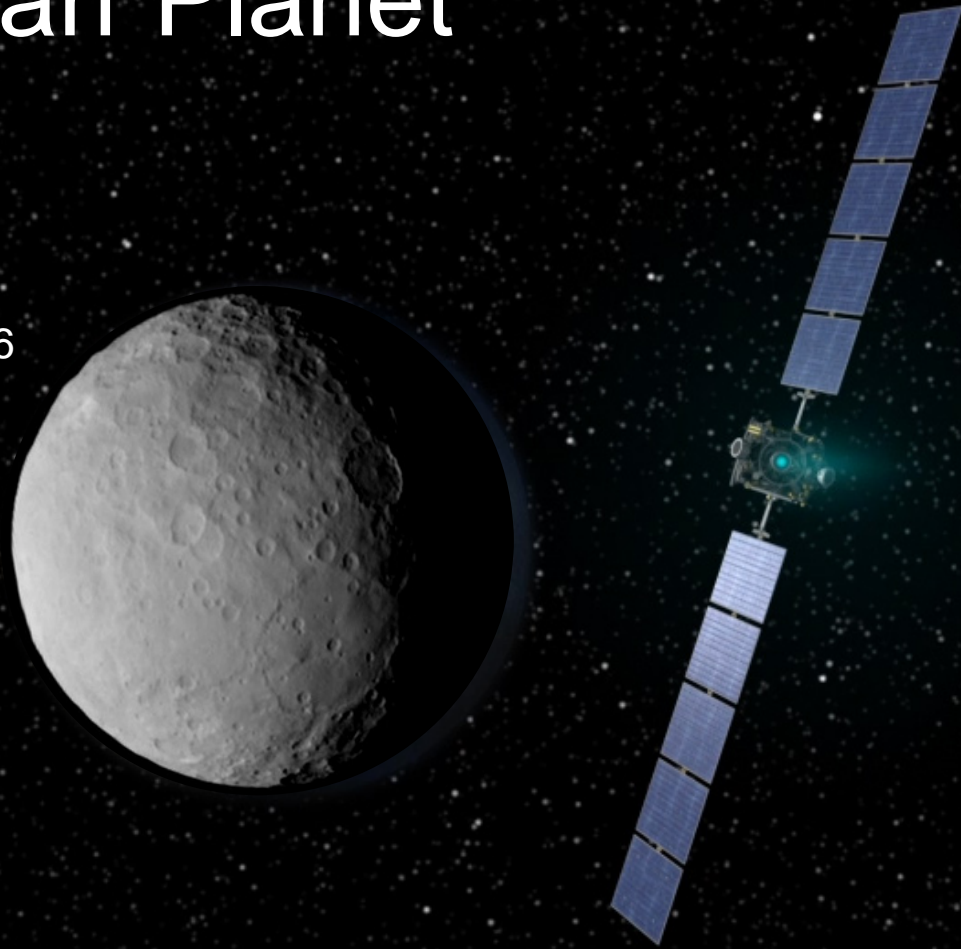
Dawn is the First and Only Mission to Orbit a Main Belt Asteroid

Vesta
2011-2012



Dawn is the First Mission to Reach a Dwarf Planet

Ceres
2015-2016



Dawn began orbiting around Ceres on March 6, 2015

CERES

Dawn is Orbiting and Exploring Ceres in
2015-2016

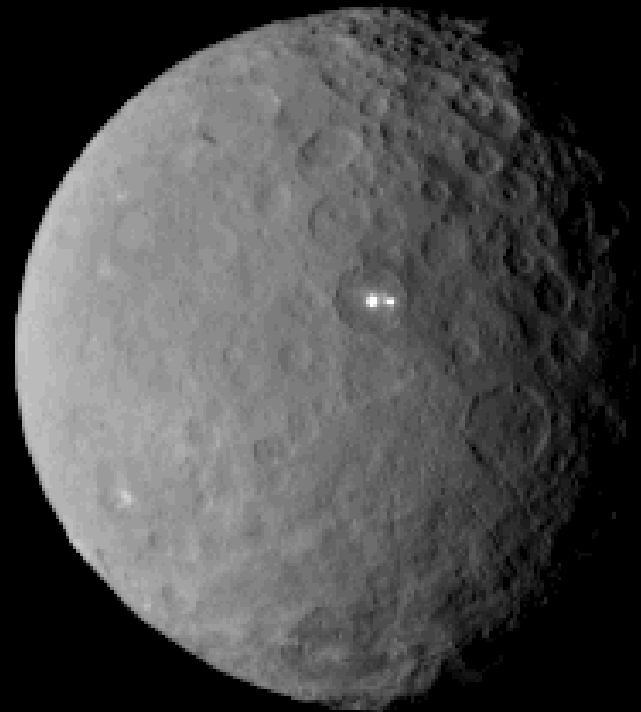
Introduction to Ceres

- The only dwarf planet in the inner solar system
- The largest, most massive body in the main asteroid belt
- Named after the Roman goddess of agriculture

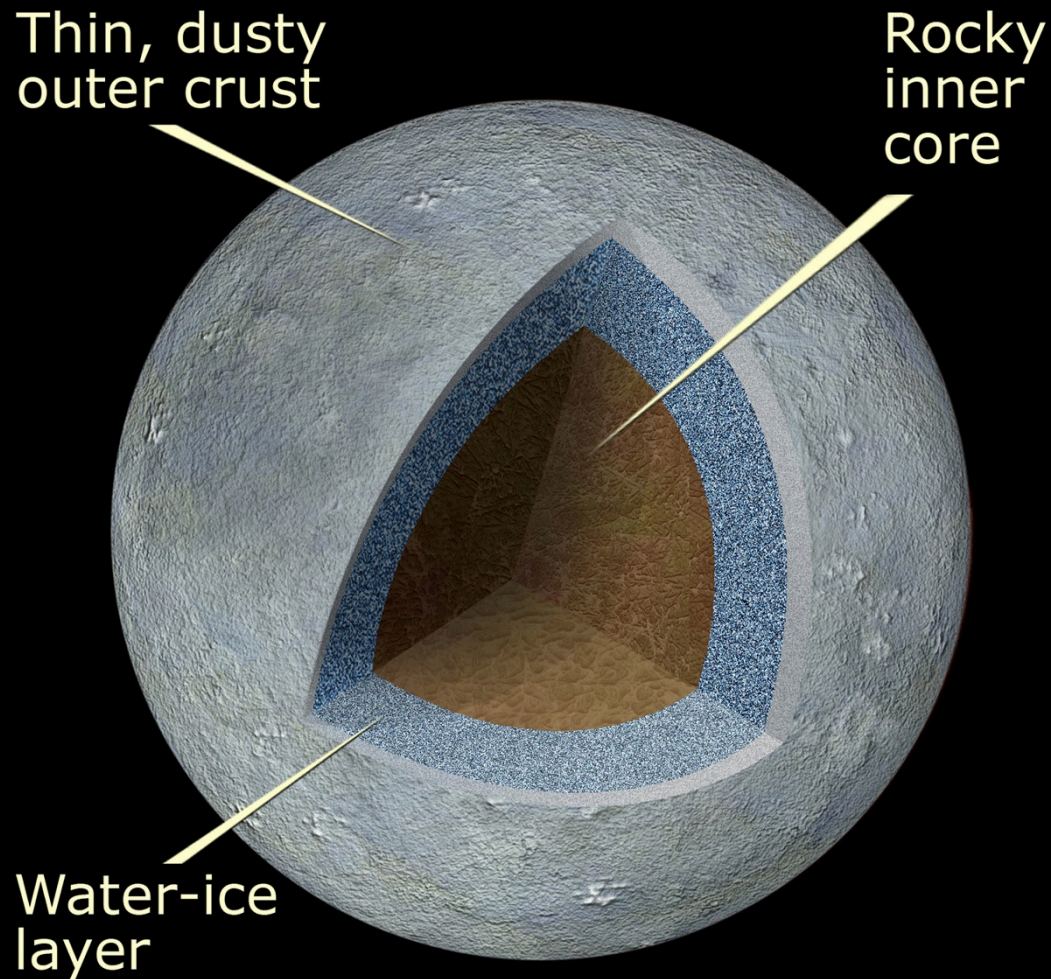


Ceres - The Basics

- About 590 miles (950 km) in diameter
- Ceres is ~25% water, and had a liquid ocean in the past
- At present Ceres is a warm icy body that may still have some liquid water



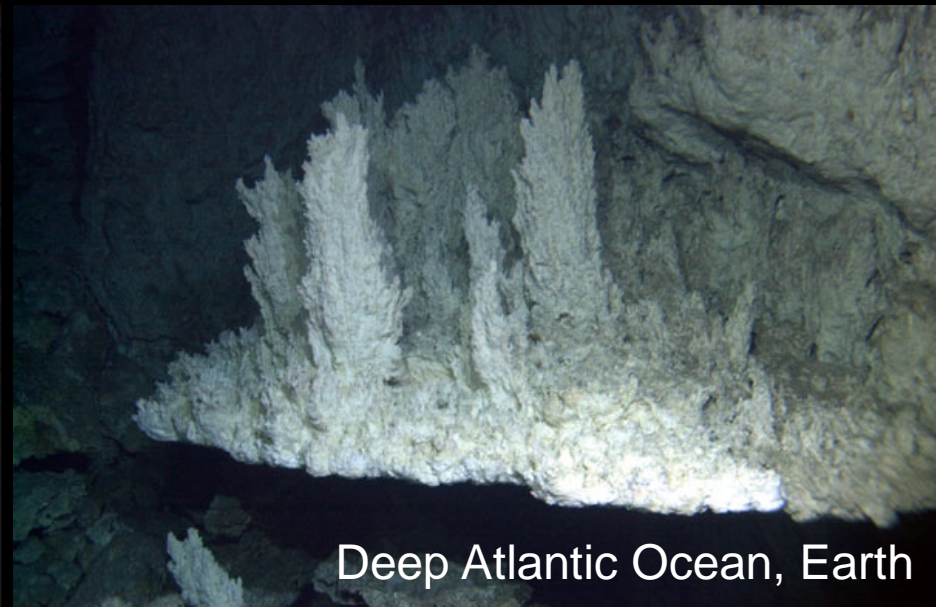
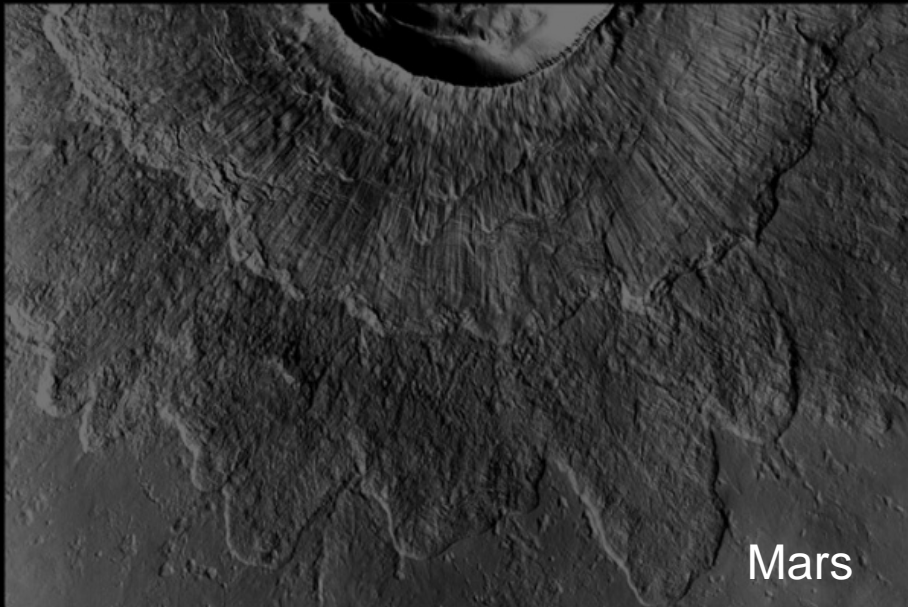
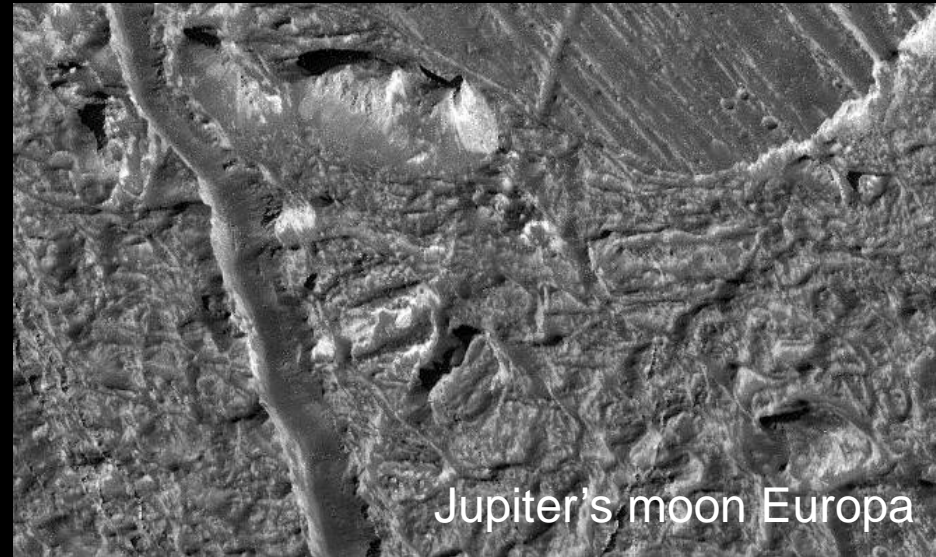
What We Expect



Dawn will map the surface properties, probe the interior structure, and characterize the interaction between them

What Might We Discover?

- Features caused by subsurface water
- Remnants of an ancient ocean
- Exotic surface composition



For More Information

<http://dawn.jpl.nasa.gov>



<http://solarsystem.nasa.gov>



VESTA

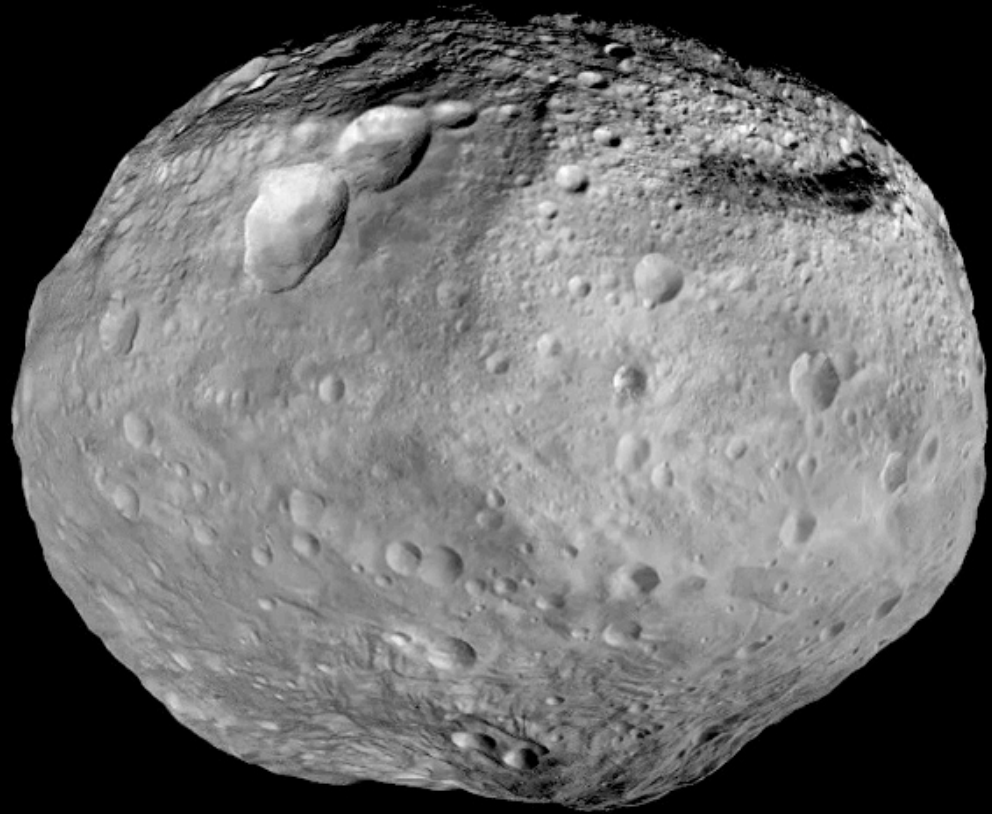
Dawn Orbited and Explored Vesta in
2011-2012

Ves



Vesta Revealed

- The second most massive body in the main asteroid belt
- Named after the Roman goddess of hearth and home



Huge Impacts



Impacts Sent Pieces of Vesta to Earth



More Meteorites from Vesta than from the Moon and Mars Combined



Remnants of the Impacts

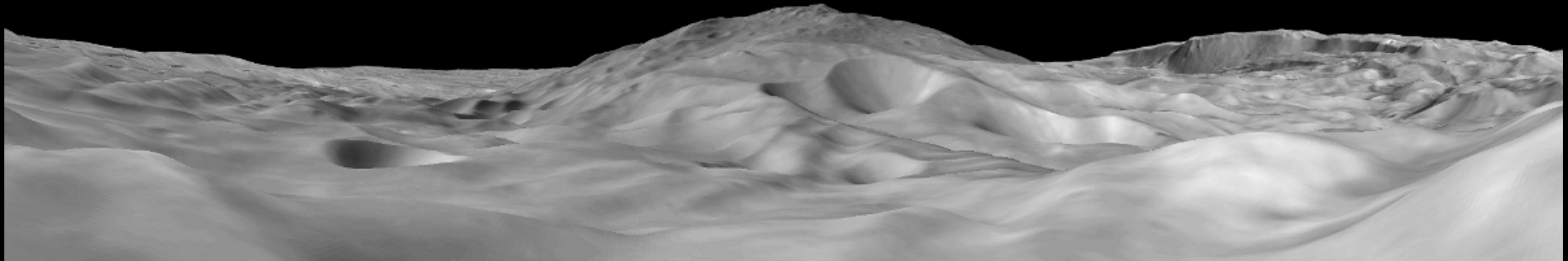
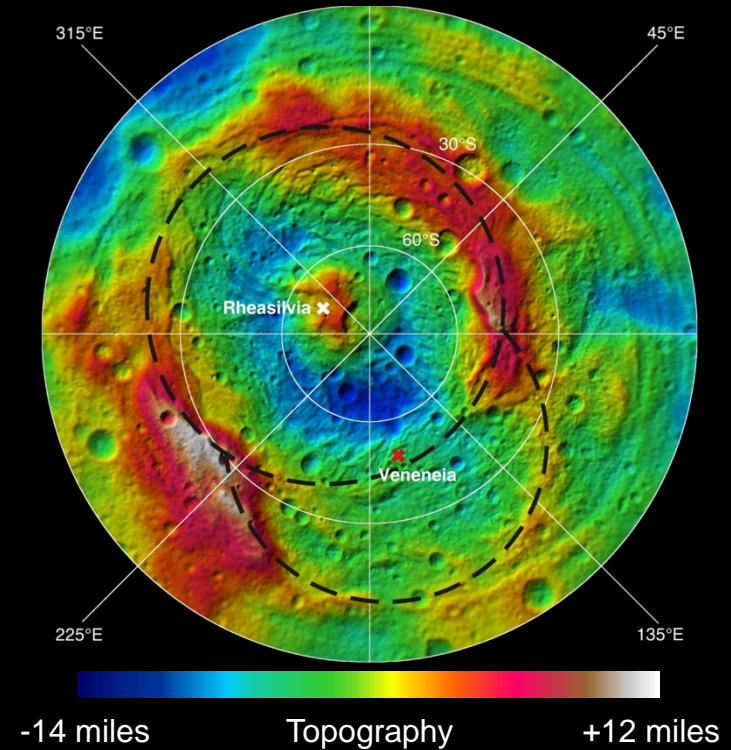
The massive impacts rippled through Vesta, leaving giant scars across the surface



Giant Impact Basins in the South

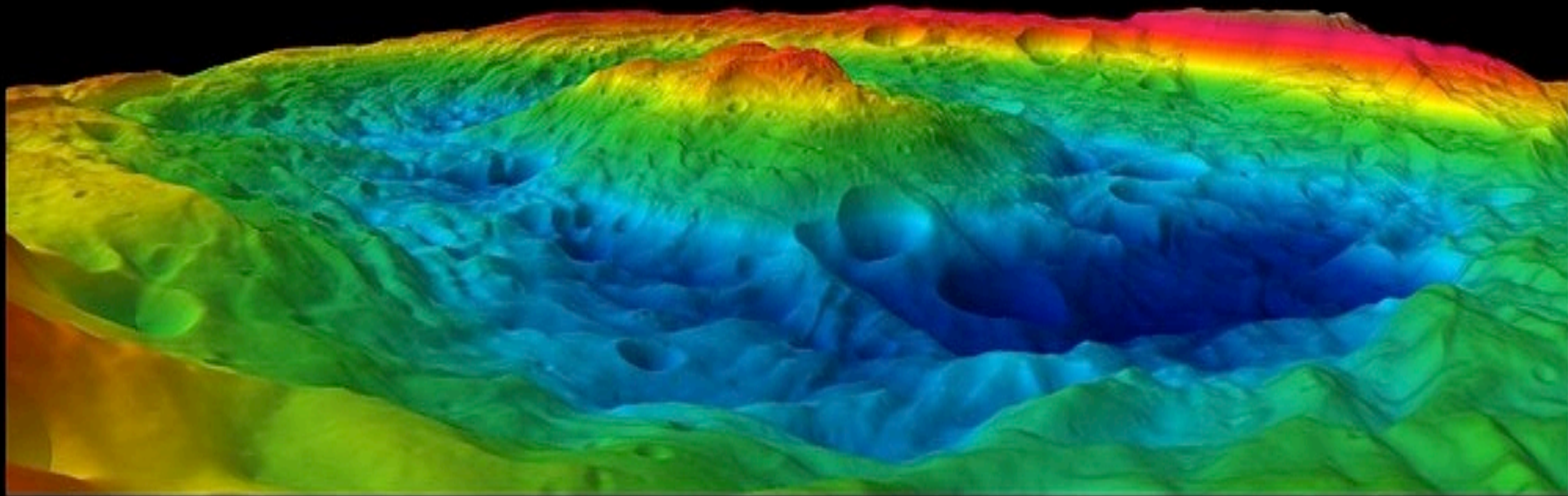
Rheasilvia is the largest crater (relative to body size) in the Solar System

Scaled to Earth, it would stretch from Washington DC, over the North Pole, to Tokyo



Largest Mountain

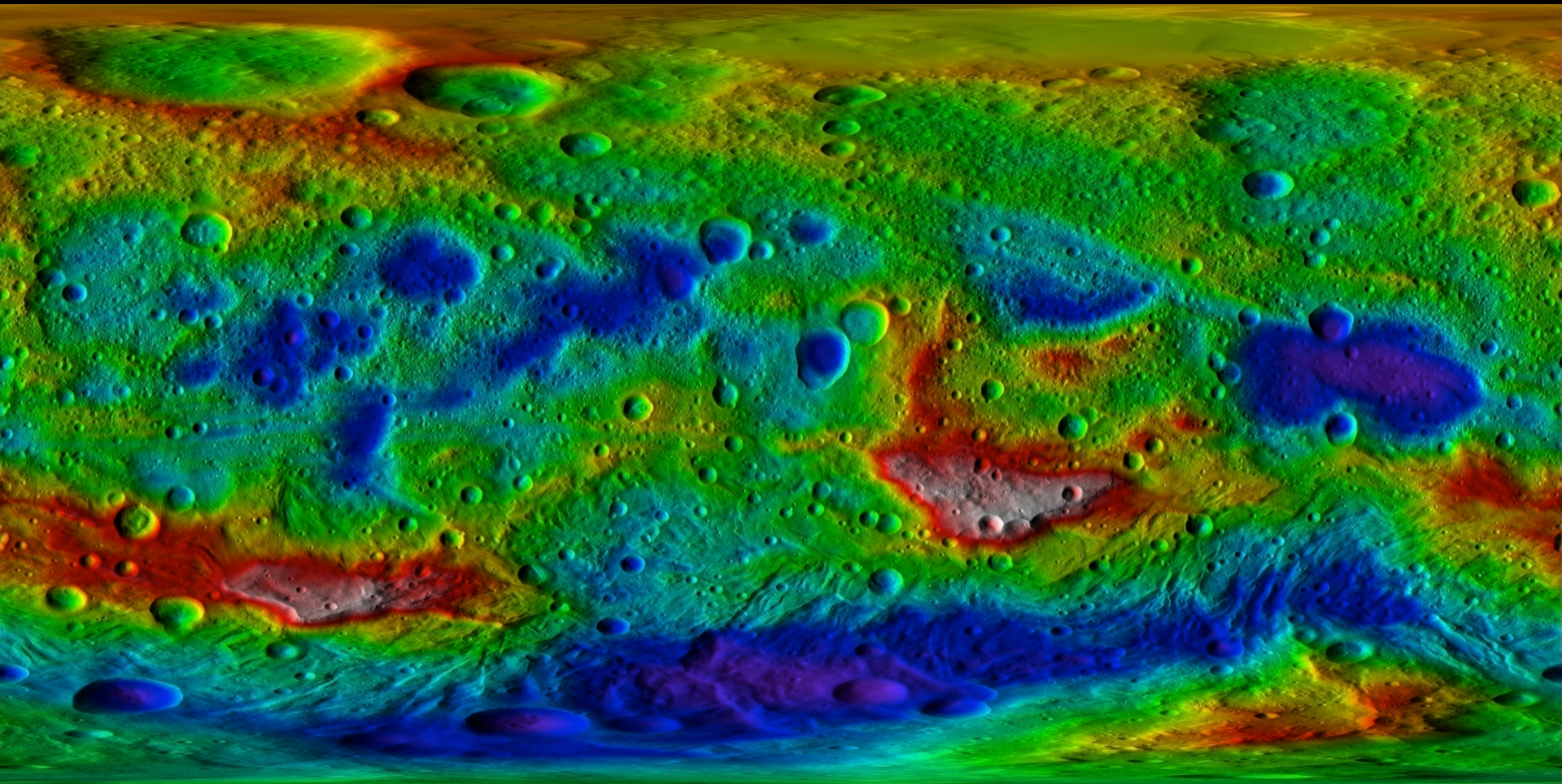
Rheasilvia's central peak is more than twice as high as Mt. Everest – rivaling Olympus Mons (on Mars) as the tallest mountain in the solar system



-14 miles

+12 miles

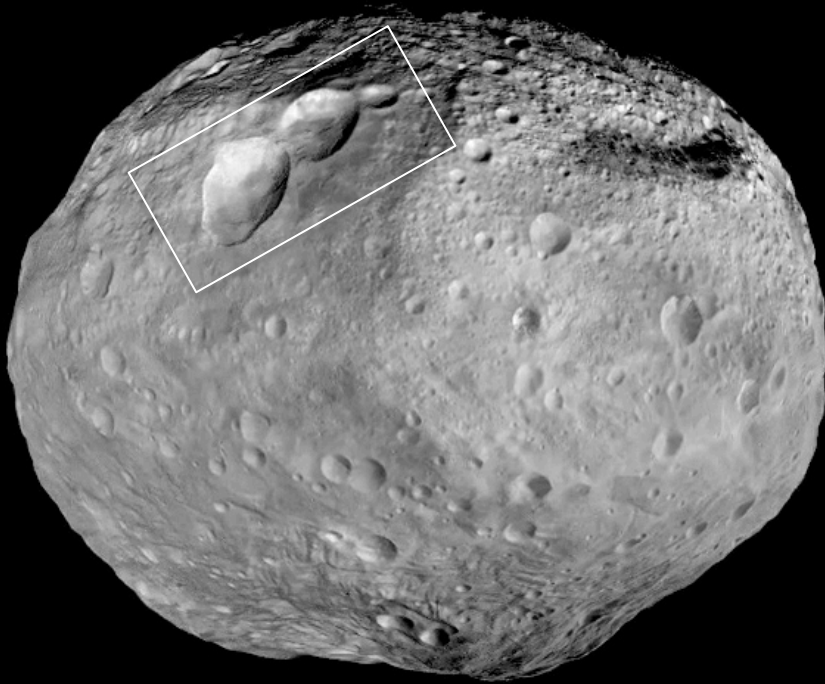
Rugged Topography



-14 miles

+12 miles

Vesta's Snowman





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