DAWN
Exploring New Worlds
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

Best images prior to Dawn are from Hubble Space Telescope

NASA, ESA, J. Parker (Southwest Research Institute), and L. McFadden (University of Maryland)
STScI-PRC07-27a
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
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
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 launch (2007)
- Vesta Arrival (2011)
- Vesta Departure (2012)
- Ceres Arrival (March 2015)
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

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
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

Jupiter's moon Europa

Mars

Deep Atlantic Ocean, Earth
For More Information

http://dawn.jpl.nasa.gov

http://solarsystem.nasa.gov
VESTA

Dawn Orbited and Explored Vesta in 2011-2012
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.
Rugged Topography
Vesta’s Snowman