LUNAR AND PLANETARY INSTITUTE

# Teachers' Guide to Solar System Exploration:
## *The Dawn Mission to the Asteroid Ceres*

exploration

## Explore Asteroids and the Solar System in Your Classroom!

Use the resources below to enable your students to explore asteroids and the solar system. Create a solar system exploration lesson or unit that fits into your classroom curriculum with hands-on activities, demonstrations, video clips, online exploration, and presentations by local scientists studying the solar system, specifically Mercury. Encourage your students to follow the news and explore more about the Dawn mission!

## Why Explore the Solar System?

Interest in the stars and planets has been both a common and consistent characteristic of humanity. We are driven to explore what we don't know, discover new things, push the boundaries of our limits, and beyond. For now, humans must stay close to Earth when exploring space. Until the day humans can routinely visit other planets, we must rely on robotic spacecraft to be our eyes throughout the solar system. Exploring the solar system is not easy and individual missions do not last forever. At some point, all missions must come to an end. However, in the human spirit of exploration, we should always look forward, ready to explore farther.

## Exploring Asteroids with Dawn

Dawn delves into the unknown, drives new technology innovations, and achieves what's never been attempted before. Dawn has orbited the asteroid Vesta and, beginning in March 2015, will explore a second new world, Ceres, the solar system's largest asteroid. Dawn's goal is to characterize the conditions and processes of the solar system's earliest history by investigating in detail two of the largest asteroids remaining intact and relatively unchanged since their formation. Dawn's investigations of Ceres and Vesta take us back in time to when the solar system was very young.

## Upcoming Events

Find information and resources about upcoming celestial events and NASA mission milestones to share with your students at http://www.lpi.usra.edu/education/look_up.

@NASASolarSystem
@NASA_Dawn

## *Night Sky Viewing Events*

Consider holding a night sky viewing at your school! Viewing planets through telescopes will give your students a personal connection with the very same objects being visited by spacecraft. Ask your local astronomical society to bring their telescopes for a viewing. Use the links below to locate a local astronomy club and/or speaker.

Night Sky Network
http://nightsky.jpl.nasa.gov/clubs-and-events.cfm
The Night Sky Network is a nationwide coalition of amateur astronomy clubs bringing the science, technology, and inspiration of NASA's missions to the general public.

NASA/JPL Solar System Ambassadors
http://www2.jpl.nasa.gov/ambassador/directory.htm
Solar System Ambassadors is a nationwide program consisting of volunteers who communicate the excitement of NASA/JPL's space exploration missions and information about recent discoveries to people in their local communities.

## *Websites*

NASA's Dawn Mission
http://dawn.jpl.nasa.gov/

Asteroids: An Overview
http://solarsystem.nasa.gov/planets/profile.cfm?Object=Asteroids

Dwarf Planets: An Overview (Ceres)
http://solarsystem.nasa.gov/planets/profile.cfm?Object=Dwarf

NASA Solar System Exploration
http://solarsystem.nasa.gov/index.cfm

Eyes on the Solar System
http://eyes.nasa.gov/index.html

Exploration Stories: Scientists' Favorite Historical Moments
http://solarsystem.nasa.gov/50th/stories.cfm

## *Explore the solar system with hands-on activities!*

**Strange New Planet**
http://marsed.asu.edu/strange-new-planet
Grade Level(s): K-8
This activity is about the use of remote sensing in planetary exploration. Learners will find out how human curiosity in planetary exploration results in science questions, engineering solutions, and teamwork.

**The Volume of Spheres and Cylinders**
http://spacemath.gsfc.nasa.gov/Modules/7Module9.html
Grade Level: Middle School
This is a set of three, one-page problems about calculating the volume of objects. Learners may calculate the volume of an asteroid, Vesta, or the stacking of satellites inside an atlas V rocket nose cone.

**Design an Ion Engine**
http://dawn.jpl.nasa.gov/DawnClassrooms/2_ion_prop/assess/1_tg_assessment.pdf
Grade Level(s): 9-12
This is a lesson about the design and operation of an ion propulsion engine. Learners will study the essential components and variables of an ion propulsion system. Activities include an on-line ion propulsion engine simulation and design.

*Other NASA educational activities for exploring the solar system can be found at http://nasawavelength.org.*