

## Teachers' Guide to Solar System Exploration: *The New Horizons Mission at the Pluto System*

### Explore Dwarf Planets and the Solar System in Your Classroom!

Use the resources below to enable your students to explore dwarf planets 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 dwarf planets. Encourage your students to follow the news and explore more about the New Horizons mission to the Pluto system!

### 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 the Pluto System with New Horizons

The New Horizons mission will help us understand worlds at the edge of our solar system by performing the first exploration of Pluto and by venturing deeper into the distant, mysterious Kuiper Belt – a relic of solar system formation. Pluto, along with other Kuiper Belt objects and the larger asteroids, is classified as a dwarf planet. More recently, it has been more specifically classified as an ice dwarf. New Horizons launched on January 19, 2006. It will arrive at the Pluto system and conduct a five-month-long study of Pluto and its moons beginning July 14, 2015. As part of an extended mission, the spacecraft is expected to head farther into the Kuiper Belt to examine one or two of the ancient, icy mini-worlds in that vast region, at least a billion miles beyond Neptune's orbit.

### 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](http://www.lpi.usra.edu/education/look_up).

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## 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 Pluto Toolkit

<http://solarsystem.nasa.gov/planets/plutotoolkit>

NASA's New Horizons Mission

[http://www.nasa.gov/mission\\_pages/newhorizons/main/index.html](http://www.nasa.gov/mission_pages/newhorizons/main/index.html)

The New Horizons Mission at Johns Hopkins University

<http://pluto.jhuapl.edu/>

Pluto: An Overview

<http://solarsystem.nasa.gov/planets/profile.cfm?Object=Pluto>

Peculiar Pluto

<http://spaceplace.nasa.gov/ice-dwarf/en/>

Dwarf Planets: An Overview

<http://solarsystem.nasa.gov/planets/profile.cfm?Object=Dwarf>

What is a Planet?

<http://science.nasa.gov/planetary-science/planetary-science-multimedia-links/what-is-a-planet/>

NASA Solar System Exploration

<http://solarsystem.nasa.gov/index.cfm>

Eyes on the Solar System

<http://eyes.nasa.gov/index.html>

[http://www.lpi.usra.edu/education/look\\_up](http://www.lpi.usra.edu/education/look_up)

*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.

### **Earth Calling**

<http://was.cdlib.org/wayback/was/20140812004143/http://pluto.jhuapl.edu/common/content/pdfs/NewHorizonsEarthCalling.pdf>

Grade Level: Middle School

A hands-on activity exploring spacecraft radio communication concepts, including the speed of light and the time-delay for signals sent to and from space.

### **Invisible Collisions**

[http://was.cdlib.org/wayback/was/20140812004514/http://pluto.jhuapl.edu/common/content/pdfs/invisible\\_collisions\\_activity\\_final\\_accessible.pdf](http://was.cdlib.org/wayback/was/20140812004514/http://pluto.jhuapl.edu/common/content/pdfs/invisible_collisions_activity_final_accessible.pdf)

Grade Level(s): High School

This is a lesson about using gravity to assist in spacecraft navigation. Learners will relate an elastic collision to the change in a satellite's or spacecraft's speed and direction resulting from a planetary fly-by, often called a "gravity assist" maneuver.

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