

# discover<sup>TM</sup> SPACE

## Exhibit Teacher's Guide

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Discover space science in your community and your classroom, with exhibit details and related resources.



### About the Exhibit

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*Discover Space: Exploring Our Solar System and Beyond* covers topics such as the formation of planetary systems, the search of planets beyond our Solar System, asteroids and comets, Mars exploration, and solar storms and their impacts on Earth. Space exploration and research are helping

humanity understand the origin and evolution of galaxies, stars, and planets, and defining the conditions necessary to support life beyond Earth. The four exhibit areas are: A. SPACE: The Final Frontier, B. Electric Space, C. Exploring our Solar System, and D. Cosmic Journey.

Discover Space Exhibit Stations	Pre-K-2nd grade	3-5th grades	6-8th grades	9th grade & up
<b>A. SPACE - The Final Frontier</b>				
Telescopes	✓	✓	✓	✓
Discovery Stations with hands-on activities	✓	✓		
Discover Space Quiz Show		✓	✓	✓
<b>B. Electric Space</b>				
Space Weather Kiosk		✓	✓	✓
Plasmasphere	✓	✓	✓	✓
Light and Color Station	✓	✓	✓	✓
Solar Monitoring Kiosk		✓	✓	✓
<b>C. Exploring our Solar System</b>				
Mission to Mars Kiosk		✓	✓	✓
Space Rocks Kiosk		✓	✓	✓
Meteorite Display	✓	✓	✓	✓
Solar System Report Station with green station	✓	✓	✓	
<b>D. Cosmic Journey</b>				
Planet Families Touch Table	✓	✓	✓	✓
Fact or Fiction Kiosk		✓	✓	✓
Cosmic Journey Presentation	✓	✓	✓	✓

## Classroom Connections

Classroom content and activities can expand upon and reinforce Discover Space content at multiple levels.

Download space science activities for different grade levels:

- **NASA Wavelength Catalogue** of activities and resources [www.nasawavelength.org](http://www.nasawavelength.org)
- **Lunar and Planetary Institute** Educator Resources [www.lpi.usra.edu/education/resources/](http://www.lpi.usra.edu/education/resources/)
- **Project Spectra! @LASP** Activities about light and spectra [lasp.colorado.edu/education/spectra/index.htm](http://lasp.colorado.edu/education/spectra/index.htm)



### Younger elementary students (K-2)

These students are eager to learn about space, and can:

- Listen to or read different cultural stories about the night sky.
- Observe changes in the sky—the daily motions of the Sun, the changing appearance of the Moon, and the appearance of planets such as Venus.
- Compare the physical properties of objects in the solar system, such as states of matter, temperatures, and sizes.

# Classroom Connections (continued)

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## Older elementary students (grades 3-5)

These students are able to integrate objects such as planets and stars into systems, and can:

- Model the sizes and distances of objects in the solar system, as well as their orbits.
- Categorize the planets, their moons, the comets, and asteroids as objects within the solar system, and stars as objects within the galaxy.
- Measure and record patterns of change in appearances of the Moon, the positions of the Sun during the day, and certain constellations in different seasons.

## Middle school students (grades 6-8)

These students are able to analyze spatially challenging concepts such as lunar phases and seasons, and can:

- Model lunar phases and seasons and describe their causes.
- Apply physical concepts of density, mass and gravity, and composition to objects within the solar system and galaxy.
- Compare characteristics of Earth and other planetary objects, such as interior structure, surface features such as volcanoes and craters, magnetic fields, and weather patterns.

# Student Research

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Middle school and high school student may conduct their own research or science fair projects using online space science data, such as:

- **Eyes on the Solar System:** [solarsystem.nasa.gov/eyes/](http://solarsystem.nasa.gov/eyes/)  
Students can observe solar system objects and planetary missions and their positions in the solar system.
- **MicroObservatory Robotic Telescope Network:** [mo-www.cfa.harvard.edu/OWN/index.html](http://mo-www.cfa.harvard.edu/OWN/index.html)  
Students use a network of automated telescopes over the internet to investigate the wonders of the deep sky from their classrooms or after-school centers.
- **Zooniverse:** [www.zooniverse.org](http://www.zooniverse.org)  
This citizen science site provides opportunities for people around the world to contribute to real discoveries in fields ranging from astronomy to zoology.
- **JMARS:** [jmars.asu.edu/](http://jmars.asu.edu/)  
This site is a geospatial information system to provide mission planning and data-analysis tools to NASA's orbiters, instrument team members, students of all ages, and the general public.
- **Planetary Data System:** [pds.jpl.nasa.gov/tools/data-search/](http://pds.jpl.nasa.gov/tools/data-search/)  
A website that accesses a variety of catalogues with planetary data.
- **Galaxies and Cosmos Explorer Tool (GCET):** [www.as.utexas.edu/gcet/browser.html](http://www.as.utexas.edu/gcet/browser.html)  
Hubble images of background galaxies can be analyzed.
- **Exoplanets Encyclopedia:** [exoplanet.eu/catalog.php](http://exoplanet.eu/catalog.php)  
This catalogue of discovered planets is sortable by several different factors.
- **World Wide Telescope:** [www.worldwidetelescope.org/Home.aspx](http://www.worldwidetelescope.org/Home.aspx)  
This site utilizes images and data to explore high resolution images of the universe in multiple wavelengths.

### **Other Useful Websites:**

#### **Solar System Exploration**

[solarsystem.nasa.gov](http://solarsystem.nasa.gov)

#### **StarChild**

[starchild.gsfc.nasa.gov](http://starchild.gsfc.nasa.gov)

#### **Amazing Space**

[amazingspace.org](http://amazingspace.org)

# Connections to Science Standards

The concepts and activities within the Discover Space exhibit and programming connect to a variety of standards.

## Space Science: Disciplinary Core Ideas

- **ESS1.A: The universe and its stars:**

The solar system is part of the Milky Way, which is one of many billions of galaxies.

- **ESS1.B: Earth and the solar system:**

The solar system contains many varied objects held together by gravity.

## Science & Engineering Practices

- Asking questions and defining problems
- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Obtaining, evaluating, and communicating information

## Crosscutting Concepts

- Patterns
- Scale, proportion, and quantity
- Systems and system models.
- Structure and function

# Key Concepts from Discover Space

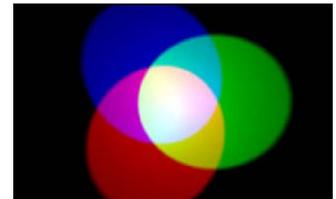
## How We Explore Space

- Telescopes, which use mirrors and lenses to collect light.
- Robotic missions to other places in our solar system.
- Instruments to examine magnetic fields, gravity, particles, light, and more.



## Light

- White light can be broken into different colors of the spectrum.
- There are some types of light that we can't see, including radio, infrared, ultraviolet, x-ray, and gamma rays.
- Our Sun and other stars give off all these different types of light.
- Examining details about light can tell us about an object's temperature, motion, composition, and more.



## The Solar System

- This includes the Sun and everything that orbits it: planets and their moons, asteroids, and comets, dust, and lots of empty space.
- The distances between the planets' orbits is very large compared to the sizes of the planets.
- Asteroids and comets can and have hit the Earth and other planets and moons throughout the history of the solar system, exploding and leaving craters.
- Meteorites are pieces of asteroids, comets, and other objects that have fallen onto Earth's surface.



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