

## Nine Planets and Counting

### Program Summary

How many planets are there in our solar system? Nine, right? Or is it eight? Maybe it's ten, or twelve, or more. Take a tour to explore the variety of objects that populate our solar system.

Along the way, the audience will examine each planet individually and then step back to look at the big picture: rocky worlds compared to gas giants and more. And just what IS a planet, anyway? The answer may surprise you.

### Tennessee Science Standards

1. Earth And Its Place In The Universe 7.0
2. Forces and Motion 11.0
3. Energy 14.0

### Objectives

1. Name three objects in the solar system and describe at least one characteristic of each object.
2. Name the four planets in our solar system known to have rings.
3. Name two reasons for the debate as to Pluto's status as a planet.

### Pre-Visit Activities

1. Invite students to come up with creative ways to remember the names of the planets.
2. Build a scale model of the solar system that focuses mainly on the distances between the various objects. The model can be small enough to fit in a classroom or as long as a football field. Give the actual distances in miles or kilometers. Have older students calculate the distances to the planets based on the scale: one square of toilet paper, one floor tile, or one foot equals x many miles.
3. Have students compare the relative sizes of the planets and the Sun. Explore why it is a challenge to make a scale model of sizes and even harder to do size and distance in the same model.

### Post-Visit Activities

1. Download the monthly star chart from our website [www.SudekumPlanetarium.com](http://www.SudekumPlanetarium.com). Encourage students to locate the constellations and any planets visible in the evening sky.
2. If you have not already done so, consider building the various scale models listed under pre-visit activities.
3. In addition to the planets, have students, individually or in small groups, investigate other objects in the solar system: moons, asteroids, comets, TNOs, KBOs, etc.
  - An example of how our knowledge is constantly expanding can be found in the current count of moons orbiting the planets. How many are there now? How are they discovered?
  - Have students investigate the origin of names of solar system objects and their features. It can be very interesting.

### Vocabulary

asteroid  
 astrobiologist  
 atmosphere  
 atmospheric pressure  
 composition  
 core  
 elliptical  
 extrasolar planets  
 Galileo  
 Gravity  
 Great Red Spot  
 helium  
 hydrogen  
 hydrothermal vents  
 infrared  
 liquid metallic hydrogen  
 lunar geologists  
 maria  
 methane  
 minor planet  
 organism  
 parallel  
 perpendicular  
 planet  
 radiation  
 shepherd moons  
 terrestrial  
 transNeptunian objects  
 volcanoes

4. Have students investigate some of the many robotic spacecraft that have been launched to explore the planets and other objects in our Solar System. Mariner, Venera, Vikings 1 and 2, Voyagers 1 and 2, Mars Pathfinder and Sojourner, Mars Exploration Rovers Spirit and Opportunity are just a few. Note that not all missions have been successful while others have accomplished much more than originally planned. Using a solar system model in the classroom, plot where each spacecraft visited and what happened to it. Explore why a mission beyond our solar system is unrealistic.
5. Hold a debate on the usefulness of space exploration. How can information about other planets help us on Earth? What benefits has the space program had on our everyday lives? What are the costs? Explore web sites on the Internet to learn how others feel about this issue. Each year NASA publishes a free booklet called Space Spin-offs that shows how space technology is used to improve life on Earth. Send for the booklet and share it with students.
6. Many students hear that Neptune and Pluto switch orbits. This is a misconception. Pluto's orbit is elliptical and tilted which occasionally carries Pluto inside the orbit of Neptune. The two planets are still billions of miles apart. Challenge students to find out the details of Pluto's orbit. When will it happen again? In their lifetimes, will Neptune ever again become the farthest planet from the Sun? Have students create ellipses and circles so they can understand the differences in orbits. Find other objects in the solar system that may have elliptical orbits.
7. Astronomers are debating whether Pluto qualifies to be considered a planet. Have students collect information about the definition and characteristics of planets and other objects. Have teams choose sides and present arguments for their case.

## Resources

### Websites

Monthly star charts and related articles -

[www.SudekumPlanetarium.com](http://www.SudekumPlanetarium.com)

clever astronomy demonstrations using paper plates <http://analyzer.depaul.edu/paperplate/>

Scale models of the solar system

<http://www.vendian.org/mncharity/dir3/solarsystem/>

Build a Solar System -

[http://www.exploratorium.edu/ronh/solar\\_system/](http://www.exploratorium.edu/ronh/solar_system/)

How Big is the Solar System? -

<http://www.noao.edu/education/peppercorn/pcmain.html>

National Space Science Data Center: (up-to-date data about the Solar System)

<http://nssdc.gsfc.nasa.gov/planetary/planetfact.html>

Chronology of Lunar and Planetary Exploration, 1957-present

<http://nssdc.gsfc.nasa.gov/planetary/chronology.html>

Kuiper Belt Objects/Trans-Neptunian Objects

<http://ifa.hawaii.edu/faculty/jewitt/kb.html>

StarDate - daily astronomy radio program

<http://stardate.org/teachers/classroom.html>

## Exhibit Connections

### Space Chase

The movement of the earth around the sun can be seen in the Earth-sun orrery in the Solar System Survey.

Students can explore the Solar System Touchscreens to learn more about the Sun and human exploration of Earth's planetary neighborhood.

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