

**Tested & Approved STEM Activities** 

# Planet Party Activity Guide



Resources For Libraries

A product of the Science-Technology Activities and Resources for Libraries (STAR\_Net) program. Visit our website at <u>www.starnetlibraries.org</u> for more information on our educational programs. Developed by the Lunar and Planetary Institute/Universities Space Research Association May 2016



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# **Planet Party**





Credit: Halfblue/Wikipedia

## **Overview**

Visitors view planets, the Moon, and stars in the sky with the naked eye and binoculars or telescopes. Planning resources and tips for partnering with a local astronomical society are provided.

## **Activity Time**

30 minutes or more

## **Intended Audience**

Families or other mixed-age groups, including children as young as 5 years old with assistance from an older child, teen, or adult School-aged children Tweens Teens Adults

## **Type of Program**

- **✓** Facilitated hands-on experience
- Station, presented in combination with related activities
- Passive program (if instructions are provided at the start of the course)
- Demonstration by facilitator

# What's The Point?

🦇 Observing the Moon, planets, and stars can show change and inspire wonder.

Many planets in our solar system are easy to see in the night sky.

Looking at a planet through a telescope will magnify the appearance, so we can see features. The Moon's familiar face offers impact craters, dark, flat plains (maria), and mountains for closer inspection through binoculars or a telescope.

Telescopes are scientific tools; they offered our first glimpses of other worlds when Galileo first used his telescope to study Venus, the Moon, Saturn, and Jupiter and its moons 400 years ago. Telescope optics have improved over time, allowing scientists to make more detailed observations of objects in the night sky.





### **Facility needs:**

- An outdoor viewing area, preferably away from bright lights and traffic
- Optional: Access to electricity and a well-marked extension cord, secured so it won't be a hazard in the dark
- □ Glow sticks to mark cords
- □ Access to drinking water
- □ Access to bathrooms

## For each group of approximately 20 visitors:

- 1 telescope operated by an amateur astronomer
- □ 1 small step-stool for children to stand on to reach tall telescope eyepieces

Even from urban locations, telescopes can reveal surprising views of the planets:

- Venus often looks like the Moon a crescent, quarter, or gibbous phase. Since Venus lies between us and the Sun, we are able to view both its day (sunlit) and night (dark) sides. Our perspective of Venus changes as the Earth carries us in its orbit around the Sun, revealing different angles of Venus. At different angles, Venus appears in different phases.
- Jupiter has faint bands of different colors, and sometimes a centuriesold storm, called the Great Red Spot, or some of its moons can be seen. Jupiter's four largest moons, Io, Europa, Ganymede, and Callisto, appear as bright dots on the sides of Jupiter, and disappear from view occasionally as they pass in front of or behind the planet.
- 👋 Saturn's rings are easily seen.
- 👋 Mars has a reddish appearance due to its rusty soil.

Telescopes are not necessary to enjoy the Moon. The basalt-filled impact basins and plains — maria — and ancient lunar highlands are easily seen with the naked eye. Binoculars reveal the Apennine Mountains, Copernicus Crater, and Tycho Crater.



A view through a telescope reveals Jupiter's banded atmosphere. You might also spot several or all of Jupiter's four largest moons. Callisto, Ganymede, and Europa appear here as small "dots" from far left to far right. Io is often also visible as a fourth "dot." – Credit: Modified from NASA/JPL/ Malin Space Science Systems.

## For each facilitator:

- Flashlights for staff, preferably with red plastic wrap or red paper taped over the light
- □ 1 set of Our Solar System lithographs (NASA educational product number LS-2013-07-003-HQ)





# **Materials (continued)**

### For each visitor:

- □ Sky map for the current night
- Optional: <u>An Earth-based Tour of the Moon</u> and/or <u>Skywatcher's Guide to the Moon</u>.

Monthly <u>sky charts</u> or simple <u>sky wheels</u> are available free from a variety of websites, including the links offered here; note that the sky wheels require assembly but work year-round.

# **Supporting Resources**

Consider setting up a digital device (such as a computer or tablet), speakers, and access to the Internet to display websites or multimedia before or after the activity.

#### **Books:**

**Becker, Helaine, and Brendan Mullan.** *Everything Space*. Washington, D.C.: National Geographic Children's Books, 2015. (ISBN-13: 978-1426320743)

**Driscoll, Michael and Meredith Hamilton.** A Child's Introduction to the Night Sky: The Story of the Stars, Planets, and Constellations--and How You Can Find Them in the Sky. New York: Black Dog & Leventhal Publishers, 2004. (ISBN-13: 978-1579123666) Grade 3 - 7

**Yasuda, A. (2015).** Astronomy: *Cool women in space*. White River Junction, VT: Nomad Press. (Hardcover ISBN 978-1-6193-0326-3, Paperback ISBN 978-1-6193-0330-0) Grade 4 – 6

## **Podcasts:**

**365 Days of Astronomy podcasts:** Launched in 2009 as part of the International Year of Astronomy, this community podcast continues to produce day after day of content across the years. In 2013, they evolved to add video, and in 2015 they join the International Year of Light: <u>http://cosmoquest.org/</u><u>x/365daysofastronomy/</u>

**Solar System Exploration What's Up Podcast:** What spacecraft and celestial events are happening each month are described in this video podcast <u>http://solarsystem.nasa.gov/news/category/whatsup</u>

#### **Interactive Websites:**

**NASA's Eyes on the Solar System:** Learn about our home planet, our solar system, the universe beyond, and the spacecraft exploring them with this downloadable application: <u>http://eyes.jpl.nasa.gov</u>

**Moon Mappers (Planet Mappers, Moon Edition):** Citizen science project mapping craters on the Moon: <a href="http://cosmoquest.org/?application=simply\_craters">http://cosmoquest.org/?application=simply\_craters</a>



Science-Technology Activities & Resources For Libraries



# **Supporting Resources (continued)**

#### Handouts:

- Our Solar System lithographs (NASA educational product number LS-2013-07-003-HQ)
- Monthly <u>sky charts</u> or simple <u>sky wheels</u>
  <u>An Earth-based Tour of the Moon</u>
- Skywatcher's Guide to the Moon

## Images:

Hubble Site (NASA/STScI) http://hubblesite.org/gallery NASA Solar System Exploration http://solarsystem.nasa.gov

Planetary PhotoJournal (NASA/JPL) http://photojournal.jpl.nasa.gov Spitzer Space Telescope (NASA/JPL-Caltech) http://www.spitzer.caltech.edu

Astronomy Picture of the Day http://apod.nasa.gov

# Preparation

#### **Advanced Planning Tips:**

- V If possible, incorporate additional science, technology, engineering, art, and mathematics (STEAM) activities into the event. See the STAR\_Net resources listed at <u>www.starnetlibraries.org</u> for ideas.
- Prepare and distribute publicity materials for programs based on this event.
- Pull supporting resources out of circulation to feature during the program.
- W Determine an appropriate date and time for the event:
  - Use online resources to determine a date at which one or more bright objects will be high in the evening sky.
  - Identify a start and end time for your program on your intended date. Best viewing times will begin about an hour after sunset. <u>SunriseSunset</u> and <u>Stellarium</u> provide sun set times for your location far in advance.
  - Optional: Contact your local astronomy club or other amateur astronomers. The <u>Astronomical League, Sky and Telescope</u>, and <u>NASA Night Sky Network</u> offer search tools to find a club near you. Let them know which planets or other objects you would most like for the public to see.
- W Have a back-up plan in place before the announcement for inclement weather: Will the event be cancelled, postponed, or moved inside with different activities? If the event is cancelled or postponed, at what time or point will the decision be made to do so, and how will the audience hear about it?
- Identify ways to help persons with all abilities to enjoy the night sky. Tips are provided in the book: Grice, Noreen (2011). Everyone's Universe: A Guide to Accessible Astronomy Places, New Britain: Connecticut: You Can Do Astronomy, LLC. ISBN: 978-0-9833567-1-4.





# **Preparation (continued)**

- If appropriate, arrange to have the viewing area sprayed for mosquitoes or treated for fire ants in advance of the observing session.
- If possible, arrange for nearby bright overhead lights and sprinkler systems to be turned off during the period of the observing session.
- Become familiar with information about the objects that are in view, as well as current and future missions to explore them using the Our Solar System lithographs and reputable websites.
- Set out the step-stool(s) where needed.
- Set up the tables and pencils or crayons in a well-lit area nearby.

There are many objects in the sky that can engage and inspire your visitors when viewed through a telescope or binoculars, including:

- Planets: Select a date when planets will be visible in the early evening sky. Venus and Jupiter are almost always bright when visible, Mars is often bright, and Saturn and Mercury are always a bit faint. Uranus and Neptune are too faint to see without telescopes or binoculars. Try to avoid dates when the Moon is full or nearly full (see below), as its light will wash out other nighttime objects. StarDate, Stellarium, the Planet Finder applet, or other planetarium programs are useful planning tools.
- The Moon: Select a date when the Moon is a crescent or in first quarter. <u>SunriseSunset</u> and <u>Stellarium</u> provide Moon phases far in advance. Observing the Moon while its near side is only partially lit, as in the crescent and first quarter phases, causes the terrain to cast longer shadows. The shadows make the features much easier to see! A full Moon is unpleasantly dazzling to view through a telescope — even the crescent Moon is bright.
- Constellations: While constellations are best viewed with the naked eye, these star patterns provide a map to finding nebulae, star clusters, and galaxies. A brief tour of the month's constellations, deep-sky objects, planets, and events is available through <u>Tonight's Sky</u>.
- International Space Station (ISS): Use "Spot the Station" (<u>https://spotthestation.nasa.gov</u>), a NASA service, to determine whether or not the ISS will be visible during the observation period or not. Visible to the naked eye, the ISS looks like a fast-moving plane (only it is much higher and traveling thousands of miles an hour faster).

Make sure that the objects you intend to view will be visible from your viewing location in the early evening. Over the course of the event, the objects will appear to move toward the west as the Earth rotates.





## 1. Share ideas and knowledge.

- Introduce yourself. Help the participants learn each other's names (if they don't already know each other).
- Frame the activity with the main message: Observing the Moon, planets, and stars can show change and inspire wonder.
- Invite the visitors to talk about what they already know about the Moon, planets, and stars. Use openended questions about how the Moon, planets, and stars appear in the sky. Invite visitors to recollect how those objects appear to change over time (e.g. setting in the west each night, planets are only sometimes visible, the Moon changes phase). Invite the visitors to talk with you and each other.
- Provide information about the objects that are in view, as well as current and future missions to explore them.

## 2. Facilitate equitable access to telescopes and/or binoculars.

- Invite visitors to form lines behind each telescope or pair of binoculars. Caution them to avoid the tripod legs and any cords.
- Ask each child to put her hands behind her back when it's her turn to look through the telescope (which will reduce the chances of moving the telescope.)

#### **Facilitator's Notes:**

- Stars appear to twinkle, but planets do not. The twinkling is caused by Earth's atmosphere. Light from a star passes through pockets of air that have different temperature and bend the light. Planets are much closer and appear as disks in the sky, rather than pinpoints. Even without the magnification of a telescope, the disk of a planet is larger than the air pockets. Starlight comes from a single point and is more readily distorted as it passes through air pockets.
- The Sun is the only star in our solar system; the others we see at night are much more distant than even Pluto.
- V Planets don't make their own light. They appear bright because they are reflecting sunlight.
- Ancient civilizations studied the skies and noted the strange motions of "wanderers" ("planets" in Greek), which seemed to move against the background of familiar constellations.
- Jupiter is the biggest planet and Mercury is the smallest. Venus is the brightest planet because it is close to us, and so seems larger than Jupiter.





# **Activity (continued)**

*	Uranus is barely visible in very dark locations to observers who know where to look!
*	The existence of Neptune was deduced mathematically and then confirmed by telescopic observations. It can be viewed through binoculars from a very dark location.
*	Pluto is a tiny, distant dwarf planet and can be viewed through a small telescope from a very dark location.
*	Galileo first used his telescope to study the Moon, Venus, Jupiter, and Saturn 400 years ago; his observations of depressions and mountains on the Moon, moons orbiting Jupiter, and the phases of Venus revolutionized our understanding of the solar system and Earth's place in it. Telescope optics have improved over time, allowing scientists to make more detailed observations of objects in the night sky.
*	Telescopes allowed astronomers to view the surfaces of planets. Now, scientists can learn about planets and moons by sending spacecraft to fly by or orbit them. Spacecraft instruments now allow us to infer information about the interiors of planets.
*	The Moon may appear "flipped" — as in a mirror image — through some kinds of telescopes.

## 3. Conclusion

Engage the participants in conversation about what they observed. What color was planet or star? Did they see any moons around other planets? If so, how were they arranged? Did the appearance of the planets surprise them? Which object was their favorite, and why?





# **Correlations to the Next Generation Science Standards**

## **Disciplinary Core Ideas**

#### ESS1.A The Universe and Its Stars

• Patterns of movement of the sun, moon, and stars as seen from Earth can be observed, described, and predicted.

#### ESS1.B: Earth and the Solar System

• The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them.

#### **PS4.B Electromagnetic Radiation**

• Object can be seen when light reflected from their surface enters our eyes.

#### The Nature of Science

#### **Scientific Investigations Use a Variety of Methods**

• Science investigations use a variety of methods and tools to make measurements and observations.

#### Scientific Knowledge is Based on Empirical Evidence

• Scientists use tools and technologies to make accurate measurements and observations.

#### Science is a Human Endeavor

- Science affects everyday life.
- Advances in technology influence the progress of science and science has influenced advances in technology.





# **Planet Party**



# **Brief Facilitation Guide**

Download the full activity guide at www.starnetlibraries.org

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- Provide information about the objects that are in view, as well as current and future missions to explore them.

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- Ask each child to put her hands behind her back when it's her turn to look through the telescope (which will reduce the chances of moving the telescope.)

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