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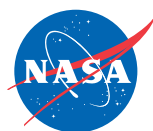
NASA STEM Facilitation Kit

Our Place in Space

NASA @
My Library

STAR★**net**

Science-Technology Activities &
Resources For Libraries



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Section 1:

Getting Started

The *NASA@ My Library* team is very excited about the release of its newest kit, called *Kit C: Our Place in Space*. Kit C was developed to supplement and thematically tie to the 2019 Summer Learning theme “A Universe of Stories.” This kit focuses on basic astronomy facts, constellations, cultural astronomy, and lunar science. NASA mission spotlights include Apollo 11, Mars Curiosity Rover, Mars Insight, and Juno. You should have already received your Orion telescope and telescope filter set. The Kit C binder includes many facilitation guides and other valuable resources such as ways to connect to NASA’s Night Sky Network and Solar System Ambassadors programs. I encourage you to take advantage of these NASA networks.

Don’t forget to actively participate in the STAR Library Network (*STAR Net*), a hands-on learning network for libraries and their communities across the country. *STAR Net* focuses on helping library professionals build their STEM skills by providing “science-technology activities and resources” (STAR) and training to use those resources. Take advantage of the many resources and opportunities available through *STAR Net* (www.starnetlibraries.org).

I also invite you to follow us on Facebook at www.facebook.com/STARLibraries/.

Thank you for your ongoing commitment to provide science programming for your community.

How to Use This Resource

Kit C was developed by *STAR Net's NASA@ My Library* team to assist library staff in facilitating programs around exciting NASA science mission topics. Kit C is titled "Our Place in Space", and focuses on activities and experiences that will support the 2019 Summer Learning theme "A Universe of Stories." Key concepts and themes in this kit include constellations, cultural astronomy, observational astronomy and space objects.

The binder is divided into 4 sections:

Section 1 contains a welcome letter, an inventory of all the items you'll need for this kit, and background information from NASA missions and the included kit activities.

Section 2 contains selected Activity Guides that describe how to use the materials in the Kit (such as "Exploring the Universe: Filtered Light") or ones that can be done with materials you already have lying around or can be purchased at low cost. Rather than printing copies of these low cost activities, we've included a full list of activities from our "Universe of Stories" collection in the *STEM Activity Clearinghouse*. Some Activity Guides were developed by external partners. These guides include a cover page that creates a consistent look and feel similar to the *STAR Net's* "Hands-on" activities in the *STEM Activity Clearinghouse*.

Section 3 includes "Quick Facilitation Guides" that will help staff be better prepared to use the STEM tools included in this kit (e.g., telescope, binoculars and planisphere). These guides provide a quick introduction on how to use these unique tools, which should help staff facilitate the activities in Section 2 or create their own unique programs (e.g., a NASA Saturday event).

Section 4 includes a list of suggested books in this kit, as well as suggestions for how to tie the books and activities together. You'll find a list of weblinks if you need to purchase additional items. This section also contains flyers that will help you connect to NASA's Night Sky Network and Solar System Ambassadors.

If you'd like to explore more hands-on activities around this and other content areas, please visit our *STEM Activity Clearinghouse* (<http://clearinghouse.starnetlibraries.org>).

Inventory Checklist

Activity Materials

Exploring the Universe: Filtered Light

- 36 color paddles
- 2 boxes of colored pencils
- Astronomical object sheets (in binder)

Pinwheel Galaxy Activity

- 6 paper punchers
- Chenille sticks
- Pinwheel galaxy printouts

STEM Tools

- 1 4.5" AstroBlast FunScope
 - Instruction manual
 - 20mm eyepiece and covers
 - 6mm eyepiece and covers
 - Red-dot finder scope
- 1 Celestron Cometron 7x50mm Binoculars
 - Instruction manual
 - 2 eyepiece caps
 - 2 optical lens caps
 - Lens cloth
 - Carrying bag with neck strap
- 1 Moon Filter
- 1 Planisphere
- 1 AstroDash Game (die, pawn pieces, cards)
- 1 Guess What? Game

Books

- *Understanding Small Worlds in the Solar System* (NASA)
- *All My Friends are Planets* (Alisha Vimawala)
- *Starry Skies* (Samantha Chagollan)
- *Journey to Constellation Station* (Lindsay C. Barry)
- *They Dance in the Sky* (Jean Guard Monroe and Ray A. Williamson)

NASA Mission Spotlight: Apollo 11



Credit: NASA

"The Eagle has landed..." The primary objective of **Apollo 11** was to complete a national goal set by President John F. Kennedy on May 25, 1961: perform a crewed lunar landing and return to Earth. Additional flight objectives included scientific exploration by the lunar module crew; deployment of a television camera to transmit signals to Earth; and deployment of a solar wind composition experiment, seismic experiment package and a Laser Ranging Retroreflector. During the exploration, the two astronauts gathered samples of lunar-surface materials for return to Earth. They also extensively photograph the lunar terrain, the deployed scientific equipment, the LM spacecraft, and each other, both with still and motion picture cameras.

Mission Website: <https://goo.gl/Q6XBLp>



On Jan. 9, 1969, NASA announced the prime crew of the Apollo 11 lunar landing mission. Later that year in July 1969, the crew launched to the Moon and into history. From left to right are lunar module pilot Buzz Aldrin; commander Neil Armstrong; and command module pilot Michael Collins. They were photographed in front of a lunar module mockup beside Building 1 at what is now Johnson Space Center.

Credit: NASA



Forty-nine years ago on July 20, 1969, humanity stepped foot on another celestial body. Mission Commander Neil Armstrong documented the lunar mission and snapped this image of Lunar Module Pilot Buzz Aldrin, as he carried the Passive Seismic Experiments Package (in his left hand) and the Laser Ranging Retroreflector (in his right) to the deployment area. These two experiments made up the Early Apollo Scientific Experiment Package. This photograph was taken at Tranquility Base in our Moon's Sea of Tranquility.

Credit: NASA

NASA Mission Spotlight: Juno



Credit: NASA

Juno is a NASA space probe orbiting the planet Jupiter. It was built by Lockheed Martin and is operated by NASA's Jet Propulsion Laboratory. The spacecraft was launched from Cape Canaveral Air Force Station on August 5, 2011, as part of the New Frontiers program, and entered a polar orbit of Jupiter on July 5, 2016, to begin a scientific investigation of the planet. After completing its mission, Juno will be intentionally deorbited into Jupiter's atmosphere.

Juno's mission is to measure Jupiter's composition, gravity field, magnetic field, and polar magnetosphere. It will also search for clues about how the planet formed, including whether it has a rocky core, the amount of water present within the deep atmosphere, mass distribution, and its deep winds, which can reach speeds up to 618 kilometers per hour (384 mph).

Mission Website: <https://goo.gl/1vnLLp>



Stormy Jupiter. This image captures the intensity of the jets and vortices in Jupiter's North North Temperate Belt.

NASA's Juno spacecraft took this color-enhanced image on May 23, 2018, as Juno performed its 13th close flyby of Jupiter. At the time, the spacecraft was about 4,900 miles (7,900 kilometers) from the tops of the clouds of the gas giant planet. Scientists think the large-scale dark regions are places where the clouds are deeper, based on infrared observations. Citizen scientist, Kevin M. Gill, created this image using data from the spacecraft's JunoCam imager.

Credit: NASA and Kevin M. Gill.

NASA Mission Spotlight: Curiosity Rover



Credit: NASA

Curiosity is a car-sized rover designed to explore Gale Crater on Mars as part of NASA's Mars Science Laboratory mission (MSL). Curiosity was launched from Cape Canaveral on November 26, 2011 aboard the MSL spacecraft and landed on Gale Crater on Mars on August 6, 2012. The Bradbury Landing site was less than 2.4 kilometers (1.5 miles) from the center of the rover's touchdown target after a 560 million kilometers (350 million miles) journey. The rover's goals include an investigation of the Martian climate and geology; assessment of whether the selected field site inside Gale Crater has ever offered environmental conditions favorable for microbial life, including investigation of the role of water; and planetary habitability studies in preparation for human exploration.

Curiosity's design will serve as the basis for the planned Mars 2020 rover.

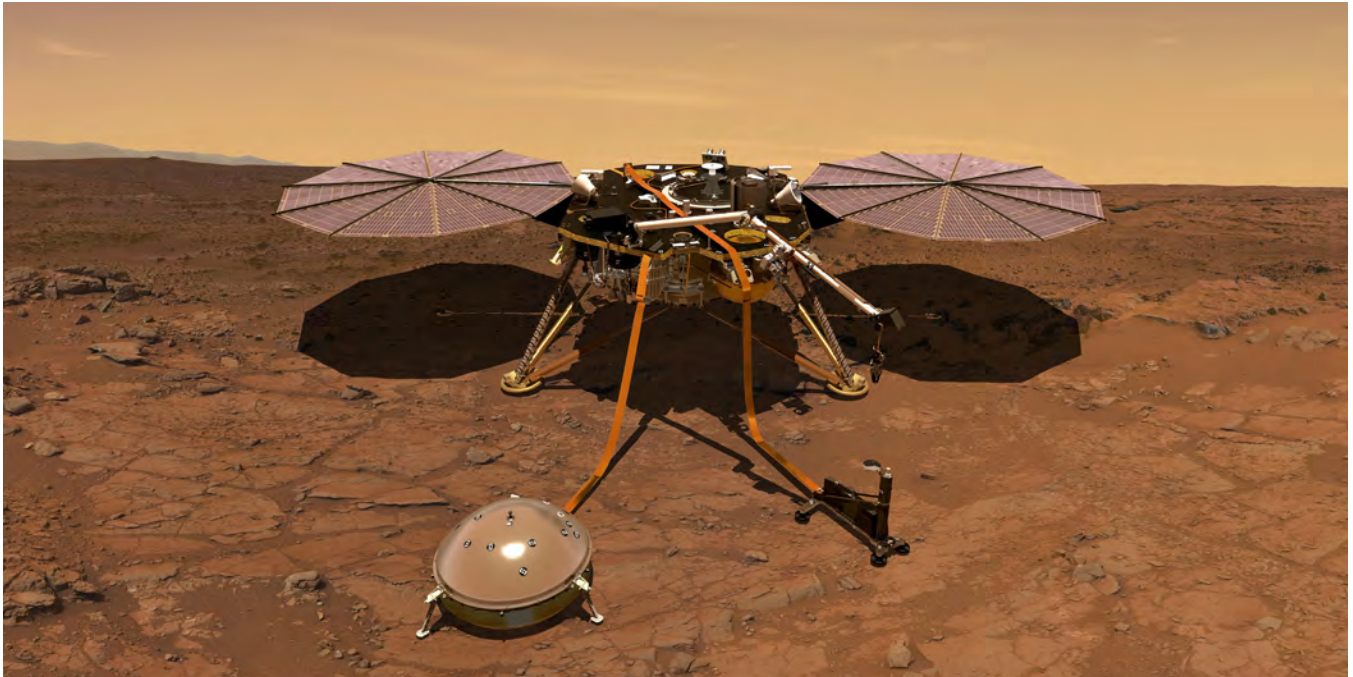
Mission Website: <https://goo.gl/2x26M3>



This composite image looking toward the higher regions of Mount Sharp was taken on September 9, 2015, by NASA's Curiosity rover. In the foreground – about 3 kilometers (2 miles) from the rover – is a long ridge teeming with hematite, an iron oxide. Just beyond is an undulating plain rich in clay minerals. And just beyond that are a multitude of rounded buttes, all high in sulfate minerals. The changing mineralogy in these layers of Mount Sharp suggests a changing environment in early Mars, though all involve exposure to water billions of years ago. The Curiosity team hopes to be able to explore these diverse areas in the months and years ahead. Further back in the image are striking, light-toned cliffs in rock that may have formed in drier times and now is heavily eroded by winds.

Credit: NASA/JPL-CALTECH

NASA Mission Spotlight: Mars InSight



Credit: NASA

InSight is a robotic lander designed to study the interior of the planet Mars. It was manufactured by Lockheed Martin Space Systems. The name is a backronym for Interior Exploration using Seismic Investigations, Geodesy and Heat Transport. The mission launched from Vandenberg Air Force Base on California's Pacific coast aboard a two-stage Atlas V launch vehicle on 5 May 2018 and is expected to land on the surface of Mars at Elysium Planitia on 26 November 2018, where it will deploy a seismometer and burrow a heat probe. It will also perform a radio science experiment to study the internal structure of Mars. InSight includes scientists from institutions in the U.S., France, Germany, Austria, Belgium, Canada, Japan, Switzerland, Spain and the United Kingdom.

InSight's objective is to place a stationary lander equipped with a seismometer and heat transfer probe on the surface of Mars to study the planet's early geological evolution. This could bring new understanding of the Solar System's terrestrial planets — Mercury, Venus, Earth, Mars — and Earth's Moon.

Mission Website: <https://goo.gl/A2dXV5>



The solar arrays on NASA's InSight lander are deployed in this test inside a clean room at Lockheed Martin Space Systems, Denver. This configuration is how the spacecraft will look on the surface of Mars. The image was taken on April 30, 2015.

Credit: NASA/JPL-CALTECH

Section 2:

Activity Guides

Activity Guide

Exploring the Universe: Filtered Light

In this activity patrons will learn more about the roles that filters play in observational astronomy, while also learning about some of the phenomena that become “invisible” without the appropriate filter. This activity can be easily adapted and modified into a station activity.



Credit: NASA, ESA, J. Hester, A. Loll (ASU)

Key Concepts

- Astronomers use different filters to aid in their study of objects in the sky

Build a Program with Related Resources

Combine this activity along with *Make a Pinwheel Galaxy*. Have patrons use different colored paddles to view their Pinwheel Galaxy creations!

This activity pairs well with a night sky viewing. It will help patrons understand that the tools that astronomers use to view the sky are quite different!

Some additional STEM Activity Clearinghouse activities that could be used in conjunction with this activity are *Art and the Cosmic Connection*, *A Matter of Perspective*, *Strange New Planet*, *Coloring the Universe*, and *Hide and Seek Moon*

Need more ideas? Visit our *STEM Activity Clearinghouse* (<http://clearinghouse.starnetlibraries.org>)



Add Your Review of This Activity

There are many STEM educational resources available to use in programs. We hope that you will give this activity a try! Then, **help others find the “best of the best” by writing a review** on the STEM Activity Clearinghouse. Email your favorite activities directly to a colleague!



Content Area – Astronomy and Space, Physics

Ages – Family, Pre-K, Early Elementary, Upper Elementary, Tweens, Teens

Activity Time – 10-20 minutes

Prep Time – 10-20 minutes

Difficulty Level – Medium

Mess Level – Low

Originating Source:
Exploring the Universe: Filtered Light was provided by the Science Museum of Minnesota with support from NASA

Quick Facilitation Guide

Exploring the Universe: Filtered Light

Astronomers use telescopes and other instruments to capture and filter different types of light – including those we can't see with our eyes, like x-rays and UV (ultraviolet) light. Begin exploring different types of light with young learners using the color paddles, puzzle, and Astronomical objects sheets provided in your kit. Use colored pencils to create a "hidden message" on a background and use the colored paddles to filter out certain colors and reveal others.

For further background information and an activity using alternative colored filters, as well as Spanish-language handouts, download Exploring the Universe: Filtered Light from <https://goo.gl/Q353YX>



Credit: NASA, ESA, J. Hester, A. Loll (ASU)

Key Concepts

- Astronomers use different filters to aid in their study of objects in the sky

Ages – Family, Pre-K, Early Elementary, Upper Elementary, Tweens, Teens

Activity Time – 10-20 minutes

Type of Program – Stations, Stand-alone activity, facilitated activity

Materials List – Astronomical objects sheets, colored paddles, colored pencils, white paper

Originating Source – The Science Museum of Minnesota with support from NASA

Simple Instructions

- 1) Start the conversation with patrons by introducing the term "filter."
 - a. "Where have you heard that word before?"
 - i. Likely answers will include water filtration – i.e., the water filter that they use at home!
 - b. Guide patrons, using examples that they are familiar with, to the idea that "filters help us block out things that we don't want."
 - c. Filters are often used for removing impurities from water and air. Filters can also be used for the things you see!
 - i. "Have you ever worn sunglasses? You were using a filter to block out certain light. That filter on your eyes makes seeing other things easier."

Simple Instructions

- 2) Introduce the idea that astronomers use filters on their telescopes to help them see certain objects better.
 - a. Astronomical images collected with different filters sometimes reveal surprising results!
 - i. (For older patrons)
 1. Some filters lessen the light, such as Sun and Moon filters
 2. Some filters select certain wavelengths of light or emissions from certain atoms
 3. Others “hide” certain parts of the object you’re observing, so you can see other features
 - b. Show patrons the images from the Astronomical object sheets.
 - c. Invite patrons to make observations about the images
 - i. “What do you think this image is?”
 - ii. “What colors do you see?”
 - d. Invite patrons to experiment by placing different colored paddles over the images.
 - i. “What part of the image changes?”
 - ii. “What parts of the image are easier to see? What parts are harder to see?”
 - iii. “Which colored paddles make the biggest changes?”- 3) Invite the patrons to use colored pencils to make their own secret messages, which they will then uncover using the colored paddles!
 - a. Patrons can start their experimentation by creating a “rainbow” of pencil streaks on a white sheet of paper. They can then use different colored paddles to see which colors the paddles highlight and which colors they block.
 - i. “Which paddle blocks red? Which paddle blocks blue?”
 - b. To create a secret message:
 - i. Pick out a colored paddle
 - ii. Pick out a colored pencil that can be seen through that specific paddle. Write your secret message with that pencil.
 - iii. Pick out a colored pencil that was blocked by that paddle. Scribble/shade all over your secret message with that colored pencil. Don’t fill it in completely solid, but try to make it as hard for someone to read as possible!
 - iv. Pass your secret message around to other patrons – let them experiment and discover which paddle reveals your message!

Connections to Other Kit Materials

Try using the colored paddles with any other astronomical images in Kit C, including the template from *Make a Pinwheel Galaxy*.

This activity is a great lead-in to a star party/night sky viewing. It will help patrons understand that astronomers use different types of filters on their telescopes!

Connections to Other STAR Net Activities

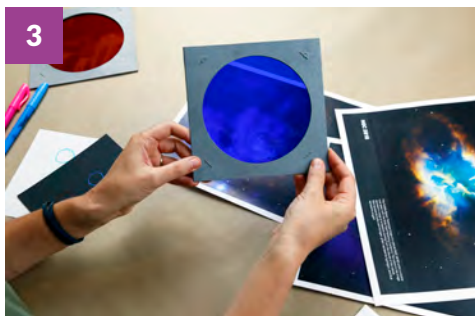
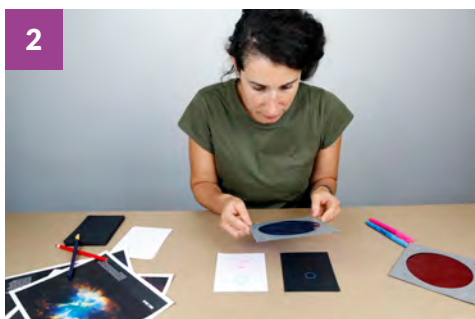
Please visit the *STEM Activity Clearinghouse* at www.clearinghouse.starnetlibraries.org and check out the “Space Science” collection to find great activities on constellations and other stellar objects!



EXPLORING THE UNIVERSE

Filtered Light

Try this!



Draw two small circles on the white piece of paper—one with the blue marker and one with the pink marker. Then draw similar circles on the black paper using the red and blue pencils.

Try using the blue and red colored filters to look at your circles. What happens when you look through one of the filters but not the other? Do any of the circles disappear? Do any appear brighter?

Use both filters, one at a time, to investigate the space image. Do some features stand out more if you look through the blue or red filter? Which filter shows you a clearer image? How could this tool be useful to space scientists?

Now try this! Draw your own picture on the white or black paper! Observe your drawings with the filters. What changes do you notice? Tip: Use the markers on the white paper and the pencils on the black paper!

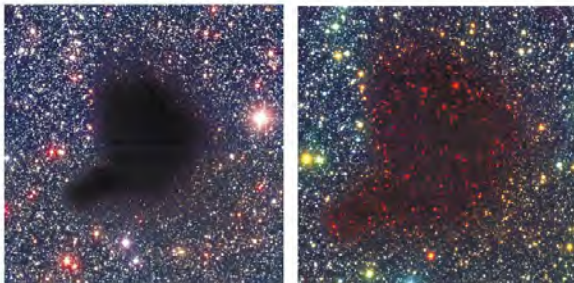
Astronomers use light from distant objects to make observations about the universe.

Filters block certain energy levels of light while allowing others to pass through. Different colors of visible light have different levels of energy, running from lower-energy red to higher-energy purple. In this activity, the red and blue colored filters changed how those colors appeared on the white paper versus the black paper, and highlighted different elements in the space pictures. When you hold up the red filter to your eye, only red light makes it through. Red light reflects off both the pink colored marker (pink is a lighter shade of red) and the white paper, because white contains all colors. The pink color disappears because it blends in with the red light from the white paper. But background color matters! Looking at the red pencil color against the black paper actually enhances the red color, because the filter blocks all the other energy levels of light (colors) reflected off the paper and improves the visibility of the red color.



Red, green, and blue visible light combine to make white light.

NASA scientists use telescopes and other instruments to capture and filter different energies of light. Objects in the universe radiate light across all these different energies—the full *electromagnetic spectrum*. We use a combination of tools, like telescopes and spectrometers, to make observations of radio, microwave, infrared, ultraviolet, X-ray, gamma ray, and visible light.



This dusty cloud appears dark in visible light, but looking in infrared light reveals stars shining through.

Astronomical images collected with different tools sometimes reveal surprising results. Scientists capture and filter light to study planets, moons, stars, galaxies, nebulae, and black holes, and even to learn more about the mysterious dark energy that makes up so much of space.



FACILITATOR GUIDE

Filtered Light

Learning objectives

- Astronomers use light from distant objects to make observations about the universe.
- Filters block certain energy levels of light while allowing others to pass through.
- NASA scientists use telescopes and other instruments to capture and filter different energies of light.

Materials

- Blue filters in cardboard holders
- Red filters in cardboard holders
- Pink and blue highlighters (Sharpie™ brand)
- Red and blue grease pencils (wax writing tools)
- White paper
- Black paper
- Space images
- Activity and facilitator guides
- Information sheets
- *Tips for Leading Hands-on Activities*

The Explore Science toolkit comes complete with all necessary materials for this activity. Materials are also readily available to create or restock activity kits. The red and blue Roscolux™ brand lighting gels work well as filters in this activity. To purchase or replace the filters, look for #80 Primary Blue and #26 Light Red. Graphic files can be downloaded from www.nisenet.org.

Notes to the presenter

The pink and blue circles on the white paper should mostly seem to disappear when covered by the red and blue filters because the colors of the circles are blending in with the same wavelengths of light reflecting off the white paper. On the black paper, the red pencil should actually appear to be enhanced by the red filter, and the blue pencil by the blue filter, because all the other wavelengths of light are blocked by the filter.

Because the word “light” has been used to describe light that our eyes can see (visible light), some scientists do not feel that it is accurate to use “light” for electromagnetic waves outside of the visible part of the spectrum. However, it can be useful to describe the rest of the electromagnetic spectrum in terms of light, or “light energy,” because it is a concept the public has experience with, so we use this term throughout this activity and related resources.

In addition to filters (filter wheels) many NASA telescopes use spectrometers and other instruments for breaking up and analyzing light.

Visitors love drawing their own pictures and exploring them with the filters. In fact, once they've started doing this they may not want to stop! If you find it difficult to bring this activity to an end, you might suggest that the participant add "one last piece" to their drawing, and then let someone else have a turn.

Young children, especially, may prefer to create a picture more elaborate than a simple circle even in the first step. After some drawing time, model how to look through the filters, and encourage the children to describe what they see by asking open-ended questions such as, "What changes when you look at your drawing through the red filter?" As appropriate, introduce the space images for viewing through the filters, but also allow children to focus on their own drawings if that is where they show the most interest.

Conversational prompts

You may find yourself with plenty of time to chat while the visitors draw and color. Try prompting some of these conversations:

- "Many types of light are invisible to our eyes. Can you think of anything from your life that's invisible? Tell me about it. Do you think it might produce light we can't see?"
- "Filtering light helps scientists focus on just one thing at a time when they are studying planets, galaxies, and other things in space. How do you help yourself focus on one thing? Do you have any tricks or tools that you use? (e.g., turning off the TV to do homework, meditation, counting sheep to fall asleep)"

Difficult concepts

Objects in space emit light from the full *electromagnetic spectrum*—not just the colors we can see with our eyes (visible light). Often, images of space include types of light outside the visible, such as X-ray, infrared, and ultraviolet light, that have been translated into visible colors by researchers so that we can see them and to make the images more useful. The real space images in this activity are good examples of this. Many of the colors that we see in these images represent other wavelengths of light. These representational-color images help scientists highlight and pay attention to certain features. We all need ways to focus! In this activity, we're exploring just the visible wavelengths of light with the filters and craft supplies because we can do this without specialized tools.

One way to talk about light is by wavelength, but another way to describe it is by its energy. Visible light ranges from red to blue (or purple/violet) and red light has lower energy than blue light. Given that hot water is often indicated with red writing and cold water is often indicated with blue writing, you might expect red light to have more energy than blue light. However, the opposite is true! Bluer stars are hotter than redder stars.

Staff training resources

Refer to the *Tips for Leading Hands-on Activities* sheet in your activity materials.

- An activity training video is available at vimeo.com/245834788
- A content training video is available at vimeo.com/245835335
- The NISE Network has a curated list of programs, media, and professional development resources in the NASA Wavelength Digital Library that directly relate to the toolkit. These resources can be viewed and downloaded from nasawavelength.org/users/nisenet.

Credits and rights

This is a classic activity and was adapted from several sources including the educator guide, *Rose-Colored Glasses*, developed by NASA eClips. Retrieved from:

https://solarsystem.nasa.gov/moon/docs/Rose_Colored_Glasses_Guide_Lites.pdf

Visible vs infrared light courtesy ESO / M. Kornmesser.

Image of NGC604 courtesy X-ray: NASA/CXC/CfA/R. Tuellmann et al.; Optical: NASA/AURA/STScI.

Image of Phoenix Galaxy Cluster courtesy X-ray: NASA/CXC/MIT/M.McDonald et al; Optical: NASA/STScI; Radio: TIFR/GMRT.

Image of NGC 2818 courtesy NASA, ESA, and the Hubble Heritage Team (STScI/AURA).

Image of Hubble Space Telescope courtesy NASA's Goddard Space Flight Center.

Image of NGC 1512 courtesy NASA, ESA, and D. Maoz (Tel-Aviv University and Columbia University).

Electromagnetic spectrum graphic courtesy High Energy Astrophysics Science Archive Research Center (HEASARC) at NASA's Goddard Space Flight Center.

Pencil in infrared graphic courtesy NASA/ JPL-Caltech.

Image of *red, green, and blue light mixing* courtesy licensed under Creative Commons Attribution-Share Alike 3.0 Unported http://en.wikipedia.org/wiki/Image:RGB_illumination.jpg



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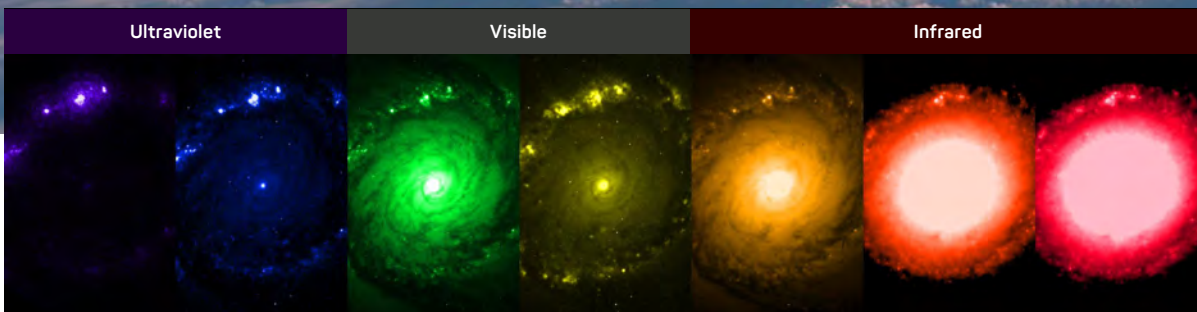
This material is based upon work supported by NASA under cooperative agreement award number NNX16AC67A. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the view of the National Aeronautics and Space Administration (NASA).

Hubble Space Telescope Images

This Earth-orbiting telescope returns detailed images of the universe in more colors than the human eye has ever seen!

The Hubble Space Telescope collects images in ultraviolet, visible, and infrared light.

LEARN MORE:
hubblesite.org/images/gallery



This galaxy, called NGC 1512, looks different depending on which wavelength of light is used to observe it.

The Hubble Space Telescope has a variety of filters and other specialized instruments that allow scientists to make images of objects by collecting light and energy in different wavelengths. Different wavelengths reveal different information. Heat emitted by dust and certain stars glows infrared, hotter stars glow in light our eyes can see (visible light), and the hottest stars glow in ultraviolet. Scientists can combine images of multiple wavelengths to make more detailed representations of stars, galaxies, or particular regions of space.

NGC604



This image combines data from the Chandra X-ray Observatory (colored blue) with optical light data from the Hubble Space Telescope (in red and green) to show a region of star formation in the nearby M33 galaxy.

Phoenix Galaxy Cluster



Composite observations, like this image of the Phoenix Galaxy Cluster in X-ray, ultraviolet, and optical wavelengths of light energy, help astronomers learn more about this massive cosmic structure. Scientists created this image with data from NASA's Chandra X-ray Observatory, the Hubble Space Telescope, and the Magellan II telescope located in Chile.



NGC 2818

This Hubble Space Telescope image of a nebula (NGC 2818) within a cluster was taken with the Wide Field Planetary Camera 2. The colors in the image represent a range of emissions coming from the clouds of the nebula. Red represents sulfur and nitrogen, green represents hydrogen, and blue represents oxygen.

Activity Guide

Planet Party

Patrons 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.

Key Concepts

- 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.
- Telescopes are scientific tools.

Build a Program with Related Resources

Audiences will be amazed at what they can see with a telescope and binoculars, which magnify small objects, especially once they learn about how to view the night sky. Start with a planisphere or use the Night Sky Planner (<https://goo.gl/wxBikQ>) to come up with a viewing plan before going outside with a telescope or binoculars at night. A viewing plan will help participants easily locate objects in the sky so that they can then use these scientific instruments to view them. Also, know in which direction you are looking or bring a compass to the Planet Party.

Get to know the telescope and binoculars you are going to use before going out at night too. See the Quick Facilitation Guides on the telescope, binoculars, and planisphere in this guide.

Loony Lunar Phases, *Pocket Solar System*, and *Art and the Cosmic Connection* are the other hands-on space science activities included in this kit that can help audiences gain a better understanding of our Moon and Solar System. Science models and art help hone observation skills.

Some additional STEM Activity Clearinghouse activities that use tools to help us expand our senses are *Blind Mice Go To Pluto*, *What Do You See in Today's Moon?*, and *Constellation Detective*.

Need more ideas? Visit our *STEM Activity Clearinghouse* (<http://clearinghouse.starnetlibraries.org>)



Add Your Review of This Activity

There are many STEM educational resources available to use in programs. We hope that you will give this activity a try! Then, **help others find the "best of the best"** by writing a **review** on the STEM Activity Clearinghouse. Email your favorite activities directly to a colleague!



Credit: Wiki Commons

Content Area – Astronomy and Space, Physics and Engineering

Ages – Family, Tweens, Teens and Adults

Activity Time – 20-40 minutes

Prep Time – 20-40 minutes

Difficulty Level – Medium

Mess Level – Low

Materials List – Binoculars, telescope, flashlight, night sky map or moon map

Originating Source:

Planet Party was developed by the Lunar and Planetary Institute and is part of the *STAR Net* portfolio of field-tested activities developed for public library programs.



Hands-on **STAR**net

Tested & Approved STEM Activities

Planet Party

Activity Guide



Science-Technology Activities &
Resources For Libraries

A product of the Science-Technology Activities and Resources for Libraries (STAR_Net) program.
Visit our website at www.starnetlibraries.org for more information on our educational programs.
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Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors
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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.

Materials





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 centuries-old 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: [An Earth-based Tour of the Moon](#) and/or [Skywatcher's Guide to the Moon](#).

Monthly [sky charts](#) or simple [sky wheels](#) 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: <http://cosmoquest.org/x/365daysofastronomy/>

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

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: <http://eyes.jpl.nasa.gov>

Moon Mappers (Planet Mappers, Moon Edition): Citizen science project mapping craters on the Moon: http://cosmoquest.org/?application=simply_craters

Supporting Resources (continued)

Handouts:

- [Our Solar System](#) lithographs (NASA educational product number LS-2013-07-003-HQ)
- Monthly [sky charts](#) or simple [sky wheels](#)
- [An Earth-based Tour of the Moon](#)
- [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:


- ✎ If possible, incorporate additional science, technology, engineering, art, and mathematics (STEAM) activities into the event. See the STAR_Net resources listed at www.starnetlibraries.org for ideas.
- ✎ Prepare and distribute publicity materials for programs based on this event.
- ✎ Pull supporting resources out of circulation to feature during the program.
- ✎ 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. [SunriseSunset](#) and [Stellarium](#) provide sun set times for your location far in advance.
 - Optional: Contact your local astronomy club or other amateur astronomers. The [Astronomical League](#), [Sky and Telescope](#), and [NASA Night Sky Network](#) 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.
- ✎ 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. [SunriseSunset](#) and [Stellarium](#) 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 [Tonight's Sky](#).

 **International Space Station (ISS):** Use “Spot the Station” (<https://spotthestation.nasa.gov>), 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.

Activity






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 open-ended 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.
-  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.

Brief Facilitation Guide

Download the full activity guide at www.starnetlibraries.org

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- Invite the visitors to talk about what they already know about the Moon, planets, and stars. Use open-ended 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 the 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.
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Activity Guide

Pinwheel Galaxy

In this fun STEAM activity, patrons will create their own pinwheel using an image of the Pinwheel Galaxy, a real galaxy in our universe! This activity works great as a station activity, or a quick stand alone activity.



Credit: NASA Space Place

Key Concepts

- Constellations (and other sky pictures called asterisms) are the building blocks of astronomy across many cultures
- Scientists use models to explore objects and processes in our Solar System and beyond

Build a Program with Related Resources

This quick and easy craft can be done in conjunction with a Night Sky Viewing! Utilize the *STAR Net* Partnerships page (<https://goo.gl/UBcqK9>) to learn how you can bring a local astronomy club to your library.

Alternatively, you can use an online sky finder application (such as Sky Map or Star Walk 2) to look for galaxies in a virtual night sky! Use the color paddles and concepts from *Exploring the Universe: Filtered Light* to view the Pinwheel Galaxy Pinwheel Blueprint – how does it look different?

Looking for other fun, space-science crafts? Search the STEM Activity Clearinghouse for the following activities: *Make a CD Saturn*, *Make a Sundial*, *Make a Star Finder*, and *Big Dipper Star Clock*.

Need more ideas? Visit our *STEM Activity Clearinghouse* (<http://clearinghouse.starnetlibraries.org>)



Add Your Review of This Activity

There are many STEM educational resources available to use in programs. We hope that you will give this activity a try! Then, **help others find the “best of the best”** by writing a **review** on the STEM Activity Clearinghouse. Email your favorite activities directly to a colleague!



Content Area – Astronomy and Space

Ages – Family, Early Elementary, Upper Elementary

Activity Time – 10-20 minutes

Prep Time – Under 5 minutes

Difficulty Level – Easy

Mess Level – Low

Materials List – Pinwheel Galaxy printout, Chenille stems, chopstick or popsicle stick, scissors, single hole puncher

Originating Source:

Pinwheel Galaxy was adapted by American Girl from an existing NASA activity.

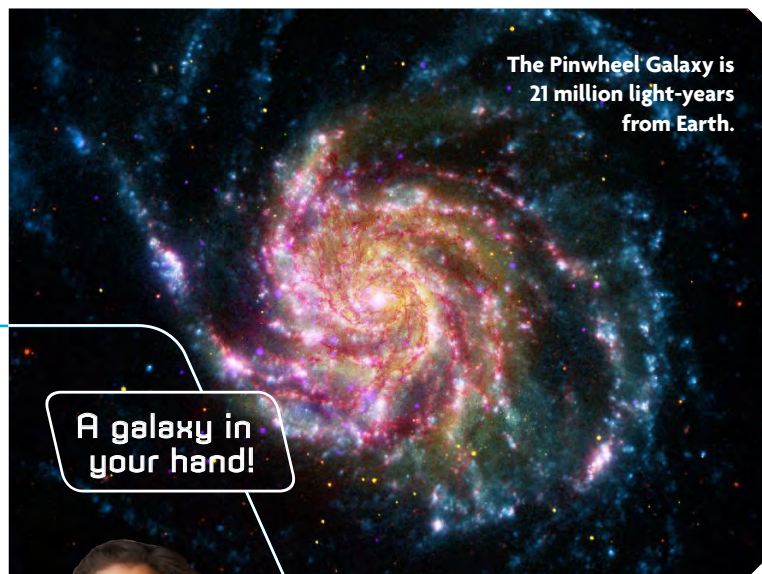
MAKE A PINWHEEL starring the Pinwheel Galaxy

Where are you? If you were to make a map of your location, what would you put on your map?

You're in a **state**, which is in a **country**, which is on a **planet**.

But keep going! Your planet (Earth) is in a **solar system**, which is inside a **galaxy** called the Milky Way—just one of the trillions of galaxies in the **universe**. It's amazing to think about how massive the universe is!

Now you can hold a little part of our big universe in your hands by making your own version of a spiral galaxy called the Pinwheel Galaxy.



The Pinwheel Galaxy is 21 million light-years from Earth.

A galaxy in your hand!



What You'll Need

- ★ Pinwheel Galaxy printout (next two pages)
- ★ Chenille stems
- ★ Chopstick or Popsicle stick
- ★ Scissors
- ★ Single hole puncher

Get even more excited about space with **Luciana** by Erin Teagan at [scholastic.com/american-girl](https://www.scholastic.com/american-girl).

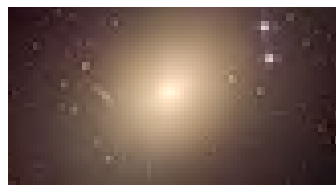


More About Galaxies

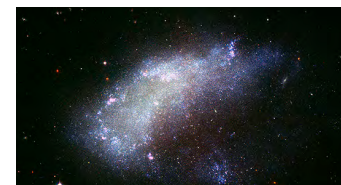
A galaxy is a huge collection of gas, dust, and billions of stars. Galaxies are held together by gravity. Check out the three types of galaxies.



Spiral galaxies have curved “arms” that make them look like a pinwheel.



Elliptical galaxies are smooth and shaped like ovals (elliptical means oval).



Irregular galaxies have—you guessed it—irregular shapes.

Your Pinwheel Galaxy Pinwheel Blueprint

1

Cut out the hexagonal shape for your Galaxy Pinwheel.

2

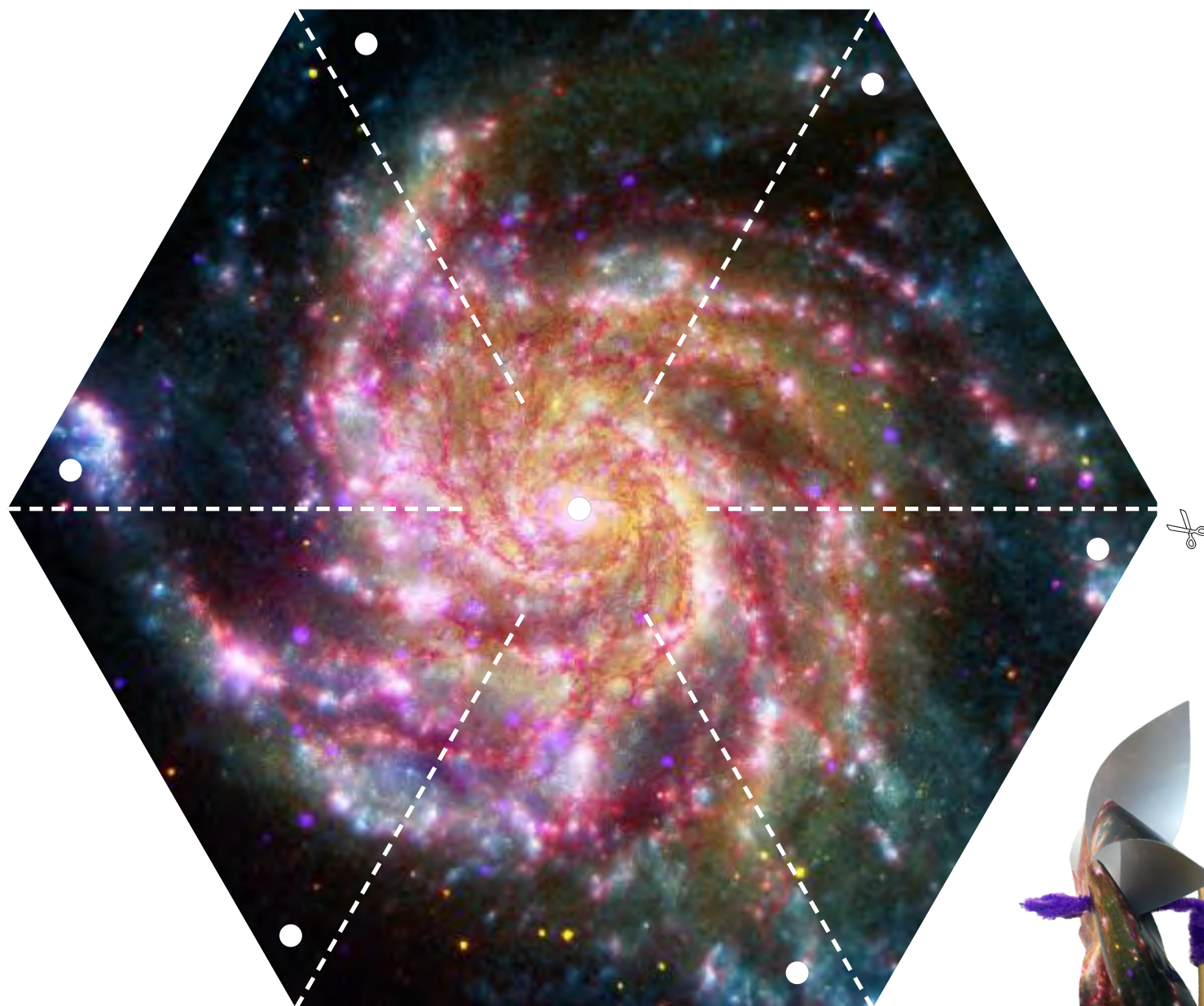
Cut along the dotted white lines.

3

Punch holes in the white circles: six around the edges and one in the center.

4

Turn the paper so it's facedown.



5

Thread a chenille stem through the center hole. Be careful in case there are sharp edges.

6

Going around the circle, fold each flap so the chenille stem goes through each hole.

7

Tie a knot in the chenille stem at the front of the pinwheel.

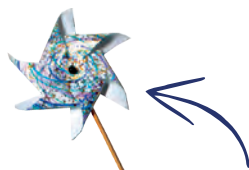
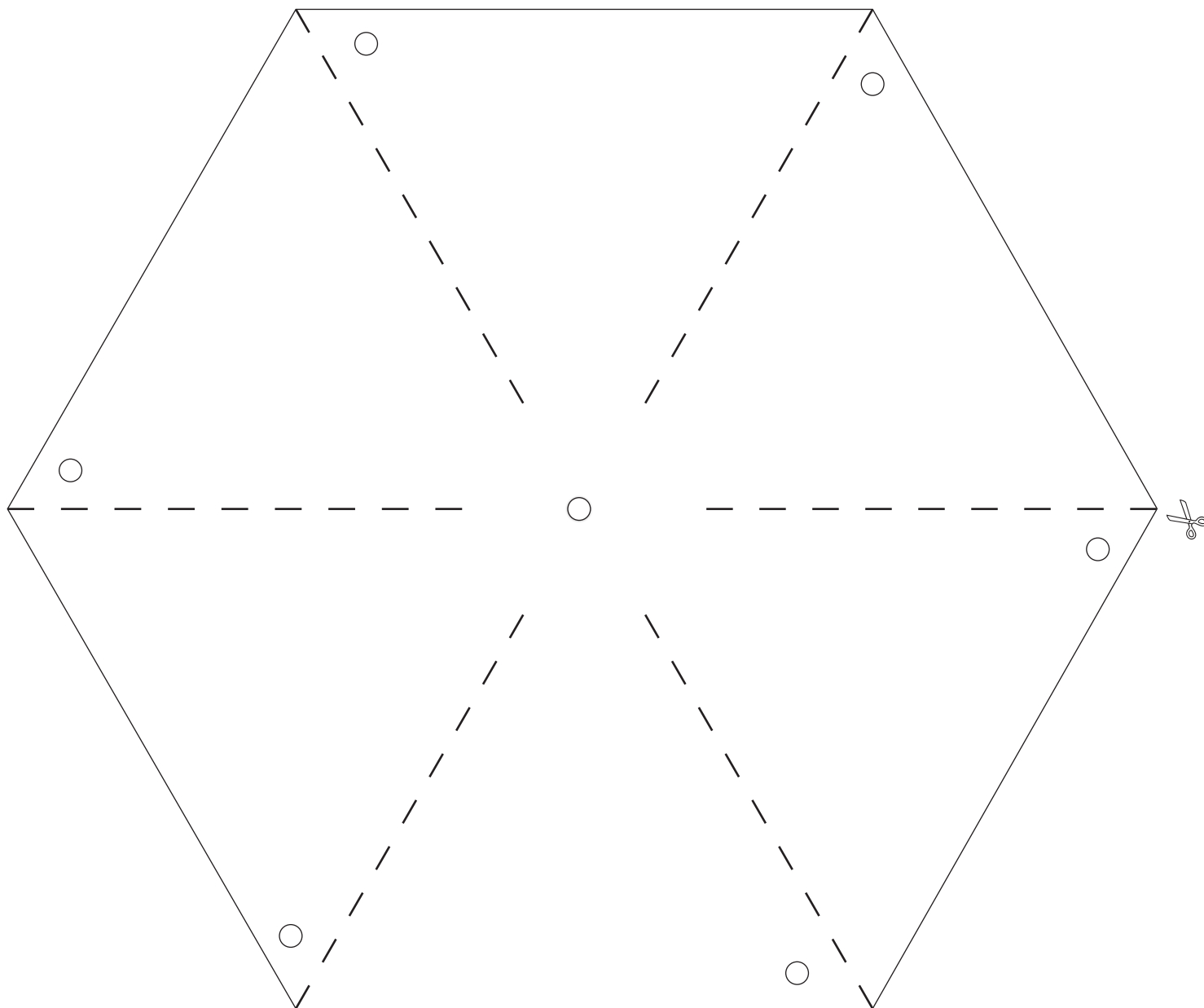
8

Wrap the other end of the chenille stem around the stick. Leave space between the pinwheel and the stick.



Design Your Own Spiral Galaxy!

Use your imagination along with markers, colored pencils, or crayons to draw your own galaxy on the template below. Then follow the directions on the previous page to assemble it.



MAKE YOUR STARS REALLY SHINE BY
ADDING GLITTER TO YOUR PINWHEEL!

Find out more
about space
at [nasa.gov](https://nasa.gov/kidsclub)
[/kidsclub](https://nasa.gov/kidsclub).

"A Universe of Stories" Collection

The following list contains activities in the STEM Activity Clearinghouse that are relevant to the 2019 Summer Learning theme "A Universe of Stories". These activities are of course timeless, and can be conducted whenever the desire strikes, but they were added to the binder to provide an idea of the great breadth and depth of material available to support your Summer Learning programs. Enjoy!

Blind Mice Go to Pluto

Students view a strange new planet in our Milky Way Galaxy to determine what it is like.

<https://goo.gl/yDzPSJ>

Improv with the Stars!

After learning about four stellar classifications and the characteristics of stars, groups of students act out an improvisation of a personification of the four stars while the audience has to guess which star type is which.

<https://goo.gl/jCC2Qt>

Playdough Planets

Patrons create rocky planets out of play dough, and then learn about distances in our Solar System by placing them the correct distance apart.

<https://goo.gl/Zw4NEd>

Mars Match Game

Patrons view images of Earth and Mars to compare features, just like a scientist (planetary geologist) would. After matching pairs of Earth features with Mars analogues, they discuss why they matched the pairs together.

<https://goo.gl/6bgD6H>

Planet Party

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.

<https://goo.gl/XTHGdy>

Recipe for a Comet

Create a "comet" using dry ice and household ingredients and use (optional) tools to observe how it models the features of a real comet.

<https://goo.gl/BCvum3>

Build a Space Colony

Participants design technology to provide air to breathe, plentiful food, shielding from ultraviolet light, power, and more for space explorers.

<https://goo.gl/Jgepbj>

Jump to Jupiter

Participants jump through a course from the grapefruit-sized "Sun," past poppy-seed-sized "Earth," and on to marble-sized "Jupiter" — and beyond!

<https://goo.gl/Y5K2vZ>

"A Universe of Stories" Collection

Strange New Planet

In this simulation of space exploration, participants plan and carry out five missions to a "planet" and communicate their discoveries to their family or a friend.

<https://goo.gl/WiXUod>

Trip to Mars

Participants play a game that steps through a human mission to Mars, to learn about the variety of people on the ground supporting missions, and the factors that can affect a mission outcome.

<https://goo.gl/3iLDx5>

Find Micrometeorites

To introduce meteorites and reinforce the composition of the solar system; to encourage student interest in space.

<https://goo.gl/SFWMbE>

Kinesthetic Astronomy

Modern everyday association with time involves watches, clocks, and calendars instead of the astronomical motions that were the original bases for time keeping.

<https://goo.gl/5o88LQ>

Big Sun, Small Moon?

If you've ever seen a picture of a solar eclipse, you may have noticed that the Moon comes very close to covering the entire Sun.

<https://goo.gl/quWeP8>

Scale Model of Sun and Earth

In this activity, participants use scaled cut-out models of the Sun and Earth to learn about the difference in size and distance between the two celestial bodies.

<https://goo.gl/XuRCvE>

How Can the Little Moon Hide the Giant Sun?

This is an activity exploring the concept that distance affects how we perceive an object's size, specifically pertaining to the size of the Sun and the Moon as seen from Earth.

<https://goo.gl/EM8Pgf>

Sorting Games: How Big? How Far? How Hot?

This NASA@ My Library Activity Guide will help library staff facilitate these sorting activities in large or small groups, with patrons from Pre-K to adult.

<https://goo.gl/kJjPN8>

Moon Mythbusters

This is an activity about the Moon's influence on Earth.

<https://goo.gl/Qoshgb>

"A Universe of Stories" Collection

Penny Moon

This is an activity about the rotation of the Moon. Learners use a penny and a quarter to model that the Moon does indeed spin on its axis as it orbits the Earth.

<https://goo.gl/AYHQWU>

Teen Moon: Moon Ooze!

Learners model how the Moon's volcanic period reshaped its earlier features.

<https://goo.gl/1z4Ktq>

Lunar Phases: A Dance Under the Sun

Learners use a Styrofoam ball, sunlight, and the motions of their bodies to model the Moon's phases outdoors.

<https://goo.gl/D2mScz>

Loony Lunar Phases

Learners hear a story, song, or (silly or serious) poem that celebrates the Moon's different phases.

<https://goo.gl/9LXD6G>

Growing Up Moon

Learners will visit a sequence of stations to discover how the dark and light areas and craters we see on the Moon's face today record major events of its lifetime.

<https://goo.gl/CmonpF>

What Do You See in Today's Moon

Learners read or listen to a cultural story describing a shape identified in the Moon's surface features.

<https://goo.gl/mCVSFr>

Moon in Action

Learners go outside on a clear evening and view the sky to see the Moon for themselves.

<https://goo.gl/xfCeIU>

Moon Over My Town

In this activity, community members of all ages are invited to contribute photographs — taken with cell phones, film cameras, or more sophisticated equipment — of the Moon.

<https://goo.gl/Ny6YWx>

Dance of the Moon and Oceans

This is an activity about the tides. Learners discover how the Moon's gravitational pull causes the level of the ocean to rise and fall twice a day along most coastlines.

<https://goo.gl/z47PF3>

Crater Creations

This is an activity about impact craters. Learners will experiment to create impact craters and examine the associated features.

<https://goo.gl/VvdaRA>

"A Universe of Stories" Collection

Lunar Surface

In this activity, learners will make a model of the Moon's surface and to consider the geologic processes and rocks of each area.

<https://goo.gl/YQxTRD>

Future Moon: The Footsteps of Explorers

Learners model how impacts throughout the Moon's history have broken rocks down into a mixture of dust, rocks, and boulders that covers the lunar surface.

<https://goo.gl/X3UXqk>

Build a Moon Habitat

Astronauts on the Moon must have homes that protect them like no home on Earth would ever need to do. Teams of participants roll sheets of newspaper to create "logs," which are stapled together to frame a "habitat" and "airlock." The structure is covered with a bedsheet and decorated with the NASA logo.

<https://goo.gl/ZAsjHW>

Coloring the Universe

Participants use pencilcode.net to undertake a series of simple programming exercises, including recoloring images of scenes, everyday objects, and finally, a supernova and a region where stars are forming.

<https://goo.gl/qFwuPL>

Nuclear Fusion in Stars

This simple and engaging activity explains nuclear fusion and how radiation is generated by stars, using marshmallows as a model.

<https://goo.gl/NtZBHM>

How Do We Find Planets Around Other Stars?

Discover the techniques scientists use to find planets orbiting distant stars: use a foam ball, a toothpick, and a small ball of clay.

<https://goo.gl/9qVxpg>

How to Build a Galaxy

Use craft materials -- and 3D printed models of astronomical models -- to model our Milky Way galaxy.

<https://goo.gl/zbTLw6>

Why Do Eclipses Happen?

Using simple materials, participants explore the vast distance between the Earth and Moon and model how solar and lunar eclipses happen.

<https://goo.gl/ZcZVvM>

Art and the Cosmic Connection

Using NASA imagery, participants use images as inspiration for artwork while learning about geology of planetary bodies and moons.

<https://goo.gl/YNNHQb>

"A Universe of Stories" Collection

Dunking the Planets

Participants place scale models of the planets, represented by fruit and other foods, in water to determine their density.

<https://goo.gl/ugNwTX>

Eclipse Chalk Art

Use a circular template and chalk to create your very own eclipse art!

<https://goo.gl/sCNkcs>

Solar System Bead Activity

Participants calculate and construct a scale model of the solar system using beads and string.

<https://goo.gl/DNSPHh>

Make a CD Saturn

Everyone loves Saturn! This craft uses unwanted CDs or DVDs and a styrofoam ball to make a model of the planet.

<https://goo.gl/S5RZD2>

Neato-Magneto Planets

Participants study magnetic fields at four separate stations: examining magnetic fields generated by everyday items, mapping out a magnetic field using a compass, creating models of Earth's and Jupiter's magnetic fields, and observing aurora produced by magnetic fields on both planets.

<https://goo.gl/kcxaHo>

See the Light

Explore light and color in Earth's atmosphere with a simple hands-on investigation using a prism, glue stick, and pen light.

<https://goo.gl/wSfts8>

Recipe for a Moon

Patrons use common food items to model the interiors of the Moon and Earth.

<https://goo.gl/4njDkd>

Recipe for a Planet

Patrons build edible models of Earth and Mars to compare their sizes, internal layers, and surface features.

<https://goo.gl/FmoXGv>

Space Place Loopy Legends

Patrons author their very own story about a zany space adventure!

<https://goo.gl/N4D4Py>

UV Kid

In this activity, children use common craft materials and ultraviolet (UV)-sensitive beads to construct a person (or dog or imaginary creature).

<https://goo.gl/w5MXzH>

"A Universe of Stories" Collection

UV Bead Bracelet Experiments

Participants make bracelets using UV beads to learn about ultraviolet light.

<https://goo.gl/9e9cnw>

Investigating the Insides

Investigate the composition of unseen materials, using a variety of tools, as an analogy to how scientists discover clues about the interiors of planets using spacecraft.

<https://goo.gl/BsknMS>

Mars Engineering

Mars is a good candidate for finding past and/or present life beyond Earth. Groups of participants design Mars rovers that could search for the building blocks of life in martian rocks and build model rovers out of everyday materials.

<https://goo.gl/WHZU94>

Gaining Traction on Mars

Groups of participants create and test various wheel designs and materials on a test vehicle to determine which are most effective on a simulated Martian surface.

<https://goo.gl/ovTpFu>

Life on Mars? Nurturing Life

A garden can be a reminder of life's needs and our connection to the planet we call home. Children consider the requirements of living things and compare the surface conditions on Mars to those found on Earth as they plant gardens. Gardening tips and options for indoors and outdoors are provided.

<https://goo.gl/AAEDDZ>

Tour the Moon or Mars with Google Earth

Patrons use Google Earth computer software to observe the geography of their own area. They then virtually-visit the same latitude and longitude on the Moon and Mars!

<https://goo.gl/88XcXt>

Mars Skits: How's the Weather on Mars?

Literacy and space science - together at last! Participants write and act out a brief (30-60 second) skit about the weather at a fictitious settlement on Mars. Use a green filming backdrop and Space Stage app to capture videos of the skits—using real images of Mars as a backdrop!

<https://goo.gl/PFNRyA>

Mars Skits: Mars Adventure Travel Corporation

Literacy and space science - together at last! Participants write a script and act out a 30-60 second commercial convincing tourists to come to Mars for a visit. Use a green filming backdrop and Space Stage app to capture videos of the skits – using real images of Mars as the backdrop!

<https://goo.gl/6BsXmp>

"A Universe of Stories" Collection

Balloon Rockets

Children are "rocket scientists" as they test their ideas relating to physical forces and launch simple balloon-powered straw "rockets."

<https://goo.gl/1P1aRv>

Balloon Rockets

Patrons use balloons, fishing line, and straws to learn about thrust and aerodynamics! You don't need to be a "rocket scientist" to facilitate this activity, but your patrons will sure feel like one!

<https://goo.gl/XE7VmX>

Binary Bead Craft: Pin Version

Write your initials in binary code to create beaded pins.

<https://goo.gl/fggsFs>

Binary Bead Craft: Bracelet Version

Write your own name or nickname in binary code using beads on a bracelet.

<https://goo.gl/SdTjZ4>

Mars Rovers

Players acting as "Mission Control" and a "Rover" must work together to navigate a large obstacle course.

<https://goo.gl/FwTctZ>

Filtered Light

Use colored filters with art supplies like astromers use filters to study the universe.

<https://goo.gl/pNvX9g>

Hide and Seek Moon

Binoculars and a hidden object Moon poster let young participants discover how some tools can make distant objects appear closer and brighter. They also learn about how cultures around the world have viewed the Moon through books (and online pre-recorded cultural stories).

<https://goo.gl/njckRE>

Objects in Motion

Participants in this activity use "orbiting" clay balls to make simple, functioning models of interacting objects in space.

<https://goo.gl/Fb5wnj>

Ice Orbs

Participants investigate a frozen sphere, trying to learn about objects hidden inside and comparing that process to how planetary scientists at NASA investigate "icy worlds."

<https://goo.gl/T9TYFb>

"A Universe of Stories" Collection

Make Your Own Planetarium

In this activity, patrons will learn how ancient people related to constellations and asterisms, then use their imagination to create a star pattern and accompanying story. Library staff can have patrons draw their designs on paper or make an inflatable planetarium, in which patrons will poke out their star constellations.

<https://goo.gl/BVQJVB>

Solar System in My Neighborhood

Patrons shrink the scale of the vast solar system to the size of their neighborhood. They then compare the relative sizes of scale models of the planets, two dwarf planets, and a comet as represented by fruits and other foods.

<https://goo.gl/9xqe58>

Constellation Detectives

This simple paper-based activity guides learners in identifying constellations such as Orion, the Big Dipper, and more.

<https://goo.gl/mTQh5w>

SciGirls Star Power

In this maker activity, participants use a showbox, constellation template, and flashlight to shine a star pattern on a wall. An additional maker project demonstrates the importance of reducing light pollution.

<https://goo.gl/9BMZcH>

Big Dipper Star Clock

Participants create a "star clock" that they can take home and use to tell the time from the position of the Big Dipper in the night sky.

<https://goo.gl/Ad7VQd>

Train Like an Astronaut

In this suite of physical activities, patrons utilize the same body parts/systems as astronauts do in training and on missions in space. The activities may be used by individual students or delivered to an audience of students by educators

<https://goo.gl/bfvigz>

Let's Make a Supernova!

Participants imagine themselves inside a large star at the end of its life, just as it is about to go supernova. Learn what happens in the core of a star when it runs out of fuel. This is a very active, engaging activity that your audience will remember.

<https://goo.gl/4gGNQk>

Soda Straw Rockets

Patrons practice the engineering design process by creating paper rockets that can be launched from a soda straw. They then test, redesign, and do it again!

<https://goo.gl/s4EPSA>

"A Universe of Stories" Collection

Make a Sundial

Participants explore the relationship between the size and position of shadows and the position of the sun. They make sundials to use outdoors. (Sundial handouts can be found on page 35 and 36 of the PDF.)

<https://goo.gl/UzYzHa>

Soft Landing Challenge

Patrons use craft sticks, balloons, and rubber bands to design an airbag system that can safely land a dropped egg.

<https://goo.gl/mrhtXM>

Roving on the Moon

Patrons use the engineering design process to build rubber-band-powered rovers out of cardboard.

<https://goo.gl/jBkT8h>

Make a Star Finder

Patrons make an origami "fortune teller" from a template that helps them learn their way around the night sky by finding constellations

<https://goo.gl/tUym3C>

Eggstronaut Drop

In this classic activity, patrons engineer a space capsule that will protect an egg that is dropped from a specific height.

<https://goo.gl/eVXJnq>

Make a Pinwheel Galaxy

Patrons design, cut-out, and assemble their own Pinwheel Galaxy

<https://goo.gl/piyHaz>

Jumping on Other Planets

Participants use math to figure out how high (or low) they could jump on another planet!

<https://goo.gl/v8mUoH>

Building and Launching a Rocket

Patrons use the engineering design process to make paper rockets. They then modify the rocket's fins to see how it affects their flight!

<https://goo.gl/V4A1Ad>

Section 3:

Quick Facilitation Guides

Quick Facilitation Guide

Using Your Telescope

The 4.5 inch AstroBlast Telescope by Orion is an engaging tool that provides a great introduction to the world of astronomy and magnification. Used as part of an indoor activity during the day or for a nighttime viewing event, this telescope is powerful enough to magnify objects that are very far away and provides hours of fun for all age levels and interests (not for solar viewing). The telescope is ready to use with only a few minutes of set-up.



Credit: Space Science Institute

Key Concepts

- Our Solar System is home to many unique objects that orbit the Sun
- Constellations are the building blocks of astronomy across many cultures
- Astronomers use different filters to aid in their study of objects in the sky

Setup Hints

NOTE: THIS TELESCOPE IS NOT SET UP FOR SOLAR VIEWING AND NO SOLAR FILTER IS PROVIDED! DO NOT LOOK AT THE SUN.

- Review included Instruction Manual before set-up and use.
- Unpack the telescope and accessories to make sure all the parts are available (notice how they are packed so that they can be easily repacked for shipping). See the Materials List to the right.
- Always set-up and use the telescope on a sturdy surface such as a table, picnic table, chair, stool, ground, etc. Using the telescope on an unstable or wobbly surface will cause unsatisfactory results and limited success in finding objects.
- Remove the front dust cover from the optical tube and the dust cap from the focuser when you are ready to use the telescope. Keep these dust covers on when the telescope is not in use and when it is stored or packed.
- The Red-dot Finder scope may or may not be attached to the telescope when you receive it. If needed, attach it to the telescope by sliding the Red-dot Finder scope into the Finder scope base located on the telescope. See Figure 2 and 5 in the Instruction Manual of the telescope for correct orientation of the Red-dot Finder scope. NOTE: This is not a laser. It is just a red LED light projecting in the small tube of the sight. The Red-dot Finder scope should not need to be

Ages – Families, Youth with adult supervision, Teens, Adults

Activity Time – 20-60 minutes

Type of Program – Stations, stand-alone activity, facilitated program, outdoor activity

Materials List – Astroblast 4.5 inch Reflector Telescope, 20mm Kellner eyepiece 1.25" in a container, 6mm Kellner eyepiece 1.25" in a container, Moon filter, Red-dot Finder reflex sight, Instruction Manual, optical tube dust cover, and focuser dust cover

Setup Hints (continued)

realigned often. If you are having trouble finding an object in the eyepiece once you have oriented the red-dot on a distant object then you may need to follow the instructions for Aligning the Red-dot finder in the Instruction Manual to have the best success at viewing objects in the telescope.

- Start with the 20mm eyepiece (low-power or low magnification) and the 6mm eye-piece (high-power or high magnification) if viewing conditions are optimal. NOTE: Higher magnification does not always lead to a better image (See the *Using Your Telescope* section of the Fun Scope Instruction Manual). Insert the chrome part of the 20mm eye piece into the focuser and secure the small thumbscrew. You may need loosen the thumbscrew and remove a dust cap on the focuser first.

Directions and Usage Hints

WARNING: THE TELESCOPE IS NOT SET UP FOR SOLAR VIEWING! DO NOT LOOK AT THE SUN.

- Review the Telescope Instruction Manual before using the telescope.
- Set-up the telescope as described above and choose an observation site. If indoors during the day, choose an area where you can see things in the distance, or if outdoors at night, choose a large open area preferably with no or low light pollution.
- Next, follow the instructions for Operating the Red-dot Finder Reflex Finder in the Instruction Manual. Remember to turn off the Red-dot Finder when done with your viewing session.
- Once you have decided an object to observe and have set the red-dot on that object using the Red-dot Finder, tighten the telescope tube(optical tube) using the altitude adjustment knob to keep the tube from moving up and down.
- Next, look through the 20mm eyepiece and slowly move the focuser wheel (located near the eyepiece) to get the object in focus. NOTE: If the object is not in the eyepiece then the telescope may have moved left or right (azimuth) or up or down (altitude). The 20mm eyepiece gives you a wide field of view and a magnification of 15x magnification and the 6mm give a narrow field of view and 50x.
- Viewing daytime terrestrial objects are seen through the eyepiece as upside down and flipped. Reflector telescopes cause this type of image, but allow for a much more compact optical tube than refractor telescopes. When viewing round objects in the sky at night, this factor will not be a problem.
- What to Observe? The moon, planets, stars, and deep sky objects are fun to locate and observe. Do not look at the Sun with this telescope since this kit does not include a solar filter. Make a viewing plan before going out at night by choosing a couple of items to locate and observe that night. Use the planisphere to help with this plan or another night sky chart (see Objects to observe in the Instruction Manual). Use the red-light flashlight (provided with this kit) when you need light at night to look at the Instruction Manual or planisphere. White-light flashlights or other lights will impede your eyes sensitivity or ability to dark-adapt.
- Have a fun “observing party” in the library during the day by posting up images of the planets around the library at a distance. Use the binoculars and the telescope. What details do you see?
- Observe a night sky object with your eyes, then with the binoculars, and then with the telescope. Notice the differences. Is one better than the other? Does the telescope always give you the clearest image?

Setup Hints (continued)

- Learning about what is up in the night sky and knowing where things are located will help you be successful at finding them with the telescope! Remember: the night sky changes throughout the night and with the seasons.
- Here are some frequently asked questions.
 - “What is the magnification of this telescope?”
The 20mm eyepiece gives you a wide field of view and a magnification of 15x magnification and the 6mm give a narrow field of view and 50x.
 - “A few minutes ago, I saw the object in the eyepiece, but now it is gone. Why?”The earth is moving so you will need to adjust the telescope’s position on an object every few minutes or so if you are observing that object for an extended period. (See Tracking Celestial Objects in the Instruction Manual)
 - “Why can’t I see the objects in the telescope as I see them in pictures?”
You will be able to see many cool things with your own eyes using this telescope, but they will be in black and white. The colorful images in magazines and online of celestial objects are from high-powered sensitive tools with lots of filters that can “see” the many things in deep space that we cannot see with our own eyes.

Advanced Activities

- Use the planisphere to identify objects you want look at in the evening and track them across the sky over time
- Learn the moon phases
- Use the moon filter. To use this filter, simply remove the eyepiece and screw the filter onto the bottom (the part that attaches to the telescope). This will significantly lessen the amount of light you’re getting, to allow for prolonged moon observing!
- Get to know when there are good “seeing” and transparency conditions

Connections to Other Kit Materials

This activity works well with:

- Planet Party
- Pocket Solar System
- Looney Lunar Phases
- Planisphere
- Binoculars

Connections to Other *STAR Net* Activities

Blind Mice Go To Pluto

<https://goo.gl/FEBHXJ>

What Do You See in Today’s Moon?

<https://goo.gl/Ma6Qq5>

Constellation Detective

<https://goo.gl/w2fyAR>

Quick Facilitation Guide

Using Your Binoculars

The Celestron Cometron 7x50mm lens binoculars provided in this kit are lightweight and have a wide field of view that allows for good night sky viewing. By letting in a good amount of light, offering a wide area to see through the eyepieces, and great magnification of small objects, these binoculars help users successfully view the Moon, planets, and other astronomical objects at night.



Credit: Space Science Institute

Key Concepts

- NASA scientists use tools to observe everything from Earth to the farthest reaches of the Universe.
 - Different tools are used to observe objects of different sizes and types (e.g., telescopes and binoculars can magnify small objects)
 - Different tools used to observe the same object can provide us with a more detailed understanding of the object

Ages – Families, Elementary ages with adult supervision, Tween, Teens, Adults

Activity Time – 10 mins. - 1 hour

Type of Program – Indoor practice, outdoor night sky viewing

Materials List – Celestron Cometron 7x50 binoculars, two eyepiece caps, two optical lens caps, neck strap, bag, lens cloth, planisphere, red light flashlight, Moon map

Simple Instructions

WARNING: THESE BINOCULARS ARE NOT FOR SOLAR VIEWING!

- Review the Celestron Cometron Binoculars Guide provided with the binoculars and get familiar with the parts of the binoculars on page 2.
- First, adjust the binoculars for the distance between your eyes, and then use the focuser knobs to bring the object into focus, this will be different for different patrons.

Follow these steps:

1) Adjusting the binoculars to your eyes: Using both hands, hold the two barrels of the binoculars and bring it up to your eyes. Adjust the distance of the eyepieces by pulling the barrels closer together or farther apart depending on how far apart your eyes are. You have set them correctly when you see a single clear image.

2) Focusing the image: After you have adjusted the binoculars to your eyes, while looking through the binoculars, cover the front right lens with your hand or lens cap and slightly rotate the Focus Wheel (round wheel located in the middle of the binoculars) to get a clear image. Remove your hand or cap from the right lens, and then cover the left lens with your hand or lens cap and slightly move the right eyepiece adjustment (Diopter Adjustment) to achieve a clear crisp image.

Guiding Questions

- 3) Once the binoculars are adjusted and focused then you will only need to use the Focus Wheel to make small adjustments for focusing on objects.
 - 4) Each person using the binoculars will need to go through steps 1-3 for adjusting and focusing the binoculars for their face and eyes.
- Practice outside during the day or indoors with the binoculars by looking at things at a distance before using them outside at night. Point on an object at a distance with your eyes first and then bring the binoculars to your eyes.
 - Here are some frequently asked questions.
 - How magnified is the object in the binoculars?
The object you are seeing through the binoculars is seven times magnified than what you would see with your regular eyes. They are 7x50 binoculars, which mean they have seven times the magnification with a 50mm aperture.
 - How far away is the moon from Earth?
On average, the distance from Earth to the Moon is about 238,855 miles (384,400 km). According to NASA, "That means 30 Earth-sized planets could fit in between Earth and the Moon."
<https://www.space.com/18145-how-far-is-the-moon.html>
 - Should I remove my glasses to use the binoculars?
No! Keep your glasses on and just fold back the rubber cups on the eyepieces. These eyepiece cups are for both eyeglass and non-eyeglass wearers. Users with astigmatism may find using the binoculars harder, and may be better off removing their glasses.

Advanced Activities

- Use the Moon Map 260 and the binoculars to identify places on the Moon.
- Use the planisphere to identify objects you want look at in the evening and track them across the sky over time
- Learn about Moon phases

Connections to Other Kit Materials

This activity works well with:

- Planet Party
- Planisphere
- Looney Lunar Phases
- Telescope

Connections to Other *STAR Net* Activities

What Do You See in Today's Moon?

<https://goo.gl/se0EjV>

Constellation Detective

<https://goo.gl/SGVW1Y>

Quick Facilitation Guide

Using Your Planisphere to Explore the Night Sky

In conjunction with your Orion telescope, this *NASA@ My library* Facilitation Guide provides tips on using the Planisphere, and provides suggestions for engaging activities.



Credit: Space Science Institute

Key Concepts

- Science models help us understand how space objects behave and make predictions about what we can't yet observe.

Simple Instructions

How to use the planisphere

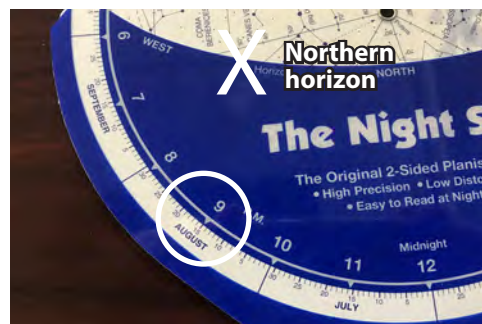
- The Planisphere is useful in helping you identify planets, stars, constellations, and even the Milky Way in the night sky.
- To begin using your Planisphere, you'll first need to find your approximate bearings. You'll need to know which direction is North, and which is South. Once you've identified North, try to find the North Star (Polaris) in the night sky. A neat trick to finding the North Star, is that it's at the same height in the sky as your latitude. So if you live in Hawaii, it's around 19 degrees from the horizon. In the Midwest, it might be closer to 40 or 50 degrees from the horizon! The North Star is indicated by the hole on your Planisphere.
- Once you've gotten yourself pointed the right way, you'll want to make sure your date is correct. Spin the white part of the planisphere, until the date and time matches yours. This one is showing August 15th at 9pm (see white circle above.)
- The line running across the planisphere is your Northern horizon (see white "x" in above figure). So the constellations you see along that line, should match the ones near the horizon where you are!
- The front of the planisphere shows you the night sky from the Northern horizon to a little past straight over-head.
- When you turn the Planisphere over and face South, you're seeing the objects in the sky from the southern horizon to almost straight overhead.

Ages – Families, Elementary-aged children, Tweens, Teens, Adults

Activity Time – 5-30 minutes

Type of Program – stations, stand-alone activity, facilitated activity

Materials List – Planisphere



Credit: Space Science Institute

Simple Instructions (continued)

Objects listed on the planisphere

- You'll note that the planisphere can help you find quite a few objects in the night sky.
- The easiest objects to locate are the constellations that change with the seasons. Try to find the pictures in the sky you already know, and identify more from there.
- The planisphere can also help you find telescope objects, like Globular Clusters, Nebulas, Galaxies and Open Star Clusters. Use the key on the back side to figure out which object you're looking at!
- You can easily find the Milky Way using this tool. On the planisphere, you'll see a blue cloudy area, once you know what you're looking for, it may be easier to see in the sky for you! Unfortunately, many parts of the country have too much light pollution to see the Milky Way or other dimmer objects. Start with planets and Globular Clusters as the brightest objects.
- You can identify planets with this tool. Although they don't appear on the Planisphere itself (because the planets move independently of the stars), you can use the dotted line labeled "ecliptic" on the planisphere to try to find planets! How do you tell the difference between a planet and a star? First, if you see a bright star that doesn't belong to a constellation on your planisphere, that might be a planet! Another clue is whether or not it twinkles. Stars almost always twinkle, because they're so far away so we receive very little light from them, and the light we get is distorted by the atmosphere. In comparison, planets only twinkle if you have an extremely disturbed atmosphere (e.g., right before a storm). We get more light from them, so the atmosphere doesn't affect them as greatly!



Credit: Space Science Institute

Connections to Other Kit Materials

- We recommend the planisphere be used in conjunction with the telescope or binoculars, but it also works great by itself to better learn the constellations!

Connections to Other STAR Net Activities

- Please visit the *STEM Activity Clearinghouse* at www.clearinghouse.starnetlibraries.org and check out the "Space Science" collection to find great activities on constellations and other stellar objects!

Game Instructions - AstroDash

Contents:

1 Game Board
Game Cards
Answer Sheets
6 game pieces
1 Die
Instruction Sheet

Object of the Game:

To make up answers that will “bluff” the other players. Earn points for fooling other players into believing your bluff as well as for choosing the real answer. The goal of this game is for players to be exposed to astronomy from other cultures, as well as higher level astronomy concepts. This is also a great writing exercise!

Ages:

For teens to adults

Each Player Needs:

Several answer sheets
Pencil
Game piece

How to Play:

- Each player rolls the die, the high roller will be the first “Dasher”
- The Dasher rolls the category die and reads the corresponding category and question (if the 6 is rolled, the Dasher can choose the category)
- Each player writes the category at the top of the answer sheet
- Categories are:
 - Consternating Constellations (these are constellations from other cultures)
 - Heavenly Bodies (astronomical objects)
 - That’s No Moon (yes it is) (moons around other planets)
 - I’m Going to Be A Star! (stars)
 - Incredible Initials (initials of telescopes, missions, etc)
- Each player makes up an answer and writes it down in the answer section. The more realistic your answer sounds, the more likely other players will vote for it! For example, if the word under “That’s No Moon” is “Titan”, you may not know the answer, but something like “A Moon of Saturn that features xyz” will get more guesses than “A Really big thing”!



Game Instructions - AstroDash

- The Dasher writes down the correct answer on their answer sheet
- After placing all the answers (including the real one) in random order, the Dasher reads all of them out loud
- Moving clockwise, each player chooses which answer they think is real. The Dasher keeps tally on the chosen answer sheets.
- After everyone's guessed, the Dasher reveals the real answer and players score as follows:
 - 1 point to players for every vote their answer gets
 - 2 points to players who guessed the real answer
 - 3 points to the Dasher if no-one guesses the real answer
 - 3 points to any player who writes an answer very similar to the real answer (these answers are combined during guessing, so two similar answers don't appear)
- Each round, players move the number of spots on the board that corresponds to their score above. First player to finish wins!

Simple Instructions:

If the above instructions are too complicated, you can just assign one person to be the dasher, and give one point to every answer category above.

Game Instructions - Guess What?

Contents:

1 Game Board
Game Cards
Instruction Sheet

Object of the Game:

Participants will be able to characterize objects in our Universe, and be encouraged to contemplate their properties.

Ages:

Pre-K (with help) to adults



How to Play:

- Both players pick a card from the deck and place it in the slot on their side of the board, being careful not to let the other player see
- Each player takes turns guessing characteristics of the other players object
- The first player to correctly guess the other players object, wins!
Note: If a player guesses incorrectly, the other player gets 2 guesses on their turn

Hints:

- Ask a question that will eliminate as many objects as possible. For example “is it a moon” is a more useful question than “is it our moon”
- Think about categories of objects. Such as planets, objects outside our Solar System, objects with moons, etc.

Section 4:

Science Books and Related Resources

Science Books

1) Understanding Small Worlds in the Solar System (NASA)

Suitable for individual use by any age, or in a group or station setting

This hands-on book allows users to explore the shape and texture of comets, asteroids, the Kuiper Belt, Oort Cloud, and even Pluto!

2) All My Friends are Planets (Alisha Vimawala)

Suitable for use during story time for pre-k to grade 3 audiences

This book tells the story of Pluto's discovery, the evolution of what it means to be a planet, and that it's ok to be different and make new friends along life's way.

Consider using this resource with the "Blind Mice Go to Pluto", "Playdough Planets", "Strange New Planets" or other planetary science activities found in the "Universe of Stories" collection in the STEM Activity Clearinghouse.

3) Starry Skies (Samantha Chagollan)

Suitable for use during story time for pre-k to grade 3 audiences

This sturdy hardcover book includes easy to see illustrations of the constellations in our night sky, and simple descriptions of how they were named.

4) Journey to Constellation Station (Lindsay C. Barry)

Suitable for use during story time for pre-k to grade 3 audiences

This book was recommended by our pilot libraries for story time. *Constellation Station* is an imaginary place in the sky where the constellations meet and share their stories.

5) They Dance in the Sky (Jean Guard Monroe and Ray A. Williamson)

Suitable for circulation for teen and adult audiences

This book includes the stories behind constellations and asterisms from multiple cultures and time periods.

For background information and audio files related to this content, please visit:

<https://lunarscience.arc.nasa.gov/books/small-worlds.html>

Web Links to Kit Materials

Below you will find a list of web links to resources for your kit.

Activities

4.5" Orion StarBlast Telescope

<https://goo.gl/afvfpH>

Moon Filter

<https://goo.gl/Jf3mEs>

Celestron 71198 Cometron 7x50 Binoculars

<https://goo.gl/9jP82u>

Planisphere (remember to use your correct latitude!)

<https://goo.gl/7MUAtP>

Color Paddles

<https://goo.gl/UnNwpv>

Bulk Colored Pencils

<https://goo.gl/VriJSG>

Books

All My Friends Are Planets

<https://goo.gl/1XacW5>

They Dance in the Sky

<https://goo.gl/r4h1Z9>

Starry Skies

<https://goo.gl/M4MoGY>

Stories of the Aurora

<https://goo.gl/iSQVup>

Journey to Constellation Station

<https://goo.gl/nhLVvL>

NASA @ My Library

**Connect with Your Local
Astronomy Club to Learn
More About the Night Sky**



Source: GoodFreePhotos.com, Photo by Greg Rakozy



This state library project was made possible in part
by the Institute of Museum and Library Services

NASA's Night Sky Network

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.

With numerous clubs in each state, many of them are excited to share their time and telescopes to provide your community with unique astronomy experiences at the public library and under the real night sky.



Astronomy clubs will bring a wealth of knowledge and resources to your library. Whether you're looking for a speaker, a display, or a star party, these volunteers are equipped with NASA activities and information to share.

To find a club near you:

- 1) Go to the Clubs and Events page at the Night Sky Network website: bit.ly/FindNSN
- 2) Type in your zip code and submit

For other space science activities:

- 1) Go to STAR Net's STEM Activity Clearinghouse: clearinghouse.starnetlibraries.org
- 2) Go to the Outreach Resources page at the Night Sky Network website: <http://bit.ly/nsnresources>



Credit: Grand Canyon National Park
23rd Annual Star Party 2013

Disclaimer: Astronomy club members are volunteers and excited to share their telescopes and knowledge at events when they are able, but may not be able to accept all requests.

NASA@ My Library is a national STAR Library Network (STAR Net) initiative that connects NASA, public libraries, state libraries, and their communities. Together we are working to increase STEM learning opportunities for millions of library patrons nationwide, particularly those underserved in STEM education.

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NASA @ My Library

**Connect with a Solar System
Ambassador Volunteer to Aid
in Your Space Science Program**



Credit: NASA



This state library project was made possible in part by the Institute of Museum and Library Services

NASA's Solar System Ambassadors

The Solar System Ambassadors (SSA) program works with motivated volunteers across the nation to share the latest science and discoveries of NASA's space exploration missions through a variety of events that inspire their communities.



To find a local ambassador near you:

- 1) Visit the Solar System Ambassadors Program's website at: solarsystem.nasa.gov/ssa
- 2) Click on the "Directory" link
- 3) Search by Name, State and/or Country
- 4) Contact a SSA Volunteer for your program



Credit: NASA/Jenny Mottar

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