



Solar Eclipse & Space Science Badge Kit

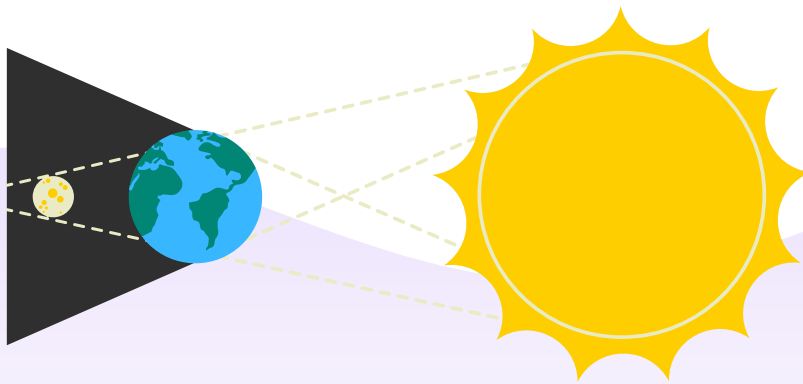
**Cadettes, Seniors, &
Ambassadors**

girl scouts 
of greater atlanta

Understanding Eclipses

What Are Eclipses?

Eclipses are all about shadows. Eclipses occur when one astronomical object moves in front of another, or when an astronomical object moves into the shadow of another object. In the sun-Earth-moon system, eclipses occur when the sun, Earth and moon all line up. In astronomical terms, this is called [syzygy](#), a word derived from Ancient Greek that means “yoked together.”



Total Solar Eclipses:

Eclipses of the sun occur when the new moon passes between the Earth and sun. When the moon covers the entire disk of the sun, we see a spectacular total eclipse of the sun with the corona glowing. During the eclipse, the moon's shadow is cast upon the Earth and travels across the surface at more than 1,000 miles per hour. From start to finish, from when the moon first starts to cover the sun to when the sun is completely uncovered, a solar eclipse takes a couple of hours. During most of that time, the sky is bright because the sun continues to light the Earth. You need eye protection the entire time when only part of the sun is covered by the moon. When the sun is completely covered—during totality—darkness descends. Totality lasts only a few minutes. The longest total solar eclipses last over 7 minutes.

Understanding Eclipses

Partial Solar Eclipses:

People inside the shadow's path see a partial solar eclipse if they are in the penumbra of the moon's shadow, and a total solar eclipse if inside the umbra. (see diagram below.) Only part of the sun is covered during partial eclipse. You need eye protection the entire time during the partial phases of an eclipse.



Partial Eclipse



Total Eclipse



Annular Eclipse

Annular Eclipses:

The moon's orbit is elliptical. On average, it is about 240,000 miles from Earth, but it can be as far as 251,900 miles (maximum distance), and as close as 225,300 (minimum distance). If the solar eclipse occurs when the moon is far from the Earth (near the maximum distance), the moon will not fully cover the disk of the sun, and an annular eclipse occurs. During an annular eclipse, we see a bright ring of sunlight around the moon. Eye protection is required at all times during annular eclipses.



The Moon's Orbit

Understanding Eclipses

Lunar Eclipses:

Eclipses of the moon occur when the full moon passes through the shadow of the Earth. Everyone on the nighttime side of the Earth can view a lunar eclipse. If the moon passes through the penumbra of the Earth's shadow, it will be slightly dimmer and redder. Penumbral eclipses are hard to detect. When the moon passes through the central part of the Earth's shadow—the umbra—it will dim to a dark red color. Lunar eclipses last for several hours as the moon moves through the Earth's shadow. It is completely safe to view the moon during lunar eclipses.



Lunar Eclipse

Why Don't Eclipses Happen Every Month?

Eclipses only happen when the sun, moon and Earth all line up, at syzygy. The moon's orbit is tilted about 5 degrees from the plane of the Earth's orbit around the sun. The lunar orbit crosses the plane of Earth's orbit in two places called nodes. Most months, the lunar orbit carries the new moon above or below the sun, and so there is no solar eclipse. The same is true for lunar eclipses: most months, the lunar orbit carries the moon above or below the shadow of the Earth, and there is no lunar eclipse. Solar eclipses happen when the new moon occurs near a node of the lunar orbit. Likewise, lunar eclipses happen when a full moon occurs near a node.



More Resources:

NASA always does a great job creating resources before any major eclipses that can be seen from the US. You can find out more on their page here (or scan the QR code).

GSGATL will be putting out a fun patch kit leading up to both the October 16, 2023 and April 8, 2024 eclipses. You can use these activities to help earn your Space Science badge as well! Watch our events calendar for fun activities at our Girl Scout Camps too.

Eclipse Map





Overview

This fun patch kit includes a customized curriculum for your Girl Scout level, worksheets and printed materials, eclipse glasses, and a fun patch. This kit will help your Girl Scout learn about the 2023-2024 solar eclipses, and you can earn your Space Science badge while doing it! We encourage Troop Leaders and parents to customize this general outline for your Girl Scout's specific needs.

This kit has five sections focusing on different space topics: Light, Eclipses, The Sun, The Moon, Stars. Each Girl Scout level will need to complete at least one activity from each section from either guide to earn their fun patch.

In order to earn the Space Science badge, look for the activities marked with the badge icon for your level and complete all of them!

Share what you learned!

Finish earning your Space Science Badges by throwing a star party to share what you have learned! You can plan it to be during one of the eclipses in October 2023 and April 2024, or on a different day.

You can also share what you learned online! Ask your parents to post on Facebook or Instagram and tag us @GirlScoutsATL, or use #GirlScoutsATL. You can also email us at STEM@gsgatl.org to show off your hard work!

Badge Requirements

Cadette Space Science Researcher Badge

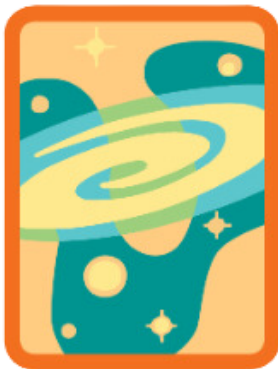


Observe and explore light, deepening your understanding of the sun, stars and other objects in space.

1. What more can you see?
2. Explore “invisible” light
3. See the stars in a new way
4. Expand your vision
5. Conserve the night sky

When you've earned this badge, you'll understand more about the amazing properties of light and how you use it to make discoveries about the universe and space science.

Senior Space Science Expert Badge



Explore light and discover what it teaches us about the universe!

1. Uncover the stuff you're made of
2. Explore the brilliance of the stars
3. Discover telescopes as light collectors
4. Find the light in the darkness
5. Share your knowledge

When you've earned this badge, you'll understand more about the universe—your place in it and how light is used to make discoveries about it.

Badge Requirements

Ambassador Space Science Master Badge

Explore, observe, design and communicate your space science discoveries—just like scientists and engineers.



1. Discover worlds beyond Earth
2. Dive into NASA science
3. Explore your interests
4. Dig deeper
5. Share what you've learned

When you've earned this badge, you'll understand more about space science and how you can be a part of NASA now and in the future.

Safety Information

Remember: Unless you are in the path of totality, the Sun is never completely blocked by the Moon during a Solar Eclipse. It is never safe to look directly at the Sun without specialized eye protection designed for solar viewing! Sunglasses are not enough to protect your eyes. The GSGATL-provided eclipse glasses in this kit comply with the ISO 12312-2 international standard for safety and will keep your eyes safe.

Viewing any part of the bright Sun through a camera lens, binoculars, or a telescope without a special-purpose solar filter secured over the front of the optics will instantly cause severe eye injury. Your eclipse glasses are NOT appropriate - they are not strong enough to protect against the magnification of the sun through these types of lenses.

Please ensure any Girl Scouts participating in these activities and/or viewing the solar eclipses wear their glasses properly. Always supervise children using solar viewers.

If you don't have eclipse glasses, you can use an indirect viewing method like a pinhole projector. There are instructions in this packet to make one. Do NOT look at the Sun through the pinhole!

Even during an annular eclipse, or during the partial phases before and after annularity, the Sun will be very bright. If you are watching an entire eclipse, you may be in direct sunlight for hours. Remember to wear sunscreen, a hat, and protective clothing to prevent skin damage.

We've included links to outside resources in this kit. Girl Scouts and adults should visit these sites together! We've included internal links (for the PDF) and QR codes to scan (if you have a printed kit).

Additional Resources

- [American Museum of Natural History: video on light wavelengths](#)
- [Light Lantern video](#)
- [Earth's Rotation and Seasons video](#)
- [History of Timekeeping video](#)
- [Forced Perspective video](#)
- [NASA: The Moon](#)
- [NASA: Moon Landing](#)
- [NASA: Artemis Program](#)
- [Day in the Life on the International Space Station](#)
- [NASA: The Golden Record](#)

Activities

Light

Activities	Materials	Badge Earning
Infrared Light Detector	• Smart phone or digital camera • TV remote control (or a few)	Cadettes, Seniors
By the Light of a Lantern	• Plastic bottle (clean) • Mod Podge or white glue • Tissue paper • Scissors • Battery-powered teal light	Seniors

Activities

Eclipse

Activities	Materials	Badge Earning
Make an Eclipse Viewer	• Cardboard box • Scissors or box knife • Masking or transparent tape • 1 piece of white paper • Pin • Duct tape or other opaque tape	Cadettes
Eclipse Art	• Black construction paper • Media such as chalk, pastels, or acrylic paint • Scissors • Glue • A traceable round object	

Activities

The Sun

Activities	Materials	Badge Earning
Sun Tracking	• Pole or stick • Open location on a sunny day • 3-12 rocks	Ambassadors
The Sun & Forced Perspective	• A cell phone or digital camera	Cadettes

The Moon

Activities	Materials	Badge Earning
Design an Alien Habitat	• A sheet of paper • A pen • Glue or tape • Recycled materials	Ambassadors

Activities

The Stars

Activities	Materials	Badge Earning
Stardust Infographic	• Drawing Paper • Crayons/markers • Other art supplies	Seniors, Ambassadors
Space Playlist	• Music streaming service of choice • speakers or headphones	Seniors, Ambassadors

Looking for more?

Stay tuned for a bonus digital guide for older Girl Scouts!

Email us at STEM@gsgatl.org to be notified when it's released.

Infrared Light

Seeing the Invisible: Infrared Light Detectors

Have you ever wondered how remote controls work? They send signals in a special type of light called “infrared light.” You can’t see infrared light (IR) with just your eyes, but smartphones and digital cameras can.

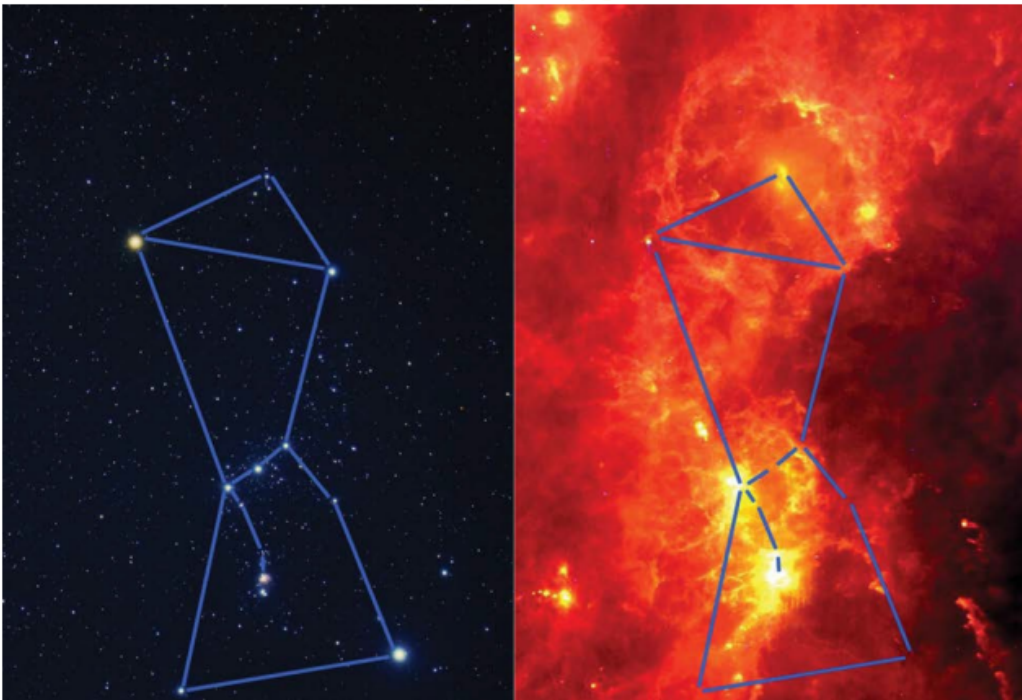
Infrared light was discovered accidentally in 1800 by British scientist, Sir Frederick William Herschel. In what is now famously known as the Herschel Experiment, he attempted to measure how different colors of light change the temperature of a thermometer by passing sunlight through a prism. He placed one of his thermometers outside the red part of the visible spectrum, where no light appeared to be falling as a control unit. He expected the control thermometer to stay unchanged. To his surprise, the control thermometer got hotter than all the rest! He called this invisible radiation “calorific rays.” Today, it is known as infrared light.

Invisible Light in Space

Astronomers understand the universe by observing the many types of light in it. Infrared light is important in understanding planets, stars, and galaxies because in IR light we can see things that are warm, but not hot enough to shine like stars. Most IR light is filtered out by water vapor in our atmosphere. So, scientists launch infrared telescopes into space or use infrared telescopes in high-altitude airplanes or balloons. They also use large ground based telescopes on top of tall mountains, such as the Infrared Telescope Facility in Hawaii at 14,000 feet elevation, which can see part of the IR spectrum.

Infrared Light

What Does it Look Like?



The Constellation Orion in visible light.

The Constellation Orion in infrared light.

Notice- there is a lot more visual “information” on the photo filtered through infrared light. Astronomers use this information to learn more about the universe!

Credits: NASA/SOFIA Visible light image: Akira Fujii; Infrared image: Infrared Astronomical Satellite

Infrared Light

Materials:

- Smart Phone or Digital Camera
- TV remote control with infrared technology
 - Note: not all controllers use infrared light. Try a few remotes to see which ones do!
 - Be sure your remotes work and have charged batteries



Instructions:

- Look at the end of the remote control that you point toward the TV and press any button. Hold the button down. Can you see any light coming from the end of the remote control?
- Now, do the same thing, holding down any button on the remote control, but view the remote control through your smartphone or digital camera.*
- What can you see? If you see a blinking light from your remote control, you have just used an infrared detector to “see” invisible light!



*Hint: With smartphones, switch to the screen-side (front) camera if the other camera does not detect anything. Smartphones and digital cameras have imaging chips that detect both visible and IR light. However, some cameras include an IR-blocking filter.

Next Level:

Does infrared light pass through the same materials as visible light? Use the remote control and your smartphone or digital camera to experiment. Try paper, cellophane, plastic bags of various types, hard plastic, and glass. Does IR pass through sunglasses or regular eyeglasses?

Invisible Light

Infrared rays – the invisible rays of natural sunlight, has literally thousands of applications. While you have probably heard about infrared saunas, infrared cameras and infrared heating pads, you may be surprised to learn the countless ways we use or are exposed to infrared rays everyday.

To learn more about how our eyes see light, and different invisible wavelengths of light, [watch this video!](#)

It might seem strange, but most of the light around you is invisible. Although your eye is an incredible piece of engineering, it is only able to see light at certain wavelengths, and is blind to much more light that it can see.



AMNH: Eyes
and Light

Light is actually a form of energy that travels in waves and we can place these waves on the electromagnetic spectrum. Infrared rays are electromagnetic radiation with longer wavelengths than those of visible light and is therefore invisible. It has a range of wavelengths that range from red light to violet.

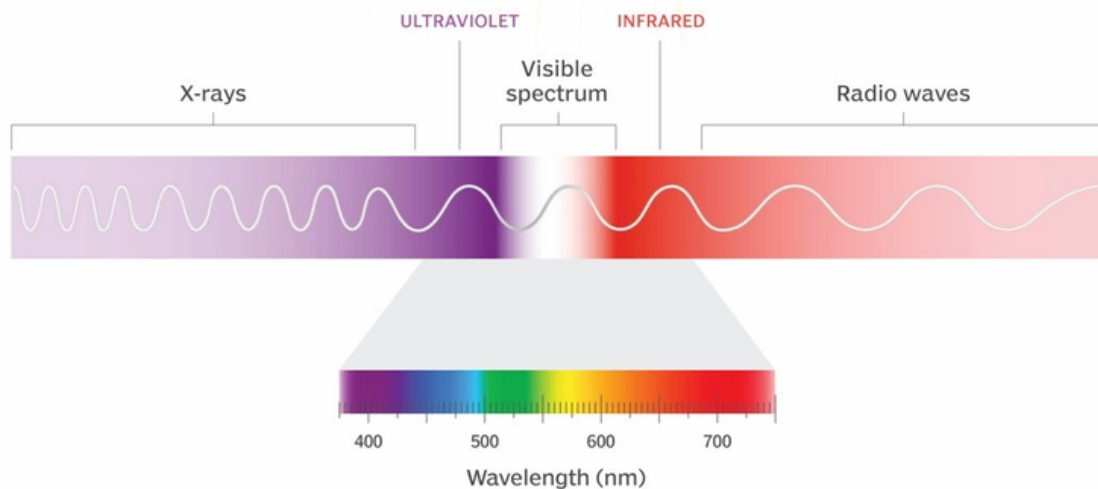
In addition to infrared light, the sun also emits microwave, radio, ultraviolet, X-ray, and even gamma-ray wavelengths! That's virtually all of the known electromagnetic spectrum. Our atmosphere protects us from the most harmful radiation coming from the sun.

Check out the diagram on the next page to see the full electromagnetic spectrum of light!

Invisible Light

Electromagnetic Spectrum

Visible and invisible light



Sunlight Fun Facts

- Almost half of the energy arriving to the Earth from the Sun comes as infrared light.
- Anything has some heat and therefore puts out infrared light, even things like an ice cube puts out some heat.
- In fire fighting, infrared cameras are being used to locate people or animals in heavy spots and to detect hot spots in forest fires.
- Snakes and fish are two animals that use infrared light to capture their prey and protect themselves.
- Weather satellites equipped with scanning radiometers produce thermal or infrared images, which can then enable a trained analyst to determine cloud heights and types, to calculate land and surface water temperatures and to locate ocean surface features.

By the Light of a Lantern

Materials:

- Soda bottles (rinsed and clean)
- Mod Podge or any other glue that dries clear
- Tissue paper of various colors
- Scissors
- A battery-powered tea light



How does light travel through something transparent or opaque?

Transparent objects do not absorb or reflect light waves. Instead, they let the light waves pass through completely. This happens because the light wave's frequency does not match the natural frequency of the object it strikes.

Now that you have conducted a few awesome light experiments, it is time to get crafty! You will make light lanterns using a plastic soda bottle as your base. [Check out this video](#) or follow the directions below!

Instructions:

- Carefully cut the top of the bottle for your preferred height. Get an adult's help!
- Use Mod Podge or another glue and adhere the tissue paper to the outside of the plastic bottle. Choose the colors that speak to you!
- Allow time to dry completely.
- Add a tea light and place your lantern in a spot to enjoy.



Light Lantern
video



Make an Eclipse Viewer

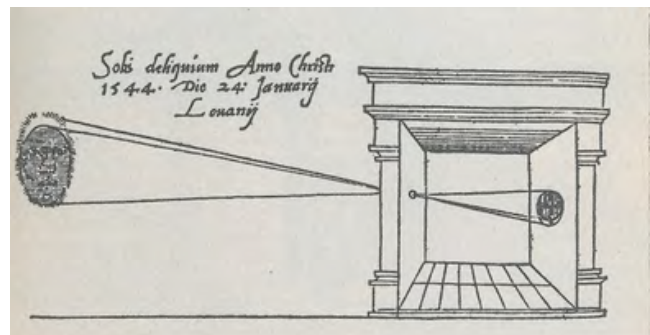
Materials:

- Cardboard box (ex: cereal box, shoe box)
 - Hint: the longer the box, the larger the image of the Sun.
- Scissors or box knife
- Masking or transparent tape
- 1 piece of white paper
- Pin
- Duct tape or other opaque tape

IMPORTANT SAFETY NOTE

It is not safe to look directly at the Sun without taking precautions to protect your eyes. The Sun is far too bright to view directly. But you can view the Sun using your eclipse glasses or this pinhole projector! Remember: sunglasses aren't powerful enough to protect your eyes looking directly at the Sun!

“Pinhole cameras” were originally called “Camera Obscura.” This drawing by Leonardo da Vinci of a “Camera Obscura” shows the Sun projected through a pinhole onto a wall. This is just like the projector you will make.

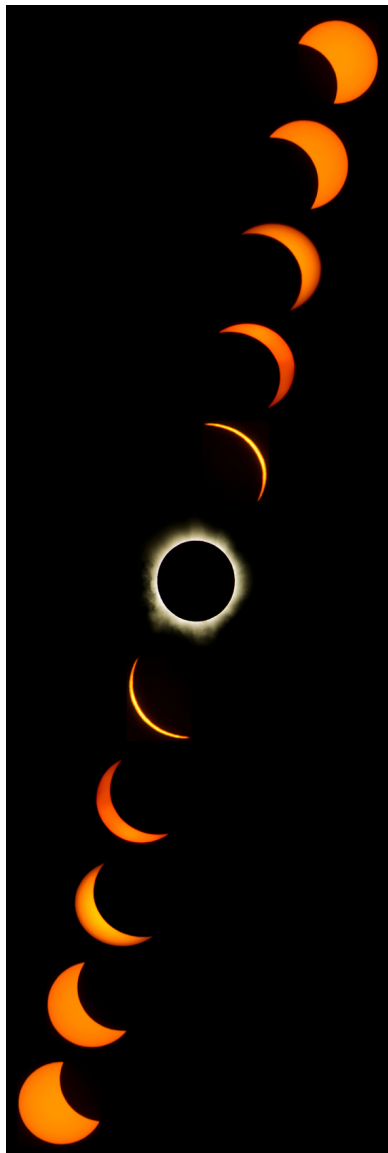
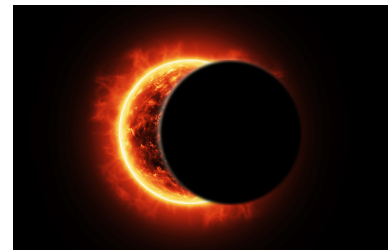


Credit: Gemma Frisius, De RadioAstronomica et Geometrica, 1545.

Make an Eclipse Viewer

Build the Box Projector —

Any box will work. The longer the box, the larger the image of the Sun. These instructions are for a cardboard box. If using a box with open seams, seal up the box with opaque tape to make the inside dark. Only the pinhole in the foil should let in light when you are looking through the viewing opening.



Tape white paper inside on one end of box.



Cut or poke eye and Sun holes.



Tape aluminum foil over Sun hole.



Poke hole in foil with pin.

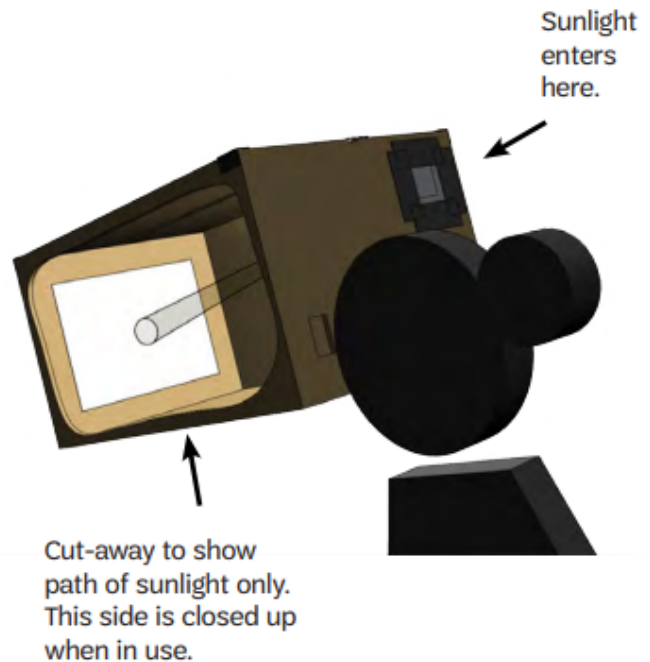


Tape box shut to block light leaks.

Make an Eclipse Viewer

To Do —

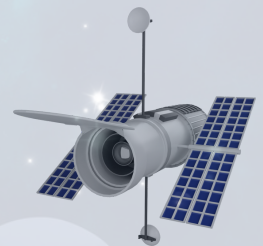
- Stand with the Sun behind you.
- Point the pinhole end of the box toward the Sun. Move around until, looking through the viewing opening, you see an image of the Sun projected inside the box.
- An easy way to align with the Sun is to make the shadow of the box and your head as small as possible.
- Your pinhole projector will show a small image of the Sun that is useful during a partial eclipse to see the “bite” the Moon takes out of the Sun.
- The longer the box is, the larger the image of the Sun will be.



Graphics: Credit: Jessica Henricks, Girl Scouts of Northern California; Conor McQuaid

Did you know?

Astronomers have observed the Sun with ground based observatories for about 400 years. Galileo proved that the Sun rotated by observing the motion of sunspots on its surface. Today, we observe the Sun in many wavelengths from large ground-based observatories like the National Solar Observatory and from spacecraft: Solar and Heliospheric Observatory, Solar Terrestrial Relations Observatory and the Solar Dynamics Observatory.



Eclipse Art

Materials:

- Black construction paper
- Media such as chalk, pastels, or acrylic paint
- Scissors
- Glue
- A traceable round object (such as the bottom of a glass jar, a mug, or a bowl)



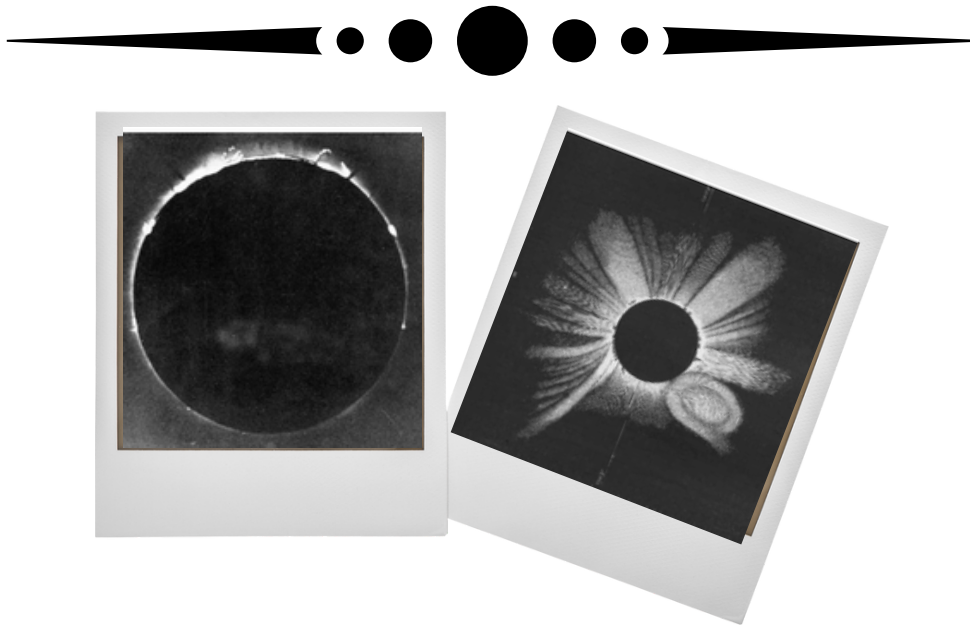
Until the advent of sophisticated and highly specialized ground and space based solar telescopes, the only opportunity anyone had to observe the sun's corona was during a total solar eclipse. Eclipse photography was not used until about 1860. Before that, astronomers would sketch what they saw at the eyepiece of their telescopes.

Real time eclipses are beautiful to see. Allow your experience of watching the eclipse inspire an amazing piece of art!

Eclipse Art

Instructions:

- Take a piece of black construction paper, use your round object and trace a circle. Cut out the circle and place it to the side.
- On the second piece of black construction paper, use the same round object and trace another circle.
 - It can be in the center or off to the side like the sample picture, wherever you would like.
- Using chalk, pastels, or acrylic paint, create soft lines starting at the circle and moving out towards the edges of the paper.
 - Be creative! Take your inspiration from the actual eclipse, if you see it, or pictures of eclipses you see online.
 - You can go as far as you would like towards the edges.
 - Don't worry about keeping the inside of the circle clean- that's what the first cut-out is for in the final step.
- If working with paint, allow time to dry.
- Add glue to the back of the first cut-out black circle and paste to the top of the circle on your whole paper.



The picture on the left is the first photograph of a solar eclipse by Charles A Young, July 18, 1860. The picture on the right is a sketch of the 1860 total solar eclipse by G. Temple showing a coronal mass ejection.

Sun Tracking

Materials:

- Pole or stick (straight branch, stake, dowel, or pencil)
- Open location on a sunny day
- 3-12 rocks or other small, heavy items



Long before humans kept track of time with mechanical clocks, atomic radiation, or computer chips, they used the Sun to tell time. As the Earth spins around like a top, the Sun appears to move across our sky. This movement causes shadows to move and change over the course of a sunny day. The simplest Sun tracker is called a gnomon, pronounced “no min.” This is most commonly seen as the vertical part of a sundial. A gnomon casts a shadow, and can be as simple as a vertical stick. It can be used to track time on its own, or to measure time in hours and minutes as part of a sundial.



Seasons Video

To review the Earth’s rotation and how it changes seasonally, [watch this short video!](#)



Timekeeping Video

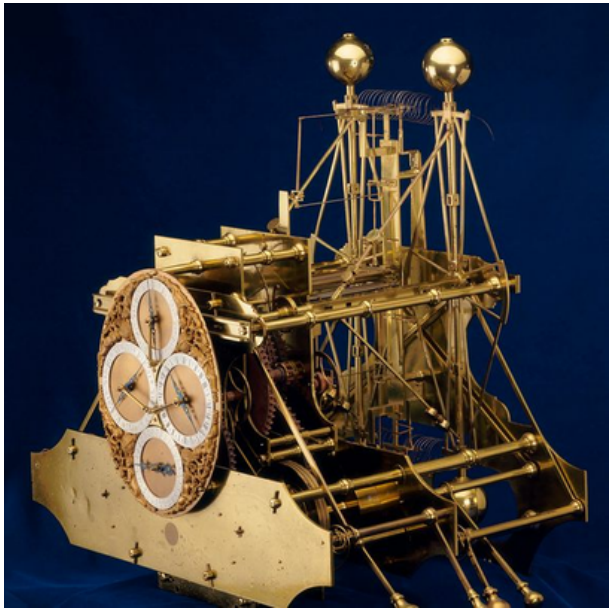
Historically, keeping time was incredibly important. If you were traveling on a ship, knowing the exact time -of your departure location- was the only way you could find your location! Romans used giant obelisks to tell time, hand-held sundials were a fad in the 1600's, and water was sometimes even used! The first portable mechanical clock that was accurate on a ship (invented in the 1730's by British carpenter John Harrison) was a world-changing invention.

[This video](#) gives a good short history of these innovations.

Sun Tracking

Instructions:

- Find a clear, sunny space with soft dirt. Press your stick or pole straight down into the ground until it stands up on its own.
 - This is your gnomon!
- Mark your gnomon's current shadow with a rock.
- Decide when you can return to your gnomon, at least 30 minutes - 1 hour later.
- Estimate where the gnomon's shadow will be at this future time and place a second rock at the location of your hypothesis.
- If you're working with a group, have each Girl Scout mark their rock (sharpies work well). Encourage multiple estimates!
- Return after the planned amount of time. How did you do with your hypothesis?



Left: John Harrison's "H1" marine chronometer of 1735, the first clock that would stay accurate on a moving ship.

Right: Astronomical clock in Prague, Czech Republic. In addition to telling the time, it also shows the position of the sun and moon, the month, and positions of astrological constellations.



The Sun & Forced Perspective

Materials:

- A cell phone or digital camera
- A great imagination and a little patience :)

Forced perspective is the use of any of various techniques in photography to create an optical illusion that objects or people are smaller, larger, closer, or farther away than they really are. For this project, you will attempt to take a forced perspective photo with the sun. This will require you to have a partner to either be the person in the photo or to help capture the picture. You can also use a camera with a timer.

Remember: protect your eyes when looking at the sun, even through a camera!

[Check out this video](#) for additional information and tips of capturing the an awesome forced perspective photo!



Forced
Perspective
Video

Instructions:

- On a sunny day, head outside with a partner and try to capture a forced perspective photo. This will require patience as forced perspective photos often need several attempts to capture the right angle.
- Have fun, be creative, and share your photo!



The Moon

The Moon has been an iconic part of mythology and culture since before written history, but we have only just begun to explore it. The first human, Neil Armstrong, landed on the Moon on July 20, 1969 as part of the Apollo 11 mission. [You can watch this historic footage here.](#) But the last man on the Moon was in 1972- and we haven't been back since.

NASA's upcoming Artemis missions aim to put people back on the Moon. And this time they're including women and people of color! There are three missions planned: one to test the newly designed rocket, one to circle past the Moon and return to Earth, and the third will land on the moon. [You can read more about the Artemis missions on NASA's website.](#)

But scientists and engineers are always planning ahead. They are currently designing habitats for the Moon and Mars so that, in the near future, people can explore these worlds in person. The Moon and Mars are rocky like the Earth, but otherwise they are very different. What do you think it will take to live there?

[Check out NASA's website about the Moon,](#) and read the info on the next page before starting this project. Learning about the Moon will help you better design a habitat for humans!

Work by yourself or with friends, and make a list of essentials for life on the Moon. Then gather recycled materials: paper tubes, straws, plastic food containers, egg cartons, or anything else you'd like, and build a prototype for a livable habitat on the Moon.



NASA: The
Moon

The Moon

No human has walked on the Moon since the Apollo 17 mission in December 1972. Next time NASA hopes the astronauts will stay much longer than the few days of the Apollo 17 mission. So now, NASA's Exploration Technology Development Program is working on everything that will be needed to make the Moon a place where a crew of astronauts can live for months.

Explorers from Earth will have to build their own habitat. Their home must protect them like no home on Earth would ever need to do. Why? You will have to consider temperature, atmosphere, weight, and more.

There is no air on the Moon. And the temperature varies from 387 degrees Fahrenheit BELOW zero (-233 Celsius) at night to 253 degrees Fahrenheit ABOVE zero (123 Celsius) in the day. Tiny micro-meteoroids (space rocks) rain down on the Moon's surface. And no atmosphere means no protection from the Sun's harsh radiation.

Temperature:

How will the astronauts stay both cool and warm in their habitat? The space needs to be well-insulated. Insulators are materials that prevent temperature change. Think about your insulated mug- it keeps liquids both hot AND cold.

Atmosphere:

As with any Moon habitat, it must have an airlock. The airlock is a small room between the door to the outside and the door to the inside. Both doors must close very tight and not leak any air. Before the astronaut opens the outside door, the inside door must be closed. The astronaut enters the airlock and closes the outside door. Then the airlock is pumped full of air. Only then can the astronaut open the inside door to enter the habitat. Leaving the habitat, the astronaut (in a spacesuit, of course), steps into the airlock with the outside door closed. The inside door is then closed and all the air pumped out of the airlock, making it a vacuum, just like the outside. The astronaut opens the outside door and steps outside.

The Moon

Weight:

The materials to build the Moon habitat should be lightweight, since they will have to be boosted out of Earth's gravitational field using rockets. The habitat will have to be sent to the Moon in pieces and assembled by the explorers once they arrive. So it should be easy to put together, since the Moon explorers will be working in space suits.

And More:

So a Moon habitat for humans will have to be very tough and very sturdy. It will have to be air tight, so the inside can be pumped up with breathable air without exploding or leaking. The habitat will have to be cooled during the Moon day and heated during the Moon night. It will need a water recycling system, a power generating system, and food storage and preparation facilities.



The light-weight experimental house shown here is inflatable, so would not take up much space until needed.

Check out this video about a day in the life on the International Space Station to see what kind of daily challenges astronauts face in space.



ISS: Day in the
Life

•• Alien World Habitat ••

Materials:

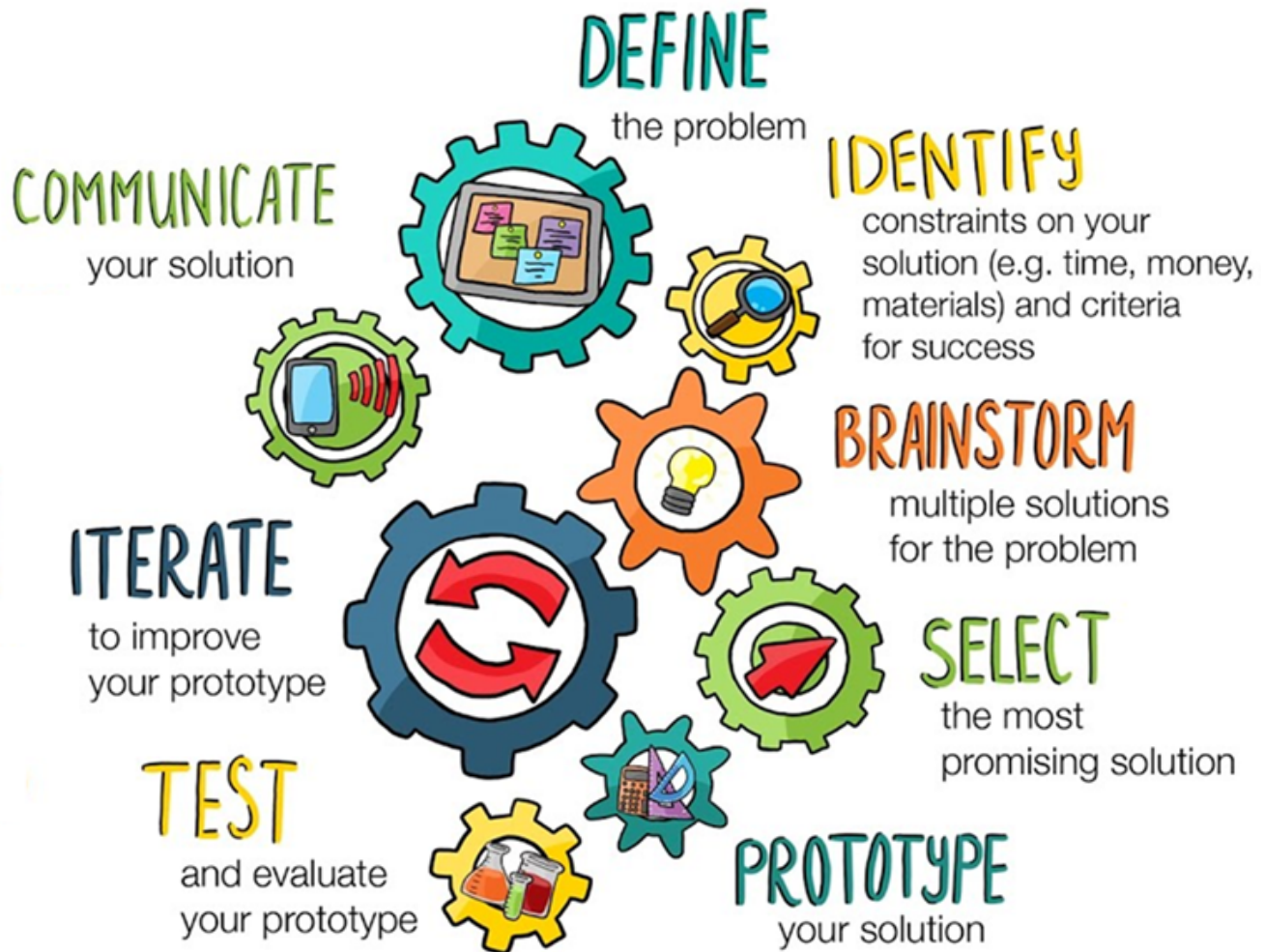
- A sheet of paper
- A pen
- Glue or tape
- Recycled materials
 - Ex: paper tubes, straws, plastic food containers, egg cartons, or anything else.



Instructions:

- Use the Design Thinking process (graphic on the next page) to brainstorm- what should I include in a moon habitat?
- Use the boxes on the next few pages to work through designing a moon habitat.
 - The Design Thinking Process is how engineers and scientists think through huge, complex problems like this one! Give it a try and see if it works for you.

•• Alien World Habitat ••



•• Alien World Habitat ••

Define the Problem

How can we design a habitat for humans on the Moon?

Identify Criteria

What does a good habitat need to have?

Identify Constraints

What can we NOT do as we build a habitat? What do we NOT have?

•• Alien World Habitat ••

Brainstorm Ideas

Draw pictures or make a list! Remember, there are no bad ideas in brainstorming



Circle the idea you want to work on! Use your criteria to ensure it fits your goals.

•• Alien World Habitat ••

Sketch your Prototype

Think about materials and how it should work.



•• Alien World Habitat ••

Test 1 Improvements

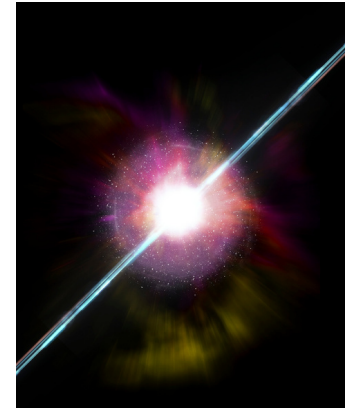
Test 2 Improvements

Test 3 Improvements

The Stars

Uncover the stuff you're made of!

When a massive star explodes at the end of its life—an event called a supernova—the star's elements scatter into space. Over time, elements made during the supernova, including those heavier than iron, are recycled into new stars and planets. The naturally occurring elements found on Earth were once at the heart of a star. Since humans are made up of the elements, we are literally made of stardust.

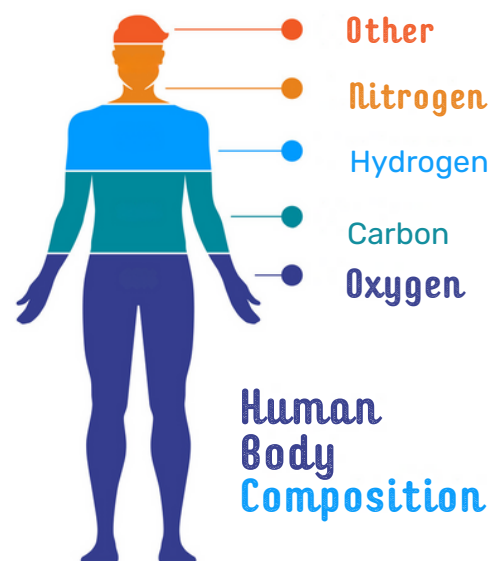


An infographic transforms information from a set of numbers into a compelling visual image—it makes data more interesting, appealing, and easier to understand.

Look at the chart: this describes the typical percentages of each element found in the human body. These elements make up your skin, hair, bones, blood, and organs—everything!

In this activity, you'll use this info to create your own life-sized infographic.

Hydrogen	62%
Oxygen	24%
Carbon	12%
Nitrogen	1.1%
Calcium, Phosphorus, Potassium, Sulfur, Sodium, and Chlorine	0.6%
Other trace elements	0.3%



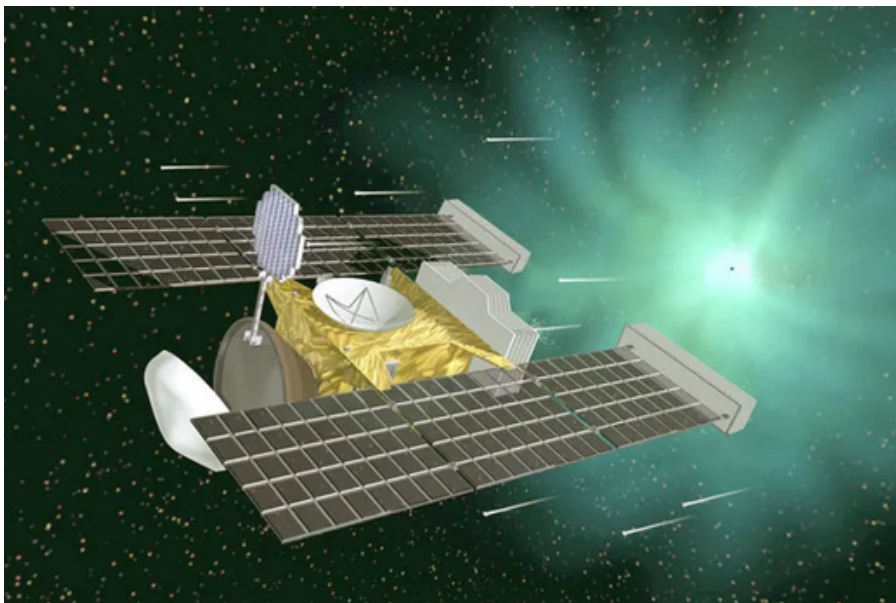
The Stars

NASA's Stardust Mission

In January 2006, a conical capsule carrying the first samples of a comet and the first pristine traces of interstellar dust ever collected landed in the Utah desert. The capsule had been dropped from NASA's Stardust spacecraft, which continued its voyage through space and became the first mission to visit two comets.

Launched in 1999, Stardust visited an asteroid before making a close brush with Comet Wild 2 (pronounced "vilt 2" after the name of its Swiss discoverer Paul Wild), then returned to Earth to deposit the samples. As part of its extended mission, the box-shaped craft visited Comet Tempel 1. When the mission ended, in March 2011, the spacecraft had traveled nearly 5.7 billion miles (9.1 billion kilometers) over the course of nearly 12 years.

[You can read more about this mission here.](#)



NASA's
Stardust
Mission

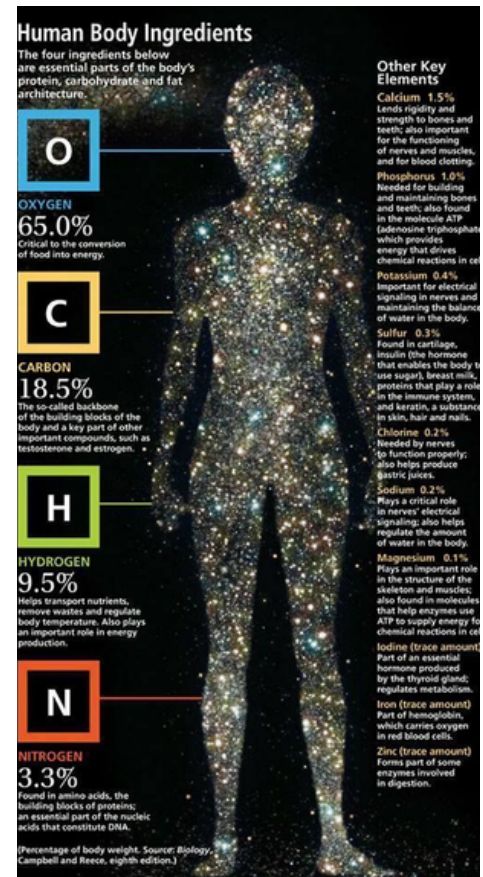
Stardust Infographic

Materials:

- Drawing paper
 - Hint: use a roll of parchment paper to fit your entire body!
- Media to draw/color with
 - ex: crayons, markers, colored pencils
- Optional: other art supplies
 - ex: stickers, glitter glue, pop poms, etc.

Instructions:

- Draw an outline of the shape you want to represent yourself.
 - It can be the shape of your body, a circle, your face, whatever you would like to use.
- Divide up your shape into the base elements at the percentage they are present in your body.
 - You can do top to bottom, in sections like a pie, or any other creative way!
 - Do your best to keep the sections close to the percentages- you might have to flex your geometry skills here.
- Color code each element area. You can use paint, color pencils, markers, whatever you have on hand, to color in each section.
- You can decorate your shape with glitter, pom poms, stickers, or whatever else you decide. Or you can pick a different decorative item for each different element.
- Share with family, friends, or on social media. Or share your project with younger girls and teach them what you've learned!



Space Playlist

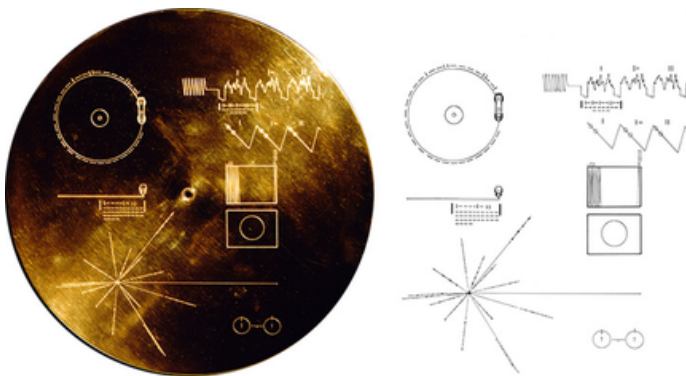
Have you ever heard the song “Man on the Moon” by REM or “Starlight” by Taylor Swift? What other songs do you know that mention anything in space: stars, the moon, the sun, comets, or the planet?

In 1977, NASA launched Voyager 1 and 2. These probes were originally designed to study Saturn and Jupiter, but NASA knew that they would eventually fly across our entire solar system and beyond. These would be the furthest-traveling human-made objects in history.

To mark this achievement, and in case extraterrestrials eventually encountered these objects, NASA supplied each probe with a “Golden Record.” The record included images, greetings in hundreds of languages, sounds from Earth, and music. You can use this playlist as inspiration and [learn more about the Golden Record here](#).



NASA's Golden Record



The cover of the “Golden Record”

Materials:

- Your music streaming service of choice OR your music collection
- Speakers or headphones

Instructions:

- For this activity, make a playlist of songs about space. Share your playlist for a friend, or play your songs in an eclipse celebration.