

Find out information about the

TOTAL ECLIPSE

coming to Harker Heights on

Monday, April 8, 2024!

Starts 12:18pm; Maximum at 1:36pm; Ends 2:58pm

Visit the City of Harker Heights'
Eclipse Website.

www.harkerheights.gov/eclipse



Register for direct notifications about
the eclipse and other events.

www.harkerheights.gov/stay-informed

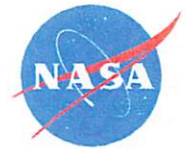
Visit the City of Harker Heights' Facebook Pages.

@harkerheightstx

@harkerheightspr

@harkerheightspubliclibrary



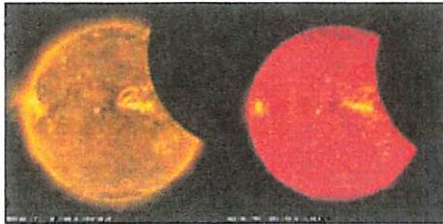


Experience the Total Solar Eclipse

Monday, April 8, 2024



WHY DOES NASA STUDY ECLIPSES?



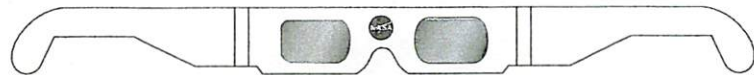
Credit: NASA/SDO

Eclipses aren't just beautiful—they're great for science. For over a century, solar eclipses helped scientists decipher the Sun's structure and explosive events, find evidence for the theory of general relativity, and discover helium. Today eclipses help NASA predict the structure of the Sun and its impact on Earth. Total eclipses are a unique opportunity to study the Sun because they allow scientists to see a part of the Sun's atmosphere – known as the corona – that is key to answering fundamental questions about how heat and energy are transferred from the Sun out into the solar wind, the constant stream of particles that the Sun scatters into the solar system.

WHAT IS A TOTAL SOLAR ECLIPSE?

For a **total solar eclipse** to take place, the Sun, Moon, and Earth must be in a direct line. The people who see the total eclipse are in the center of the Moon's shadow when it hits Earth. The sky will darken, as if it were twilight. Weather permitting, people in the path of a total solar eclipse can see the Sun's corona, the outer atmosphere of the Sun. A total solar eclipse is the only type of solar eclipse where viewers can watch without their eclipse glasses – and they can only remove them when the Moon is completely blocking the Sun.

A **partial eclipse** happens when the Sun, Moon, and Earth are not exactly lined up. Only a part of the Sun will appear to be covered. During a total or annular solar eclipse, people outside the Moon's inner shadow see a partial solar eclipse.



Credit: AAS

SAFETY

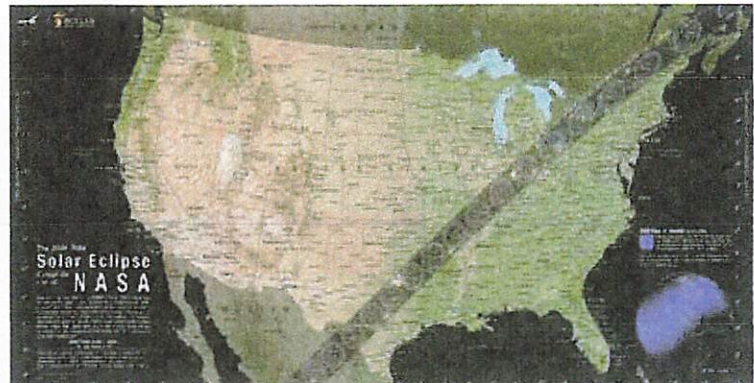
Except during the total phase of a total solar eclipse, do not look at the Sun without special eye protection. **BEFORE EACH USE:** Check the front and back of each lens for damage such as scratches, pinholes, or separation from the frame. **DO NOT USE IF DAMAGED!** Cut glasses into small pieces and discard. **DO NOT** attempt to clean or disinfect eclipse glasses except with a soft, dry, nonabrasive tissue or cloth.



You can see the Sun and an eclipse with special eclipse or solar viewing glasses. **NEVER** look directly at the uneclipsed or partially eclipsed Sun without appropriate eye wear. Sunglasses are not safe to view an eclipse. For more information, visit: go.nasa.gov/EclipseEyeSafety

ECLIPSES THROUGH THE EYES OF NASA

On April 8, 2024, a total solar eclipse will cross North America creating a path of totality.



Credit: Michala Garrison and the Scientific Visualization Studio (SVS), in collaboration with the NASA Heliophysics Education Activation Team (NASA HEAT), part of NASA's Science Activation portfolio. Eclipse calculations by Ernie Wright, NASA Goddard Space Flight Center.

To find out where to watch, how to watch, and eclipse duration in your area, explore go.nasa.gov/Eclipse2024

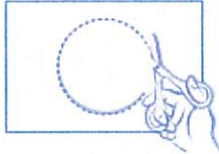
PREDICT THE CORONA

Long before there were cameras or telescopes, eclipse watchers recorded what they saw in the sky in words, drawings, and paintings. Now NASA scientists use instruments like coronagraphs to study eclipses to make new discoveries about the Sun, Earth, and our space environment. You can have fun creating your own picture of a solar eclipse with chalk, paper, and scissors! You can do this activity before an eclipse to predict what you'll see, or after to record what you saw.

First, trace a large circle template on stiff paper.



Carefully cut out the circle.



Place the template on dark paper and hold or tape it down. Draw a thick circle or lines with chalk around the template a few times – it doesn't need to be neat!



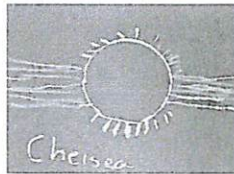
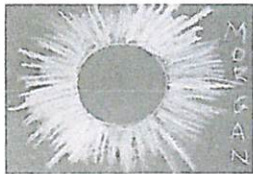
Holding the template in place, smudge the chalk away from the center of the circle using a finger to create the corona of the Sun.



When you are done smudging, remove the circle template and add words, pictures, or fun designs.

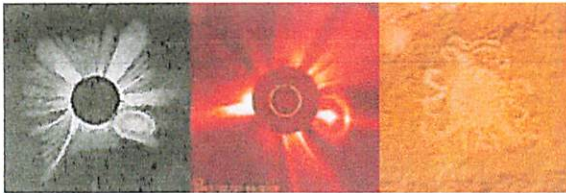


You've made total solar eclipse art!



The whole family can get involved in learning about eclipses! Morgan (age 11) and Chelsea (age 8) drew these dazzling coronas.

Compare your coronagraph art to that of early to modern scientists. Which does yours most closely resemble?



Left: Drawing of the 1860 solar eclipse. Credit: G. Tempel
Center: A coronagraph simulates a solar eclipse, blocking the Sun to reveal its outer atmosphere. Credit: NASA/ESA SOHO
Right: Ancient rock art in Chaco Canyon may depict a total solar eclipse in 1097. Credit: National Park Service

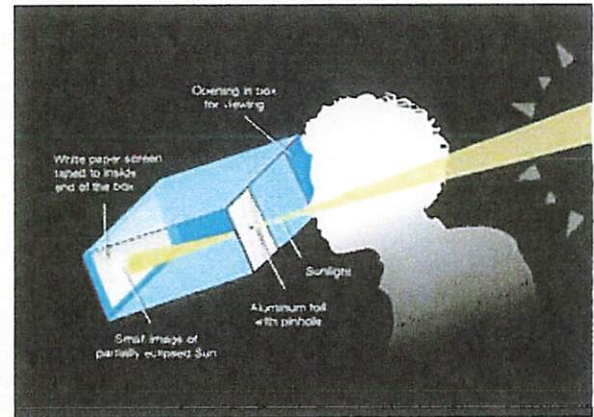
Download this activity and the Predict the Corona Cake Art extension at science.nasa.gov/learn/heat/resource/predict-the-corona-activities

EXPECTATION VS REALITY



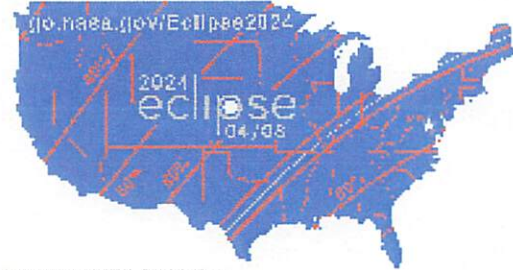
The left image is a highly processed composite, assembled using a multitude of images. One may expect to see something like this; however, it is unrealistic for direct viewing. Credit: S. Habbel, M. Druckmüller, and P. Aniol. The right image is more representative of what you could expect to see if you were in the path of totality. Credit: NASA/Nat Gopalswamy. We suggest taking in this awe-inspiring moment without a device in front of you.

MAKE YOUR OWN ECLIPSE PROJECTOR



Credit: NASA

You can make this simple eclipse projector with almost any cardboard box, paper, tape, and foil. The longer the distance from the pinhole to screen, the larger the image of the Sun will be.



Credit: NASA HEAT/J. Patrick Haas

Pinhole projectors allowed early scientists to view the shapes of illuminated objects, like the Sun, by shining the light from the object through a very small hole, projecting the image of the object onto the ground, wall, or other flat surface. These are a great method for safe solar viewing. Be sure that when using, the Sun is always behind you. Explore the 2D paper cut and 3D printed versions of the total eclipse pinhole projectors and activity. **Find More:** nasa3d.arc.nasa.gov/detail/usa-eclipse-2024



Find More: go.nasa.gov/HelioBigYear

Learn more about the Heliophysics Big Year: October 2023 to December 2024



Find More: go.nasa.gov/Eclipse2024

Updated resources for eclipse safety, NASA science, and history.

**Monday
April 8th,
2024**



HARKER HEIGHTS SOLAR ECLIPSE

Stewart C. Meyer Harker Heights Public Library
400 Indian Trail, Harker Heights, TX 76548 | Phone: 254-953-5491

2024 TOTAL SOLAR ECLIPSE

The City of Harker Heights will experience a Total Solar Eclipse on Monday, April 8th, 2024 with peak totality beginning around 1:38 PM and lasting about 4 minutes. Learn how you can prepare !

What is a Total Solar Eclipse?

A total solar eclipse happens when the Moon passes between the Earth and the Sun, and it **completely** blocks the Sun from view for a brief amount of time. This creates a shadow on Earth. A total solar eclipse can only be experienced if you are located in a place on Earth that is in the Moon's dark **umbral shadow**, or the innermost and darkest part of the shadow.

How to Safely View a Total Eclipse

Looking directly at the Sun during a solar eclipse is unsafe and can cause serious eye damage. To safely view the uneclipsed or partially eclipsed Sun, use special-purpose solar filters like "eclipse glasses" or hand-held solar viewers that meet the ISO 12312-2 international standard. Homemade filters or regular sunglasses, even very dark ones, are not safe for solar viewing.

DO NOT

- Look at the uneclipsed or partially eclipsed Sun through an unfiltered camera, telescope, binoculars, or any optical device.
- Use your eclipse glasses or hand-held solar viewer while looking at the Sun through a camera, telescope, binoculars, or any other optical device. The concentrated solar rays can damage the filter and cause serious injury to your eyes.

If you are in the path of totality, you may remove your solar filter only when the Moon completely covers the Sun's bright face and it becomes dark. Experience totality safely, and as soon as the bright Sun starts to reappear, put your solar viewer back on to observe the remaining partial phases.



CITIZEN SCIENCE

Everyone in the community can become a scientist!

Download the Globe Observer App to participate in various Earth science research activities.

Observe clouds, take air temperature readings & more!

Scan the QR Code for more.



ECLIPSE SOUNDSCAPES



This [NASA Citizen Science](#) project is studying how eclipses affect life on Earth.

Help scientist with their mission by becoming an Apprentice or an Observer!

Scan the QR Code to learn more.



CITY OF HARKER HEIGHTS ECLIPSE WEBSITE

View the City's new Eclipse Website at www.harkerheights.gov/eclipse, or scan the QR Code, for updates about

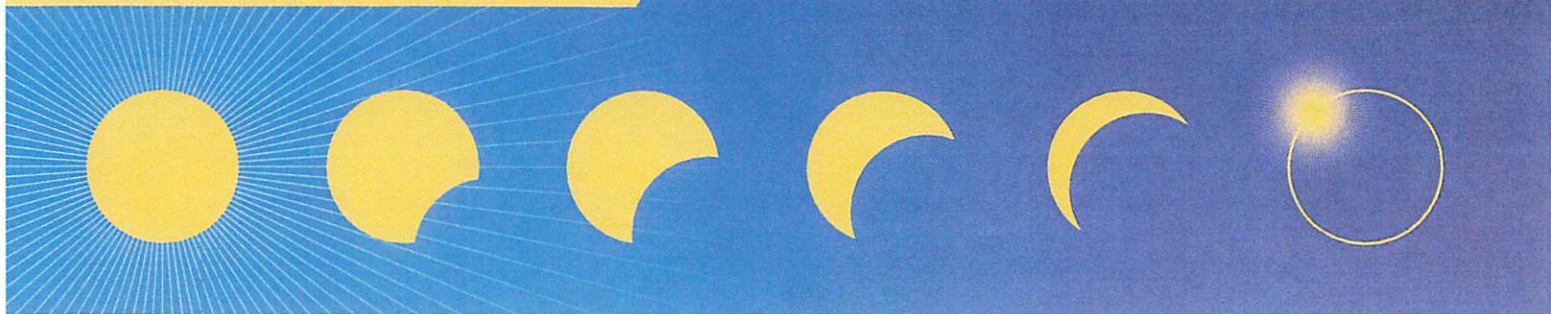
Safety Tips
Programs
Events
Solar Eclipse Live Streams



Register for direct notification about the eclipse and other events at www.harkerheights.gov/stay-informed

The Sun drives many processes in Earth's atmosphere.

National Aeronautics and Space Administration



Air Temperature

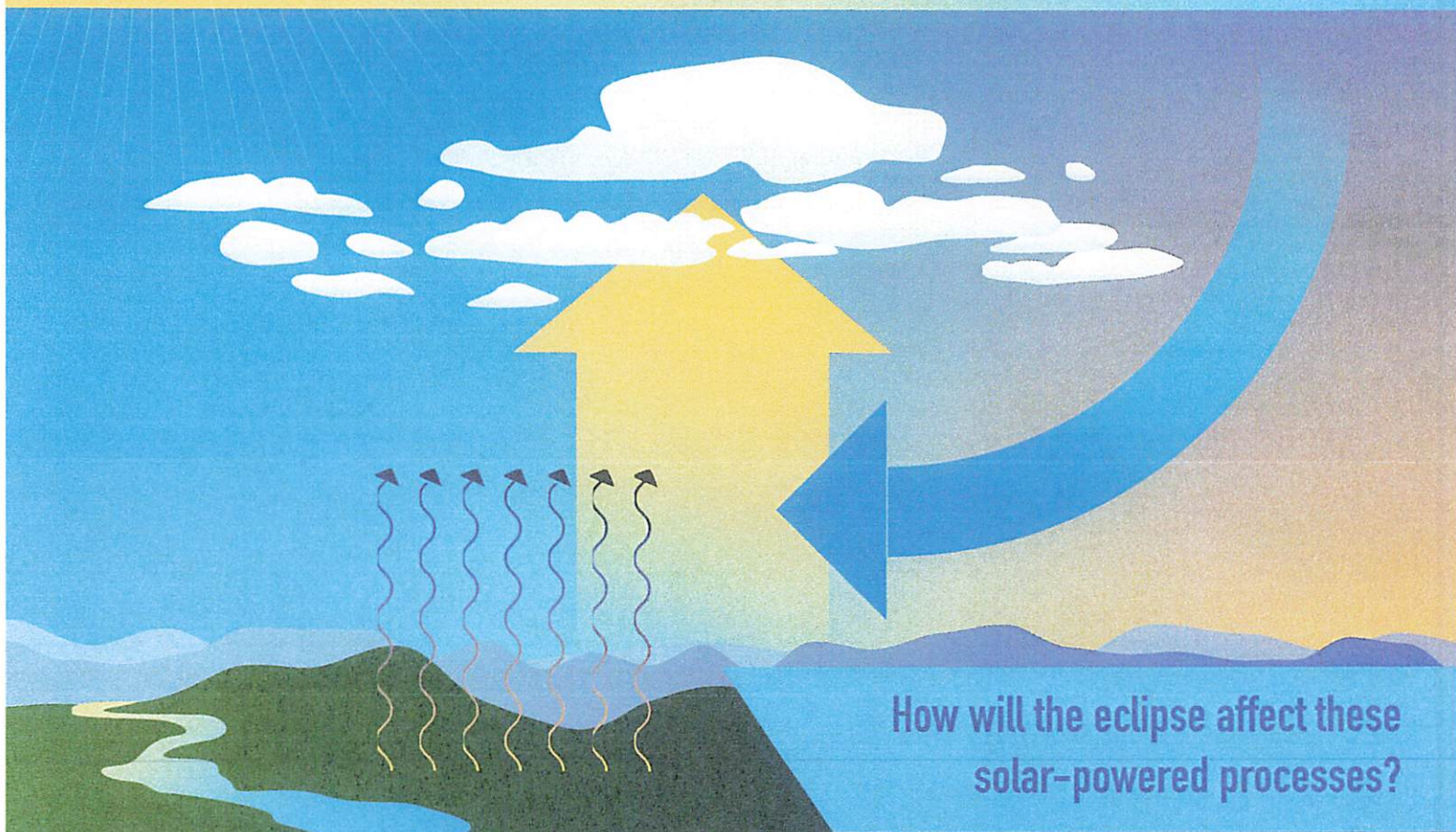
Energy from the Sun warms the surface of the Earth. Warmth from the Earth's surface heats the surrounding air, causing it to rise.

Clouds

Warm air cools as it rises, and water vapor condenses into puffy cumulus clouds.

Wind

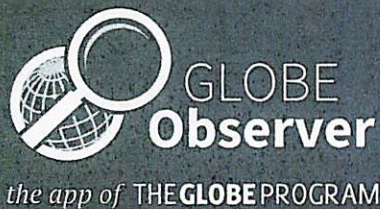
Changes in temperature drive differences in air pressure, causing wind to form.



How will the eclipse affect these solar-powered processes?

Share your eclipse observations using the GLOBE Observer app. Learn more at observer.globe.gov/eclipse

nasa.gov



Energy from the Sun warms our planet, and changes in sunlight can also cause changes in temperature, clouds, and wind. What happens when the Sun is blocked by the Moon during an eclipse? How will the eclipse affect these solar-powered processes?

Air Temperature

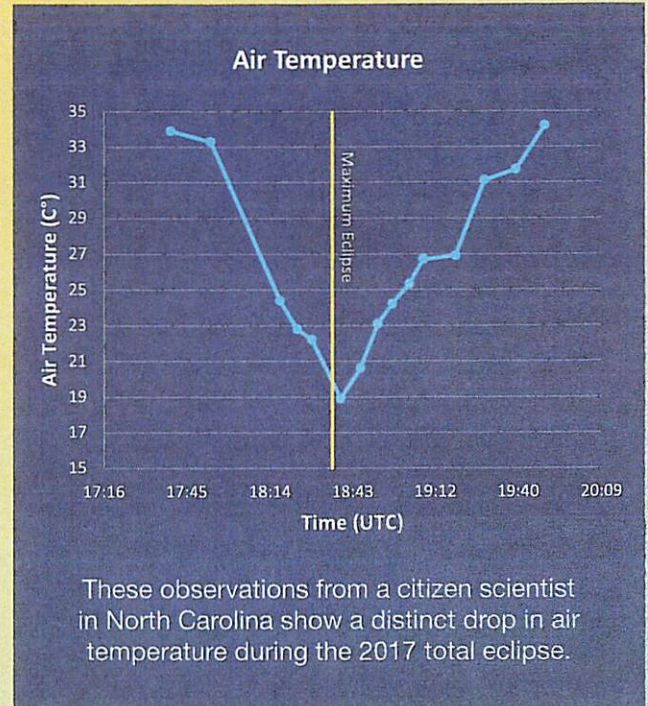
In general, during an eclipse when sunlight is blocked, the air temperature will go down. The amount of the drop can depend on factors such as cloud cover, humidity, passing cold or warm air fronts, vegetation, and local geography.

Clouds

Clouds form when air cools and water vapor condenses. However, the reason for that cooling can vary. One type of cloud formation is through convection, when the sun-warmed surface heats the air and causes it to rise, cool, and condense into clouds. We often call these “fair weather clouds,” and consist primarily of small cumulus clouds. Since the eclipse will affect the heating of the ground, this is the type of cloud we expect to be most affected by an eclipse. Clouds formed by other processes may change less during an eclipse.

Wind

Wind forms when air moves from an area of high pressure to low pressure. Differences in temperature drive differences in pressure that lead to wind. So, as the eclipse affects the temperature of the air and surface, we can expect to see changes in wind speed and direction. However, there are also many other factors involved, such as the surface type, vegetation, and the geography of the area.



Do Eclipse Science with NASA

If it seems that studying weather is complicated, it is! This is why we want your help to collect observations during the eclipse and document the impacts on the atmosphere.

Learn more about the GLOBE Observer app, and explore other opportunities to collect data at observer.globe.gov/eclipse.

Use the GLOBE Observer app to:

- Document clouds as the eclipse progresses
- Report the land cover and surface conditions at your observation site
- Record changing air temperature with a simple meteorological thermometer
- Photograph a wind flag to show changes in wind
- Add field notes and comments about your experiences during the eclipse

With additional GLOBE training, you can:

- Report changes in surface temperature using an infrared thermometer
- Share weather station data, including wind speeds and other atmospheric measurements

Check out additional NASA citizen science opportunities, like [Eclipse Soundscapes](#). With Eclipse Soundscapes, you can document changes in animal behavior and sounds during the eclipse.

NEVER LOOK DIRECTLY AT THE SUN! Learn more at solarsystem.nasa.gov/eclipses/safety

Air Temperature Data Sheet

National Aeronautics and
Space Administration



Use this data sheet to record air temperature measurements during the total solar eclipse on April 8, 2024. All you need is a thermometer that measures air temperature. You do not need to be within the path of totality to collect data.

Eclipse Planner

You can look up the percent coverage, eclipse type, and times by scanning the QR code or going to eclipsesoundscapes.org/eclipse-lookup-tool.



Coverage:

- Eclipse Type: Total
 Partial

Start:

Max:

End:

Thermometer Set-Up

Place your thermometer in a shaded, but well-ventilated area. For example, you can place your thermometer under a chair or hold it in your own shadow. Be sure to hold the thermometer away from yourself or other sources of heat.

Thermometer Type:

- Liquid Filled
- Digital
- Weather Station
- Other:

Units:

- Fahrenheit
- Celsius

Site Description

You can find the coordinates of your site in decimal degrees by dropping a pin in a mapping application. Write a short description of your site, paying particular attention to features that might affect the temperature.

Latitude:

Longitude:

Time Zone:

Description:

Safety First: Looking directly at the Sun without proper eye protection is unsafe EXCEPT when the Moon completely blocks the Sun. This happens ONLY within the narrow path of totality. Outside the path of totality, it is NEVER safe to look directly at the Sun without a solar filter.

To share your observations, scan or take legible photos of both pages and email them to globeobserverhelp@lists.nasa.gov.

www.nasa.gov



Air Temperature Measurements

Your data is most useful to scientists if you record observations through all phases of the eclipse (about two hours before and after maximum eclipse); however, this is not a requirement. We recommend observing every 10 minutes for the first and last 1.5 hours and increasing the frequency to every 5 minutes in the 30 minutes before and after maximum eclipse. Take a break during maximum eclipse to enjoy this incredible experience!

Time	Temp.	Time	Temp.	Time	Temp.	Time	Temp.

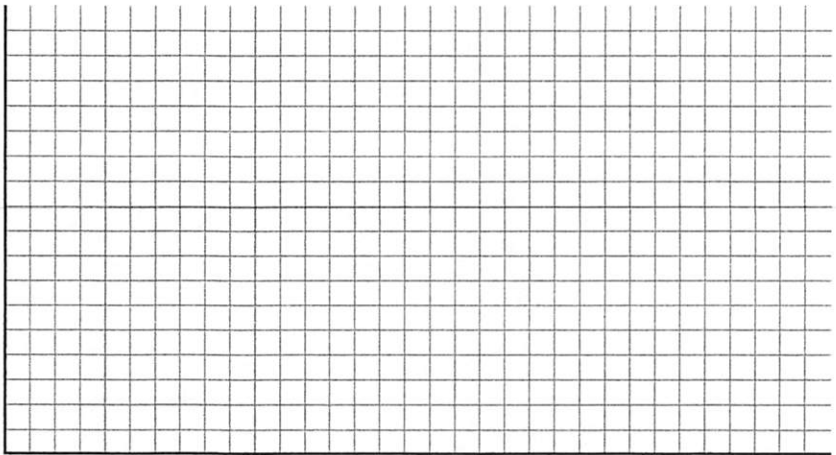
Graph Your Data

Use this space to create a line graph of your data after the eclipse.

Indicate when maximum eclipse occurred.

What do you notice about the temperature before and after maximum eclipse?

Temperature



Time

How to Safely View the April 8, 2024, TOTAL SOLAR ECLIPSE

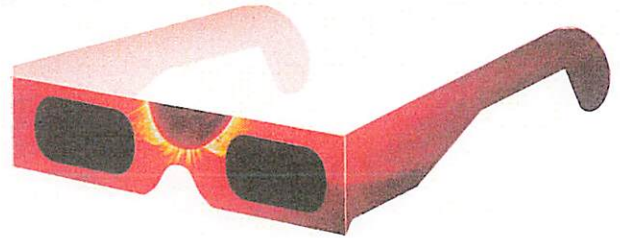
A solar eclipse occurs when the Moon blocks any part of the Sun. On Monday, April 8, 2024, a solar eclipse will be visible in North and Central America, as well as parts of Europe and South America. All 50 U.S. states (excluding most of Alaska) will have a chance to see at least a partial solar eclipse. In a narrow track across Mexico, the U.S. from Texas to Maine, and Canada from Ontario to Newfoundland, the Moon will completely cover the Sun's bright face, producing a spectacular total solar eclipse.



A total solar eclipse is about as bright as a full Moon — and just as safe to look at. But the Sun at any other time is dangerously bright. View it only through special-purpose solar filters that comply with the transmittance requirements of the ISO 12312-2 international standard for filters for direct solar viewing.

Protect Your Eyes

- Looking directly at the Sun without proper eye protection is unsafe EXCEPT during the brief total eclipse phase (“totality”). This happens ONLY within the narrow path of totality. At all other times, it is safe to look directly at the Sun ONLY through special-purpose solar filters, such as “eclipse glasses,” that comply with the transmittance requirements of the ISO 12312-2 international standard. Ordinary sunglasses, even very dark ones, are not safe for looking at the Sun.
- If you are inside the path of totality on April 8, 2024, remove your solar filter ONLY when the Moon completely covers the Sun's bright face. As soon as the Sun begins to reappear, replace your solar filter to look at the remaining partial phases.
- Outside the path of totality, there is NO TIME when it is safe to look directly at the Sun without using a solar filter that complies with the transmittance requirements of the ISO 12312-2 international standard.



Instructions for the Safe Use of Solar Filters and Viewers

- Always inspect your solar filter before use; if scratched, punctured, torn, or otherwise damaged, discard it. Read and follow any instructions printed on or packaged with the filter.
- Always supervise children using solar filters.
- If you normally wear eyeglasses, keep them on. Put your eclipse glasses on over them or hold your handheld viewer in front of them.
- Stand still and cover your eyes with your eclipse glasses or solar viewer before looking at the bright Sun. After looking at the Sun, turn away and remove your filter – do not remove it while looking at the Sun.
- Do not look at the uneclipsed or partially eclipsed Sun through an unfiltered camera, telescope, binoculars, or other optical device. Do not do so even while wearing eclipse glasses or using a handheld solar viewer in front of your eyes – the concentrated solar rays could damage the filter and enter your eyes, causing serious injury.
- Solar filters must be securely attached to the front of any telescope, binoculars, or camera lens. Seek expert advice from an astronomer before using a solar filter with a camera, telescope, binoculars, or any other optical device.



What If You Don't Have a Safe Solar Filter or Viewer?

Another method for safe viewing of the partially eclipsed Sun is indirectly via pinhole projection. For example, with your back to the Sun, cross the outstretched, slightly open fingers of one hand over the outstretched, slightly open fingers of the other, creating a waffle pattern. In your hands' shadow on the ground, the spaces between your fingers will show the Sun as crescents.

A solar eclipse is one of nature's grandest spectacles. By following these simple rules, you can safely enjoy the view and be rewarded with memories to last a lifetime. For more information about eye safety and the eclipse, visit <https://eclipse.aas.org/eye-safety>.

This safety information has been endorsed by the American Astronomical Society, the National Aeronautics and Space Administration, the National Oceanic and Atmospheric Administration, the U.S. National Science Foundation, the American Academy of Ophthalmology, the American Academy of Optometry, and the American Medical Association.



Cómo ver de forma segura el ECLIPSE SOLAR TOTAL del 8 de abril de 2024

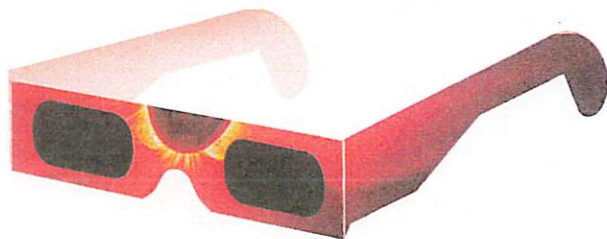
Un eclipse solar ocurre cuando la Luna bloquea cualquier parte del Sol. El lunes 8 de abril de 2024, un eclipse solar será visible en América del Norte y Central, así como en partes de Europa y América del Sur. Los 50 estados de Estados Unidos (excluyendo la mayor parte de Alaska) tendrán la oportunidad de ver al menos un eclipse solar parcial. En un estrecho recorrido a través de México, Estados Unidos desde Texas hasta Maine y Canadá desde Ontario hasta Terranova, la Luna cubrirá completamente la cara brillante del Sol, produciendo un espectacular eclipse solar total.



Un eclipse solar total es tan brillante como una luna llena, e igual de seguro de observar. Pero en cualquier otro momento, el Sol es peligrosamente brillante. Míralo solo a través de filtros solares especiales para ese propósito que cumplan con los requisitos de transmisión de la norma internacional ISO 12312-2 para filtros de observación directa del Sol.

Protege tus ojos

- Mirar directamente al Sol sin la protección ocular adecuada no es seguro, EXCEPTO durante la breve fase del eclipse total (la "totalidad"). Esto ocurre SOLO dentro del estrecho camino de la totalidad. En cualquier otro momento, SOLO es seguro mirar directamente al Sol a través de filtros solares especiales para ese propósito, como los "anteojos para eclipses", que cumplen con los requisitos de transmisión de la norma internacional ISO 12312-2. Las gafas de sol comunes, incluso las muy oscuras, no son seguras para mirar el Sol.
- Si estás dentro del camino de la totalidad el 8 de abril de 2024, puedes quitarte el filtro solar SOLO cuando la Luna cubra completamente la cara brillante del Sol. Tan pronto como el Sol comience a reaparecer, vuelve a colocarte el filtro solar para ver las fases parciales restantes.
- Fuera de la trayectoria de la totalidad, NO HAY NINGÚN MOMENTO en el que sea seguro mirar directamente al Sol sin usar un filtro solar que cumpla con los requisitos de transmisión de la norma internacional ISO 12312-2.



Instrucciones para el uso seguro de filtros y visores solares

- Examina siempre tu filtro solar antes de usarlo; no lo uses si está rayado, perforado, rasgado o dañado. Lee y sigue las instrucciones que vienen impresas o empaquetadas con el filtro.
- Siempre debes supervisar a los niños cuando utilicen filtros solares.
- Si normalmente usas anteojos, mantenlos puestos. Ponte tus anteojos para eclipses sobre ellos o sostén tu visor manual frente a ellos.
- No te muevas y cúbrete los ojos con tus anteojos para eclipses o tu visor solar antes de mirar hacia el Sol brillante. Después de mirar al Sol, date vuelta en dirección opuesta al Sol y quítate el filtro; no te lo quites mientras estás mirando al Sol.
- No mires al Sol sin eclipsar o parcialmente eclipsado a través de una cámara, telescopio, binoculares u otro dispositivo óptico que no tenga filtro. No lo hagas incluso mientras usas anteojos para eclipses o mientras tienes un visor solar manual frente a los ojos: los rayos solares concentrados podrían dañar el filtro y entrar en tus ojos, causando lesiones graves.
- Los filtros solares deben estar sujetos de forma segura a la parte frontal de cualquier telescopio, binoculares o la lente de una cámara. Busca el consejo experto de un astrónomo antes de usar un filtro solar con una cámara, telescopio, binoculares o cualquier otro dispositivo óptico.



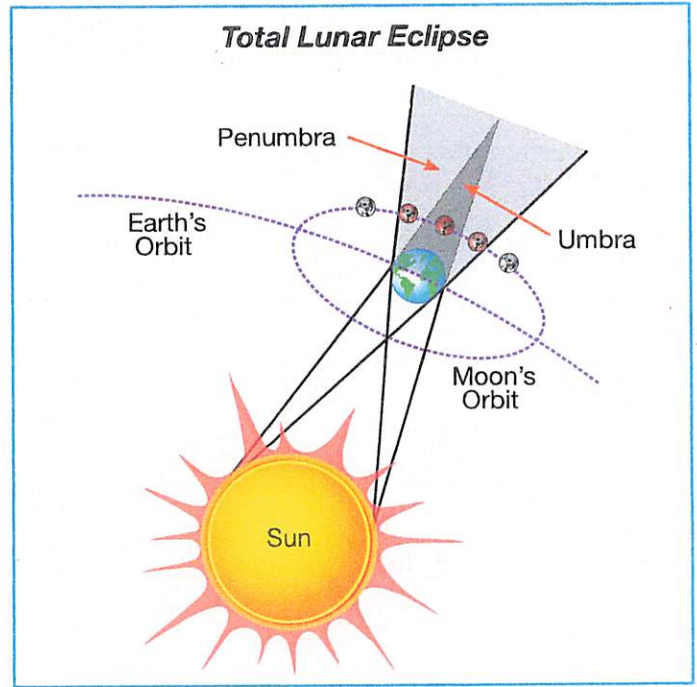
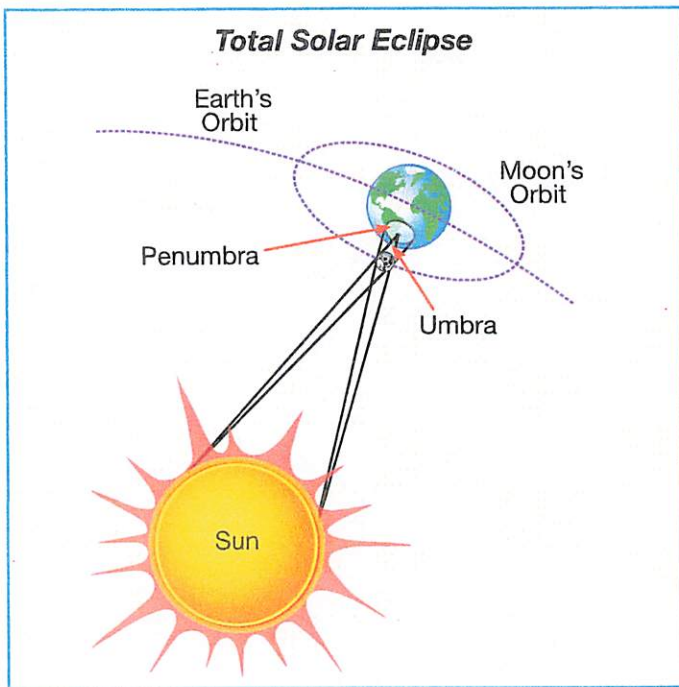
¿Qué pasa si no tienes un filtro o visor solar seguro?

Otro método para la observación segura del Sol eclipsado parcialmente es de forma indirecta mediante la proyección estenopeica (con agujero). Por ejemplo, mientras das la espalda al Sol, cruza los dedos extendidos y ligeramente abiertos de una mano sobre los dedos extendidos y ligeramente abiertos de la otra, creando un patrón de rejilla, como un *waffle*. A la sombra de tus manos en el suelo, los espacios entre tus dedos mostrarán el Sol como medias lunas.

Un eclipse solar es uno de los espectáculos más grandiosos de la naturaleza. Al seguir estas reglas sencillas, puedes disfrutar de la vista de forma segura y ser recompensado con recuerdos para toda la vida. Para obtener más información sobre la seguridad ocular y el eclipse, visita la página (en inglés): <https://eclipse.aas.org/eye-safety>.

Esta información de seguridad ha sido respaldada por la Sociedad Astronómica Estadounidense, la Administración Nacional de Aeronáutica y el Espacio, la Administración Nacional Oceánica y Atmosférica, la Fundación Nacional para las Ciencias de Estados Unidos, la Academia Estadounidense de Oftalmología, la Academia Estadounidense de Optometría y la Asociación Médica Estadounidense.





Credit: E. DeVore, SETI Institute

Annular Eclipses:

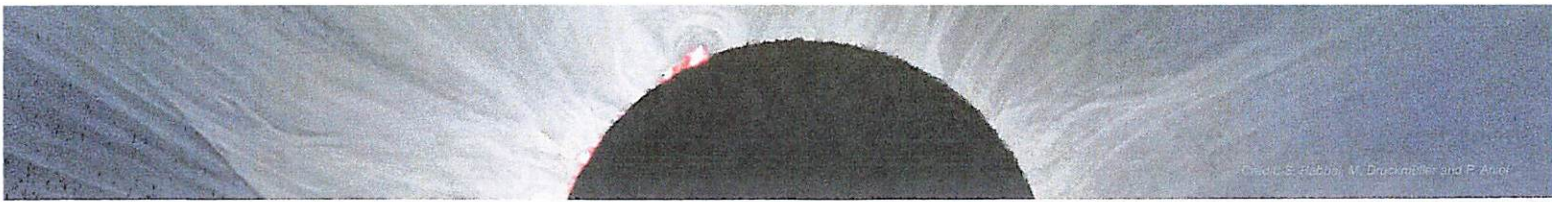
The moon's orbit is elliptical. On average, it is about 240,000 miles from Earth, but it can be as far as 251,900 miles (maximum distance), and as close as 225,300 (minimum distance). If the solar eclipse occurs when the moon is far from the Earth (near the maximum distance), the moon will not fully 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.

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. Like red skies at sunset, the Earth's atmosphere bends the redder (longer wavelength) light into the Earth's shadow. (The other colors are scattered by the atmosphere.) During lunar eclipses, the moon is illuminated with this red light. 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 because the moon is actually dimmer during the lunar eclipse than when it is full and outside Earth's shadow.

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.



Credit: S. Habbu, M. Driscoll and P. Aniol

10. WAXING AND WANING: PHASES OF THE MOON AND ECLIPSES

A Bit of History:

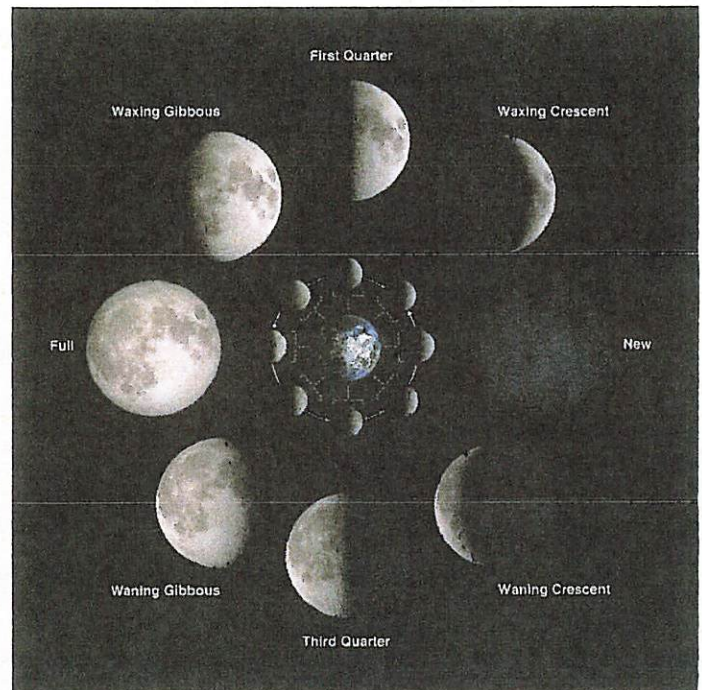
People have watched the moon go through its predictable phases from full to new and back again for tens of thousands of years. We don't know who first understood and described the reasons for the phases of the moon. We do have evidence that people followed and recorded the phases of the moon as much as 30,000 years ago through lunar calendars where notches and holes were carved into sticks, reindeer bones and mammoth tusks. In this activity, you will create a model of the sun—Earth—moon system and demonstrate the changing phases of the moon.

Materials: (you provide)

- 20 moon balls
- 20 pencils, skewers or other short sticks
- The sun as a single light bulb in a lamp without a shade (or a bright flashlight)
- Darkened room
- Masking or duct tape to tape down the lamp cord (safety)

Get Ready:

- Set up the lamp in the middle of the room. This is the sun. Tape the cord to the floor to avoid tripping hazard. Alternative: One person holds a flashlight, and is the sun.
- Give each person a moon ball, and pencil, skewer or stick. Mount the ball on the pencil, and form a circle around the lamp.
- Each person's head is the Earth, and each person holds up the moon ball at arm's-length.



Phases of the moon

Credit: NASA/Bill Dunford
<http://solarsystem.nasa.gov/galleries/phases-of-the-moon>

Eclipse Essentials: Safe and Stylish Solar Viewing Glasses

Next Generation Science Standard MS.ESS1-1 - Develop and use a model of the Earth-Sun-Moon system to describe the cyclic patterns of lunar phases, eclipses of the Sun and Moon, and seasons.

Overview:

Keep solar viewing safe, easy, and fun with this hands-on, art-infused, 25- to 30-minute activity for audiences of all ages. Engage learners in the wonders of solar viewing by having them personalize their solar viewing glasses.

Materials:

- ❑ Solar Viewing Glasses (ISO 12312-2 Safety Standard)
- ❑ Paper Plate or Cardstock
- ❑ Pen or Pencil
- ❑ Scissors
- ❑ Tape
- ❑ Optional Supplies: Hole puncher, stapler, ruler, markers, crayons, glitter glue, feathers, adhesive gemstones, stickers, ribbon, etc.



Credit: NASA HEAT/Shannon Reed

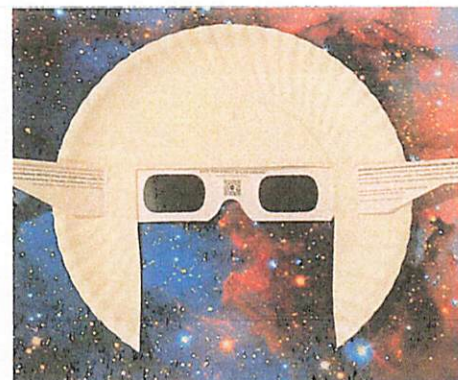
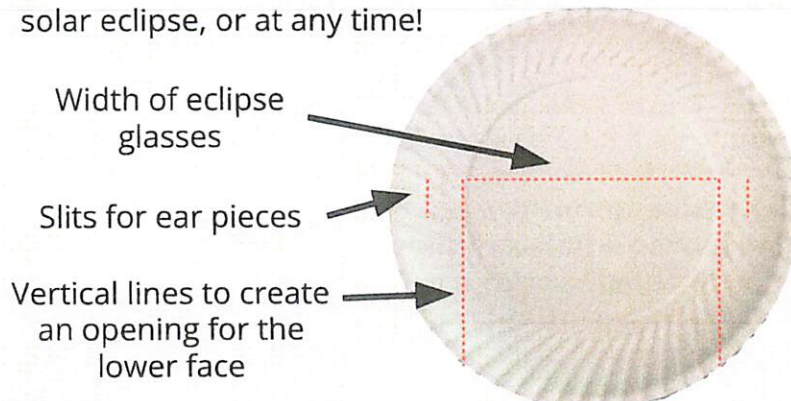
Steps:

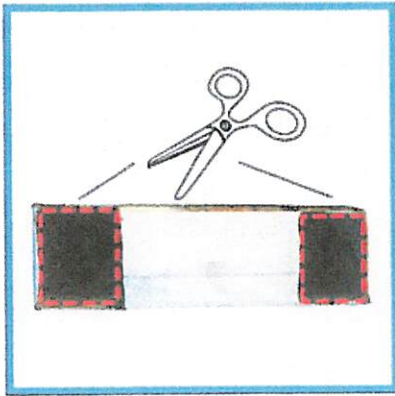
1. Use the glasses as a template to mark the score lines on the paper plate or cardstock, following the guidelines shown in the diagram below.
2. Cut along the score lines and make the two slits for the ear pieces to slide into.
3. Slide the earpieces into each slit and adhere the glasses to the plate/cardstock by taping along the inside of the ear piece slits and where the back of the glasses and plate meet.
4. Optional: Modify your design to make a crown, flowers, or any shape of your choice.
5. Observe! Use the glasses to safely observe the Sun during a solar eclipse, or at any time!

Note: Decorating the paper plate or cardstock is optional.

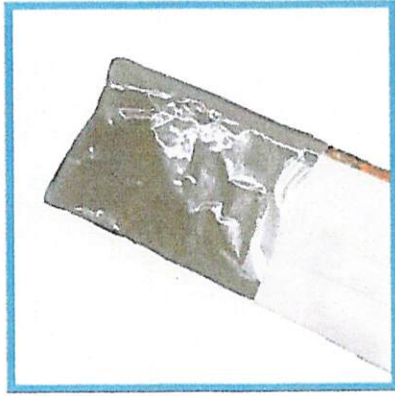
Have learners decorate the plates prior to inserting the glasses, or protect the lenses of the eclipse glasses by covering them with paper while decorating.

Do not view the Sun with damaged or scratched lenses.





1. On one short side of your box, cut two holes with your scissors or craft knife. If necessary, secure this side of the box with tape to hold it together after cutting.



2. Cover one of the holes with foil and secure it with tape.



3. Poke a small hole in the center of the foil using a pen, pencil, or other small pointy object.

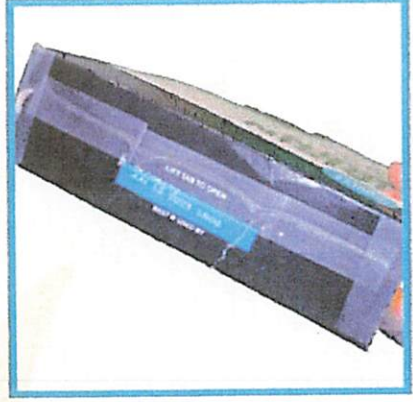
Cereal Box Viewer



4. Using the short side of your box as a guide, trim a strip of white paper so that it is slightly smaller than the short side of the box. This will ensure that your piece of paper fits into the inside of your box without getting crumpled.



5. Tape your strip of white paper inside the short edge of the box opposite from the side you cut the holes in step 1.



6. Seal this end of the box with tape along all edges. This will help prevent light from leaking into your eclipse viewer.

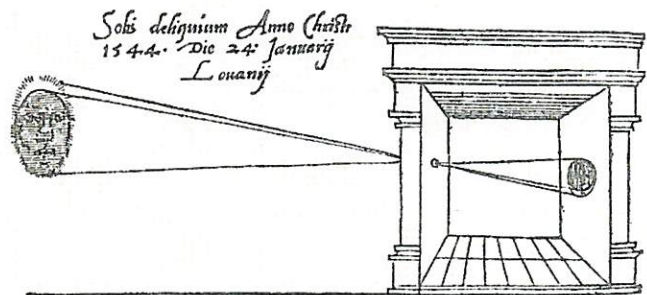


13. MAKE AN ECLIPSE VIEWER

What Is This About?

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 build a simple pinhole projector to help you see an image of the sun, safely.

“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.



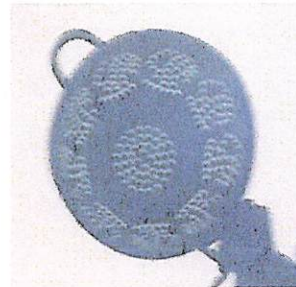
Credit: Gemma Frisius, *De Radio Astronomica et Geometrica*, 1545.

Materials: (you provide)

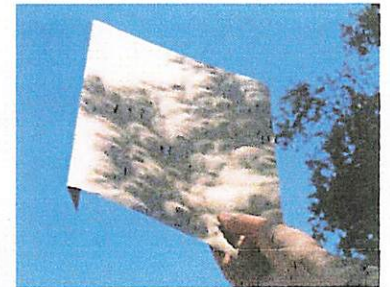
- Cardboard box: carton, cereal box, shoe box. The longer the box, the larger the image of the sun.
- Scissors or box knife
- Masking or transparent tape
- 1 piece of white paper
- Pin
- Duct (opaque) tape, as needed.

Try These:

During an eclipse of the sun, any small hole will make an image of the sun. Here's some other fun ways to project images of the sun during partial eclipses.



Colander



Leaves

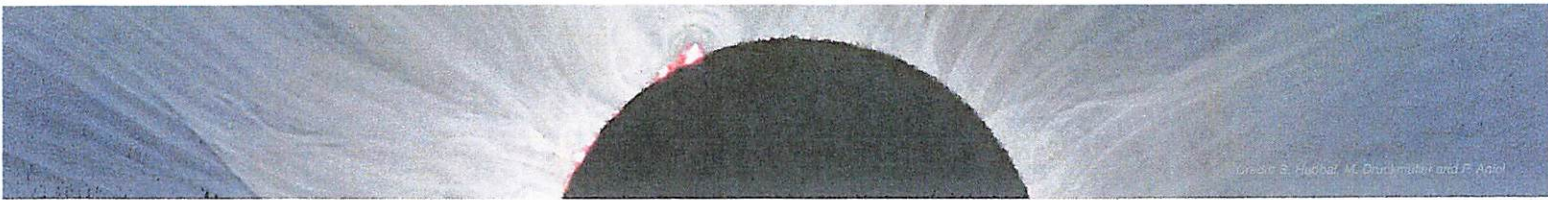
Space Science Tie-In:

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.



Crossed fingers

Credit: Public domain (top) and R.T. Fienberg (bottom)



Credit: S. Hubbel, M. Drachmiller and F. Apsel

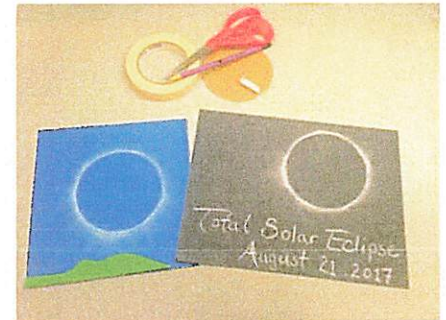
14. ECLIPSE CHALK ART

What Is This About?

Observing a total solar eclipse can be an exciting, once in a life time experience! Long before there were cameras or telescopes, eclipse watchers recorded what they saw in the sky in words, drawings, and paintings. You can have fun creating your own picture of a solar eclipse with chalk and paper!

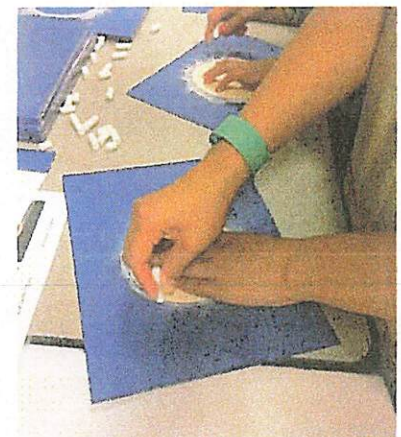
Materials: (you provide)

- Paper, dark blue or black. Smooth cardstock paper works best (not construction paper).
- White, non-toxic chalk
- Pencil
- Scissors
- Masking tape
- Circle templates cut from cardstock, file folders or cereal boxes
- OPTIONAL: Brightly colored construction paper or foam sheets for cut-out horizon detail.



To Do:

- Make circle templates on stiff paper. Trace around the masking tape roll with a pencil, and cut out the template. Make several for group activities.
- Place the template on a piece of dark paper. Secure with a loop of masking tape or simply hold down with one hand.
- Draw a thick circle of chalk around the template. Go around 2 or 3 times. It does not need to be neat.
- Holding the template in place, smudge the chalk away from the center of the circle using a finger to create the corona of the sun.
- When you are done smudging, remove the circle template.
- Add words, pictures, or fun designs.
- You've made total solar eclipse art!



Credit: J. Henricks, Girl Scouts of Northern California

Space Resources

Songs:

Solar System Song by Planet Custard Songs for Children

<https://www.youtube.com/watch?v=0A8Yq1s598A>

8 Planets in the Solar System

<https://www.youtube.com/watch?v=mQrlgH97v94>

The Planets song

<https://www.youtube.com/watch?v=noiwY7kQ5NQ>

8 Planets Go Round and Round

<https://www.youtube.com/watch?v=Ae2WlLpICUc>

8 Planets by Pink

<https://www.youtube.com/watch?v=Syx3oMa-od4>

Videos:

National Geographic Solar System 101

<https://www.youtube.com/watch?v=libKVRa01L8>

Our Solar System

<https://www.youtube.com/watch?v=Qd6nLM2QIWw>

Eclipses for Kids

<https://www.youtube.com/watch?v=Cca5DaNs98w>

Lunar Eclipse by Dr. Binco

<https://www.youtube.com/watch?v=LH-aSizsx1o>

What is a Solar Eclipse? By NASA

https://www.youtube.com/watch?v=hyf5JF_VxwM

Space Fingerplays

We'll Be Orbiting Around the Sun

(To the tune of "She'll Be Coming Round the Mountain")

We'll be orbiting around the sun – yes we will

We'll be orbiting around the sun – yes we will

We'll be orbiting around the sun, we'll be orbiting around the sun,

We'll be orbiting around the sun – yes we will.

(Change out "sun" for "earth," "moon," etc.)

Four Little Rockets

Four little rockets winking at me.

One shot off and then there were three!

Three little rockets with nothing to do.

One shot off, and then there were two!

Two little rockets afraid of the sun.

One shot off, and then there was one!

One little rocket alone is no fun.

It shot off, and then there was none!

I'm a Little Rocket

I'm a Little Rocket (Child Squats)

Pointing Towards the sky (Points a finger upward)

4....3...2...1... (repeats slowly)

Blast off! Fly! (Springs into the air)

Rocket Launching

(To the tune of "Are you sleeping")

Rocket launching

Rocket launching

To the sky

To the sky

Very, very fast

Very, very fast

Way up high

Way up high

If You're Going To the Moon

(To the tune of "If You're Happy and You Know It")

If you're going to the moon, wear your boots.

If you're going to the moon, wear your boots.

If you're going to the moon, this is what you have to do.

If you're going to the moon, wear your boots.

(Substitute suit, gloves, helmet for boots.)

In the Sky

(To the tune of "Farmer In the Dell")

The sun is in the sky.

The sun is in the sky..

Hot and bright, it shines so bright.

The sun is in space.

The moon is in the sky.

The moon is in the sky.

Round and round the Earth it goes.

The moon is in the sky.

The stars are in the sky.

The stars are in the sky.

Far and bright and out at night.

The stars are in the sky.

Let's Take a Trip to Space

(To the tune of "Farmer In the Dell")

Let's take a trip to space.

Let's take a trip to space.

We'll see the moon, the stars, the sun

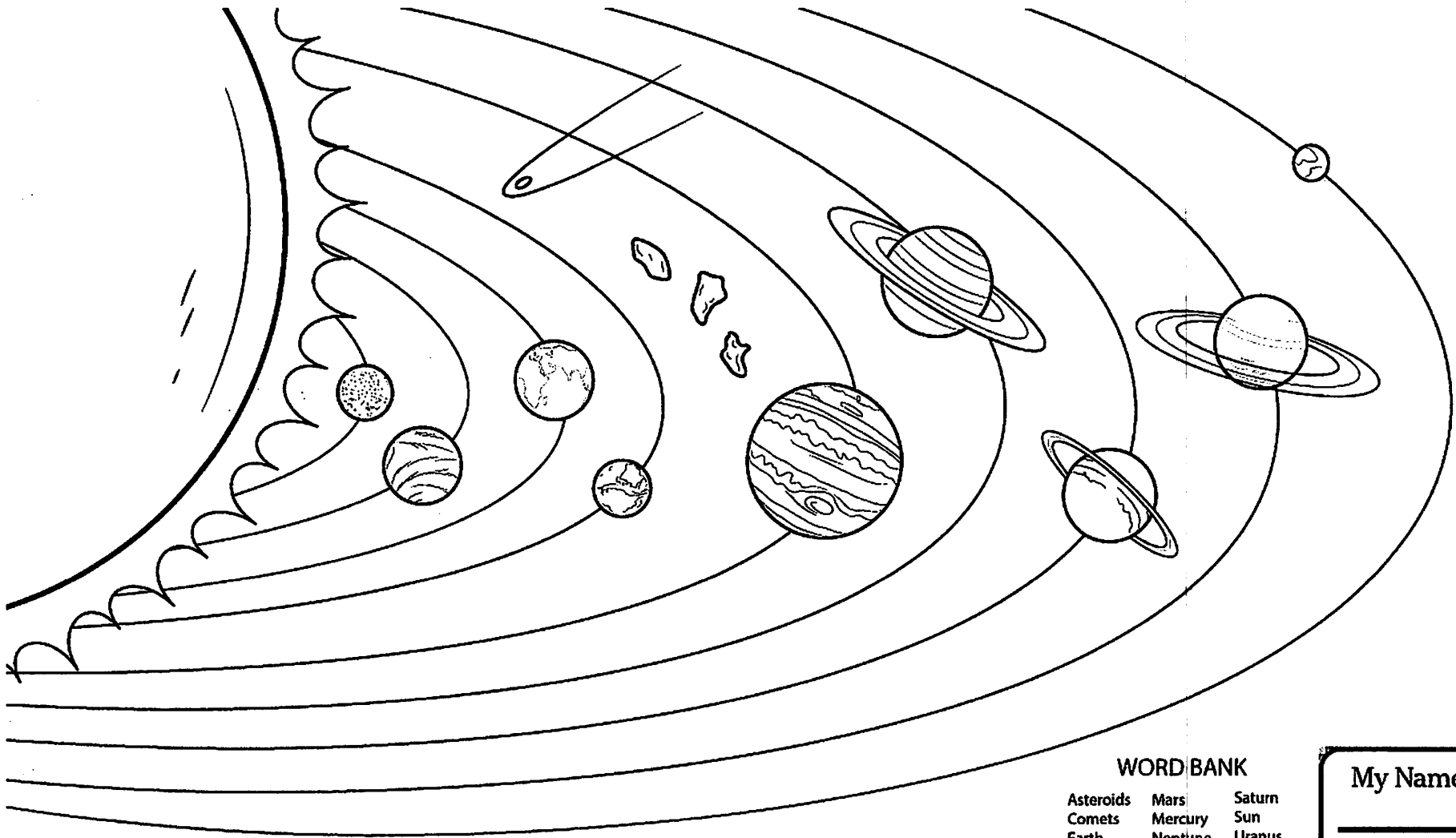
Let's take a trip to space.

In a rocket we will go.

In a rocket we will go.

We'll go so far and travel far.

Let's take a trip to space.

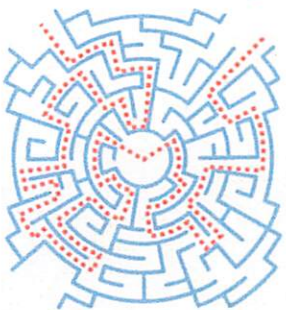


WORD BANK

- | | | |
|-----------|---------|--------|
| Asteroids | Mars | Saturn |
| Comets | Mercury | Sun |
| Earth | Neptune | Uranus |
| Jupiter | Pluto | Venus |

My Name

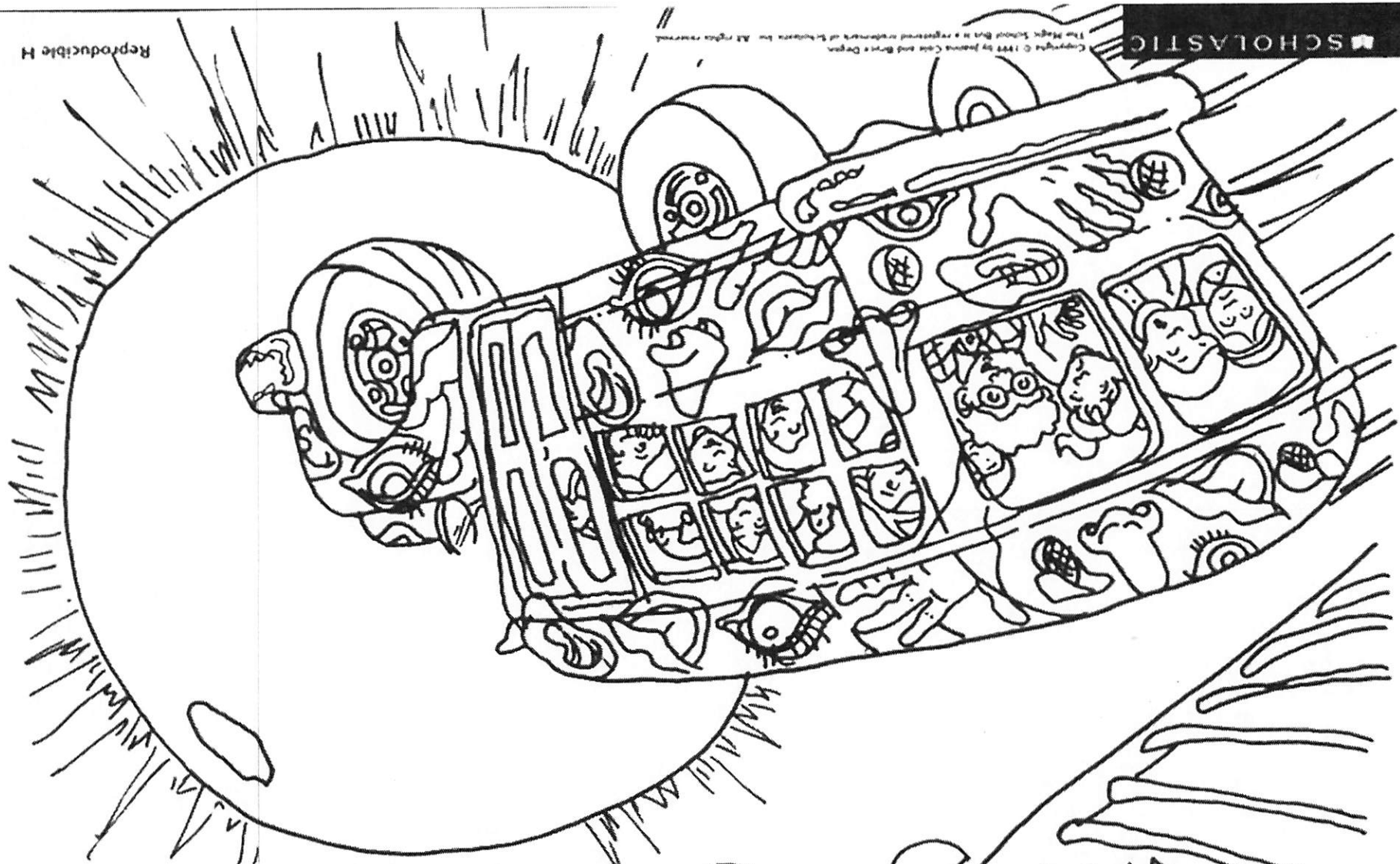
Help Checkers and Snoozer go to the Moon and return to Earth!



ANSWER:



The Magic School Buses



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