

2023-2024 SOLAR ECLIPSES

This school year Fort Worth, Texas will get to experience TWO SOLAR ECLIPSES! We will see 87% coverage in October 2023. Next we will experience a rare Total Solar Eclipse with 100% coverage in April 2024. Totality will happen just before 1:41 p.m. CDT. If you're downtown, you'll see about 2m 30s of totality, which is very respectable. You don't want your students to miss these mesmerizing astronomical events!



ANNULAR SOLAR ECLIPSE
October 14th, 2023

TOTAL SOLAR ECLIPSE
April 8th, 2024

Credit: Total eclipse (left): NASA/MSFC/Joseph Matus; annular eclipse (center): NASA/Bill Dunford; partial eclipse (right): NASA/Bill Ingalls

WHAT IS A SOLAR ECLIPSE?

The Moon orbits around the Earth and sometimes the Moon is between the Sun and Earth. When this happens, the Moon blocks the light of the Sun from reaching Earth, causing a solar eclipse. During a solar eclipse, the Moon casts a shadow onto Earth.

THERE ARE THREE MAIN TYPES OF SOLAR ECLIPSES:

Partial solar eclipse: This happens when the Sun, Moon and Earth are not exactly aligned. The Sun appears to have a dark shadow on a small part of its surface.

Annular solar eclipse: An annular solar eclipse happens when the Moon passes between the Sun and Earth while it is at its farthest point from Earth. Because the Moon is farther away from Earth, it appears smaller than the Sun and does not completely cover the star. This creates a "ring of fire" effect in the sky.

Total solar eclipse: A total solar eclipse is visible from a small area on Earth. The sky becomes very dark, as if it were night. For a total eclipse to occur, the Sun, Moon and Earth must be in a direct line.



Since the Moon appears smaller than the Sun during an annular solar eclipse, the Sun peeks out from around the Moon. Credits: NASA



Annular Solar Eclipse

Saturday, October 14, 2023, the annular solar eclipse will cross North, Central, and South America. It will be visible in parts of the United States, Mexico, and many countries in South and Central America.

In the U.S., the annular solar eclipse begins in Oregon at 9:13 a.m. PDT and ends in Texas at 12:03 p.m. CDT.



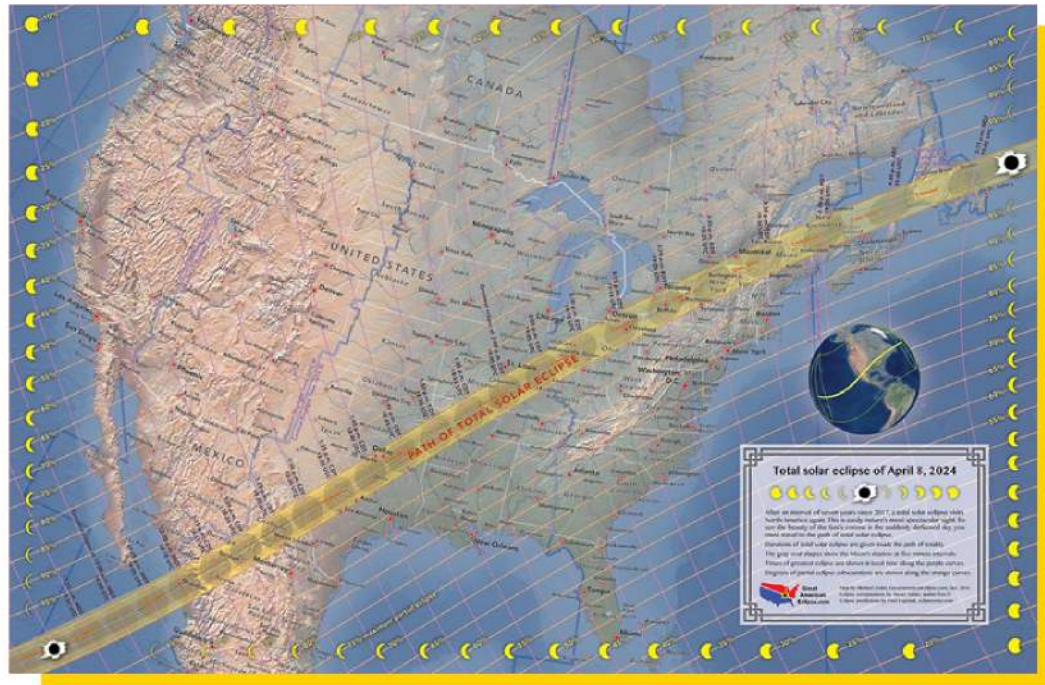
The path of the annular solar eclipse over North America.

Credits: ©2021 Great American Eclipse, LLC,

Total Solar Eclipse

Monday, April 8, 2024, the total solar eclipse will cross North America, passing over Mexico, the United States, and Canada. The total solar eclipse will begin over the South Pacific Ocean. Weather permitting, the first location in continental North America that will experience totality is Mexico's Pacific coast at around 11:07 a.m. PDT.

The path of the eclipse continues from Mexico, entering the United States in Texas with totality around 1:41 p.m., and traveling through Oklahoma, Arkansas, Missouri, Illinois, Kentucky, Indiana, Ohio, Pennsylvania, New York, Vermont, New Hampshire, and Maine.



The path of the total solar eclipse over North America.

Credits: ©2021 Great American Eclipse, LLC,

SAFETY

Safety is the number one priority when viewing a solar eclipse.

Be sure you're familiar with and follow safety guidelines when viewing an eclipse!

1. Except during the brief total phase of a total solar eclipse, when the Moon completely blocks the Sun's bright face, it is not safe to look directly at the Sun without specialized eye protection for solar viewing.



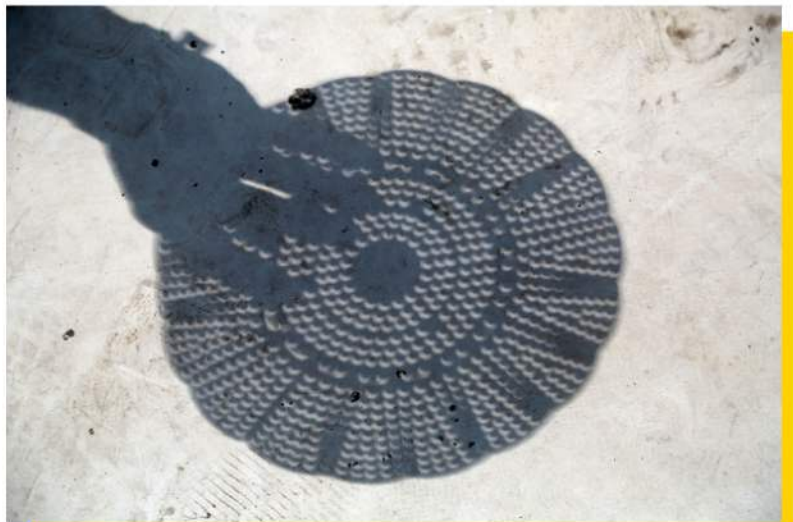
2. Viewing any part of the bright Sun through a camera lens, binoculars, or a telescope without a special-purpose solar filter secured over the front of the optics will instantly cause severe eye injury.

3. When watching the partial phases of the solar eclipse directly with your eyes, which happens before and after totality, you must look through safe solar viewing glasses ("eclipse glasses") or a safe handheld solar viewer at all times. **Eclipse glasses are NOT regular sunglasses**; regular sunglasses, no matter how dark, are not safe for viewing the Sun. Safe solar viewers are thousands of times darker and must comply with the ISO 12312-2 international standard.

4. Always inspect your eclipse glasses or handheld viewer before use; if torn, scratched, or otherwise damaged, discard the device. Always supervise children using solar viewers.

5. Do **NOT** look at the Sun through a camera lens, telescope, binoculars, or any other optical device while wearing eclipse glasses or using a handheld solar viewer — the concentrated solar rays will burn through the filter and cause serious eye injury.

6. If you don't have eclipse glasses or a handheld solar viewer, you can use an indirect viewing method, which does not involve looking directly at the Sun. One way is to use a pinhole projector, which has a small opening (for example, a hole punched in an index card) and projects an image of the Sun onto a nearby surface. With the Sun at your back, you can then safely view the projected image. Do **NOT** look at the Sun through the pinhole!



The circular holes of a colander project crescent shapes onto the ground during the partial phases of a solar eclipse. Credits: NASA

<https://www.fwmuseum.org/explore/noble-planetarium/solar-eclipse/>

CLASSROOM CONNECTIONS

Solar eclipses are captivating astronomical events that provide unique opportunities for learning and wonder. By incorporating these lesson plan ideas into your teaching, you can inspire students to explore the mysteries of the universe and instill a lifelong fascination with science and astronomy. Remember to prioritize safety during eclipse observations and encourage curiosity and exploration among your students!



BEFORE THE ECLIPSE

Introduction to Solar Eclipses: Watch “A Beginners Guide to Eclipses” - <https://youtu.be/n7tnHPDH5d8?si=1HI1zFEBYhqUgPDs> - have students keep a running list of unfamiliar words such as “umbra,” “penumbra,” “corona,” and “totality.” Discuss the different types of solar eclipses, their causes, and the safety precautions necessary for observing them with students and define the unfamiliar words as a whole group.

Solar System and Orbits: Explain how the Earth, Moon, and Sun are connected in the solar system and how their orbits lead to eclipses. Create a hands-on demo; for example, use a flashlight, a ball, and a small object to mimic the Sun, Earth, and Moon, or you can even use student volunteers to represent each, allowing your class to understand the mechanics of an eclipse.

Eclipse Viewing Safety: Educate students on the importance of using proper eye protection, like eclipse glasses, when observing a solar eclipse to prevent damage to their eyes. Refer to the next page of this guide to learn how to build your own pinhole projector!

AFTER THE ECLIPSE

Eclipse Reflections: Have students write reflective essays or create presentations discussing their experiences during the eclipse, including what they saw, felt, and learned! Have students include some questions that they still have after experiencing the eclipse. Have them ask the rest of the class their questions to foster meaningful discussion.

Drawing Diagrams: Have students work together in partners or small groups to illustrate both lunar and solar eclipses, giving students an opportunity to access artistic ability. Encourage them to draw this to scale and be sure to include the umbra and penumbra.

Historical and Cultural Significance: Have students research the historical and cultural significance of eclipses in different societies throughout history or one predicted for the future. They can create reports or presentations detailing the date, location, duration, and unique characteristics and explore myths related to the eclipses.

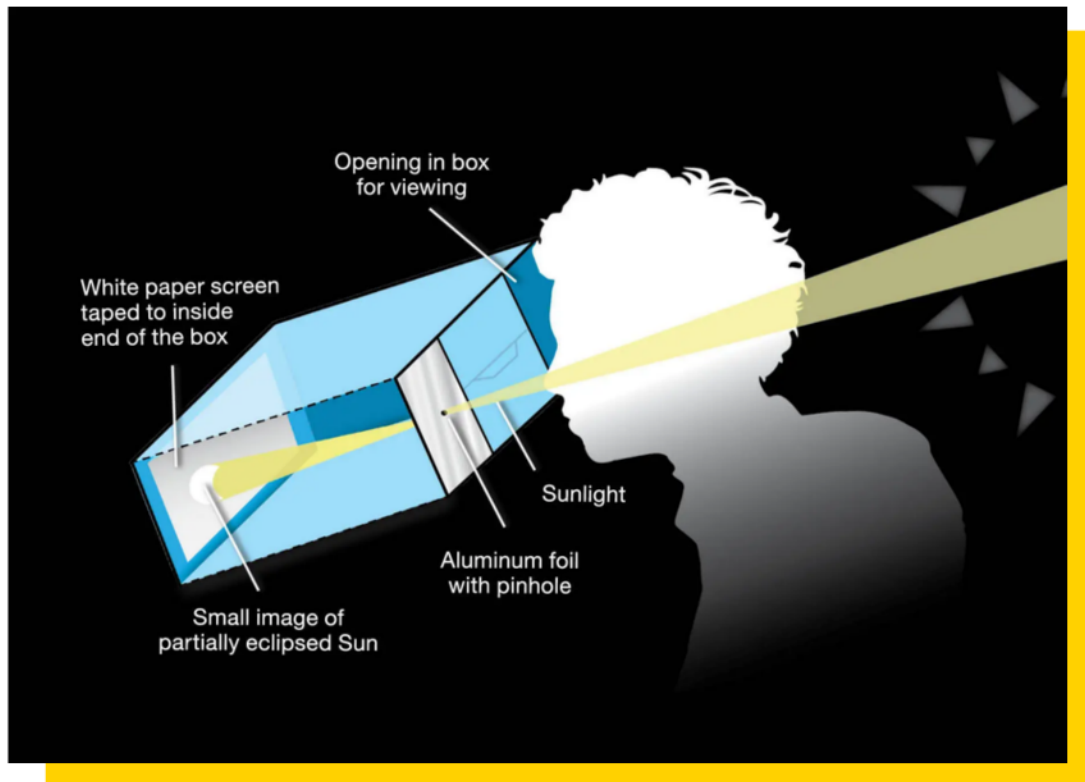
MAKE YOUR OWN “PINHOLE PROJECTOR” ECLIPSE VIEWER

All you need to make an eclipse viewer are the following supplies: an empty cereal box, a pencil, pen, or marker, scissors, tin foil, tape, a piece of white paper, and a nail or needle to make a pinhole!

How to make your own eclipse viewer:

- Start by emptying a cereal box.
- Get a piece of white paper, place the cereal box upright on it, and trace its shape on the paper with a pencil, pen or marker.
- Cut out that shape with the scissors.
- Tape or glue the cut-out white paper to the inside of the box on the bottom.
- Close the top of the box, and cut out two square holes on the left and right sides. One of these will be where the light enters and the other where we look to see the eclipse's image on our white paper at the bottom of the box.
- Place the tin foil over one of the holes, tape it down, and put a pinhole in it.

With the Sun behind you, sunlight will stream through a pinhole punched into aluminum foil taped over a hole in one side of the box. During the partial phases of a solar eclipse, this will project a crescent Sun onto a white sheet of paper taped to the inside of the box. Look into the box through another hole cut into the box to see the projected image!



ADDITIONAL RESOURCES:

<https://solarsystem.nasa.gov/eclipses/home/>

<https://spaceplace.nasa.gov/eclipse>

<https://www.greatamericaneclipse.com/october-14-2023>

<https://www.greatamericaneclipse.com/april-8-2024>