

Teachers' Guide to Solar Eclipses: *October 23, 2014*

What is a solar eclipse?

Every month, the Moon makes one trip, or orbit, around Earth. The Moon's orbit around Earth is tilted ever so slightly ($\sim 5^\circ$), so, for example, from the Sun's perspective, the Moon usually passes a little above or below Earth as it orbits around Earth. Occasionally, the Moon reaches a position where it is in a straight line with Earth and the Sun. When this happens, eclipses occur. A solar eclipse happens when the Moon is directly between Earth and the Sun. Conversely, a lunar eclipse happens when Earth is directly between the Sun and the Moon. There are at least four eclipses each year.

A partial solar eclipse will be visible from most of North America on October 23, 2014. A partial solar eclipse occurs when a portion of the Sun is blocked by the Moon. (A total solar eclipse occurs when the entire Sun is obscured from view.) The exact timing of the eclipse and the amount of the Sun that will be obscured depends on your location. You can find a list of eclipse beginning and ending times for many U.S. cities at <http://eclipse.gsfc.nasa.gov/OH/OHtables/OH2014-Tab05.pdf>.

Solar Eclipse Safety

If you plan to view any solar eclipse, remember to **NEVER** look directly at the Sun. There are a number of safe ways to view solar eclipses. More information about these methods can be found at <http://www.skyandtelescope.com/observing/how-to-watch-a-partial-solar-eclipse-safely/>.

Solar Eclipses in Your Classroom!

Use the resources on the following pages to enable your students to explore solar eclipses. Create a solar eclipse lesson or unit that fits into your classroom curriculum with hands-on activities, demonstrations, video clips, online exploration, and presentations by local scientists. Encourage your students to follow the news and explore more about eclipses!

Upcoming Events

Find information and resources about upcoming celestial events and NASA mission milestones to share with your students at http://www.lpi.usra.edu/education/look_up.

solar eclipse



Explore solar eclipses in your classroom with hands-on activities!

Moon Phases and Eclipses

<http://cosmictimes.gsfc.nasa.gov/teachers/downloads/lessons/1919/eclipse.pdf>

Grade Level(s): Middle School

Using a foam ball and a lamp, learners create a solar eclipse, a lunar eclipse, and learn more about why the moon appears differently from one night to the next. *MS-ESS1-1 (Middle School); Developing and Using Models; Patterns*

Measuring Angular Size and Distance

http://www.knowitall.org/nasa/pdf/connect/Path_of_Totality.pdf

Grade Level(s): Middle School

This is an activity about measuring angular size and understanding the solar and lunar proportions that result in solar eclipses. Learners will use triangles and proportions to create a shoebox eclipse simulator. They will then apply what they learn about angular size to predict the diameter and distance of one object that can be eclipsed by another. They will also complete three journal assignments to record observations and conceptual understanding. *NGSS Alignment: MS-ESS1-1 (Middle School); Developing and Using Models, Analyzing and Interpreting Data, Using Mathematics and Computational Thinking; Patterns, Scale, Proportion, and Quantity*

Ancient Eclipses and the Length of Day

<http://spacemath.gsfc.nasa.gov/SMBooks/SMEarthV2.pdf#page=24>

Grade Level(s): Middle School, High School

In this problem set, learners will compare actual versus computer track of a solar eclipse in Babylonian times to calculate the rate at which the day is lengthening over time. Answer key is provided. This is part of "Earth Math: A Brief Mathematical Guide to Earth Science and Climate Change." *NGSS Alignment – MS-ESS1-1 (Middle School); Developing and Using Models, Analyzing and Interpreting Data, Using Mathematics and Computational Thinking; Patterns*

These activities, and other NASA educational activities, can be found at <http://nasawavelength.org>.

Make a Pinhole Projector to Safely View a Solar Eclipse!

<http://www.timeanddate.com/eclipse/make-pinhole-projector.html>

One of the easiest and safest ways to view an eclipse is to project its image on a screen using a pinhole projector. This website provides instructions for creating your own pinhole projector.

Clarifying Science Through Natural Events

http://marsed.asu.edu/stem-lesson-plans/natural_events

Grade Levels: Middle School, High School

Natural events happen around us on a daily basis and are frequently reported widely in the media. The students in our classrooms are aware of them, curiously engaged or often perplexed as to why they happen. Through this lesson, learn how to turn these timely natural events into NGSS-aligned teachable moments.

http://www.lpi.usra.edu/education/look_up

Websites

How to Safely View a Solar Eclipse

<http://www.skyandtelescope.com/observing/how-to-watch-a-partial-solar-eclipse-safely/>

Eclipse Glasses & Safe Solar Viewers

<http://www.rainbowsymphonystore.com/eclipse Shades.html>

Solar Eclipse: What You Should Know (YouTube)

<http://youtu.be/HrloqdXrzN4>

Solar Eclipses for Beginners

<http://www.mreclipse.com/Special/SEprimer.html>

Solar Eclipse Pics from Mr. Eclipse

<http://www.mreclipse.com/Special/photo.html#solar>

NASA Eclipse Website

<http://eclipse.gsfc.nasa.gov/OH/OH2014.html#SE2014Oct23P>

NASA's Living With a Star Program

<http://lws.gsfc.nasa.gov/>

Solar Eclipse Viewing

Consider holding an eclipse viewing at your school! For an eclipse viewing, it is highly recommend that you work with someone who has experience viewing the Sun and/or eclipses. Ask your local astronomical society to bring their telescopes for a viewing. Use the links below to locate a local astronomy club and/or speaker.

Night Sky Network

<http://nightsky.jpl.nasa.gov/clubs-and-events.cfm>

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.

NASA/JPL Solar System Ambassadors

<http://www2.jpl.nasa.gov/ambassador/directory.htm>

Solar System Ambassadors is a nationwide program consisting of volunteers who communicate the excitement of NASA/JPL's space exploration missions and information about recent discoveries to people in their local communities.

http://www.lpi.usra.edu/education/look_up

Add a Creative Twist

"The "why" of space exploration is a matter of emotions and instincts... It takes a variety of languages, including, those of art, music, and literature, to teach."

- Piers Bizony, "The Bigger Pictures"

Ever read a good science-fiction book or watch a futuristic movie like "Star Wars," "Star Trek," "Ender's Game" or "The Time Machine?" Science fiction is storytelling that reflects scientific thought and foresees and communicates a future based on the reality of today. Literature, movies, music and works of visual art all have the power to communicate an idea and elicit emotion from an audience.

Encourage your students to create an artistic interpretation of the Solar Eclipse!

Solar Eclipse

Jacqueline Moliner is an avid science fan and professional artist. Her enthusiasm for all things Space inspires her to research the science behind celestial events and create her Cosmic Funnies series. This combination of art with science is a great example of a fun way she shares her passion with others. *Solar Eclipse* was motivated by the upcoming October 23, 2014 event.

You can see more of the Cosmic Funnies and follow Jacqueline's other work at <http://cosmicfunnies.tumblr.com/>

