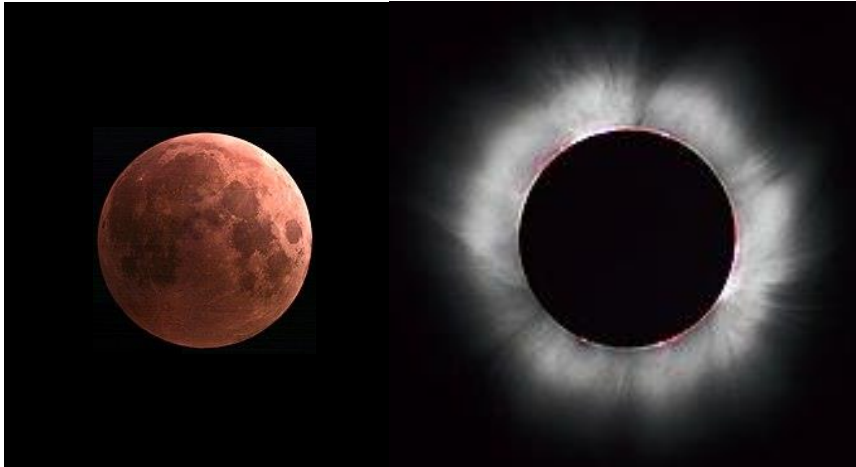


Yardstick Eclipse

The Size and Scale of the Earth Moon System

Let's make a model to explore eclipses



Have you ever seen an eclipse?

What did you notice?

We'll start with the Earth and Moon

If we shrink our Earth down to a **one-inch** ball... how big would the Moon be?



Q: How far away would the Moon be at this scale?

Answer: The Moon is about 1/4 of the width of the Earth, and 30 Earths away!



Let's use these materials & this scale to make an eclipse model.

Think about how the Moon moves – can you use the model to show the Moon's orbit?

Using the Sun or a bright light, can you show a New Moon or Full Moon?

Now we have the Sun, the Earth and the Moon:

- **Try making a lunar eclipse.**

Remember, that's when the Sun shines on Earth and the Moon goes into Earth's shadow. Where on Earth can you see a lunar eclipse?

- **Now try a solar eclipse.**

Now the shadow of the Moon falls on Earth. Where on Earth can you see a solar eclipse? Will everyone on Earth be able to see it?

What do you notice about these eclipses?

Notes for the Presenter

Eclipse Yardstick

Time: 5-20 minutes

Visitors: General audience, ages 7+

Venue: bright light source needed, the Sun is preferred.

Learning Goals

1. Build an Earth Moon model, to scale in size and distance.
2. Explore creating miniature eclipses with the Sun / bright light and this model.
3. Understand the differences between lunar and solar eclipses.

Materials (and Sources)

- Yardstick, 2 toothpicks, 2 binder clips, 1 inch Earth ball and $\frac{1}{4}$ inch Moon ball (note that the Moon bead is very small and can escape, so
- (Optional) pictures of solar and lunar eclipses
- (Optional, if outside) Solar Viewers

Advance preparation

- Note: The Moon bead is very small and can escape, so gluing the bead to the toothpick can be useful.

Introductory Remarks

The Moon and the Sun each appear to be about a half degree in the sky. That's about the width of your pinky finger when held out at arm's length. Earth is unique in the solar system for having its Moon appear to be the exact same size as the Sun. How is this possible when our Moon is only $\frac{1}{400}$ th the size of our Sun? In a remarkable coincidence, the Moon is also 400 times closer to the Earth than the Sun!

Facilitation Notes



Let your visitors hold the model and let them explore. It is easiest to make eclipses with the Sun or light source behind you. Look for the shadows on the ground to help line up the Earth and Moon.

Remember to guide them, but don't correct them right away. Try asking leading questions instead! While there are often many misconceptions around eclipses, this model will be useful to test out their own ideas. Encourage participants to discover on their own, using prompts such as, "That's interesting. What do you think would happen if..." and, "Tell me more about that." Often, they will come to the right answer on their own and the understanding of discovery is much more powerful than being told facts.

Background Information & Websites

Total solar eclipses are more than just beautiful natural displays. They allow astronomers and helio-physicists to study the lower corona close to the surface of the Sun, which is only visible during a solar eclipse. Learn more about the scientific research around eclipses at:

<https://science.nasa.gov/eclipses/nasa-research/>

For more information about eclipses, go to:

<https://science.nasa.gov/eclipses/>

<https://astrosociety.org/education-outreach/eclipse.html>

<https://eclipse.aas.org>

To make plans for future eclipses, go here:

<https://science.nasa.gov/eclipses/future-eclipses/>

Additional Resources and Credits

This activity was adapted from earlier versions of the yardstick eclipse activity exist. Current version was created in 2024 Eclipse Ambassadors Off the Paths is funded by NASA SMD Cooperative Agreement 80NSS22M0007.