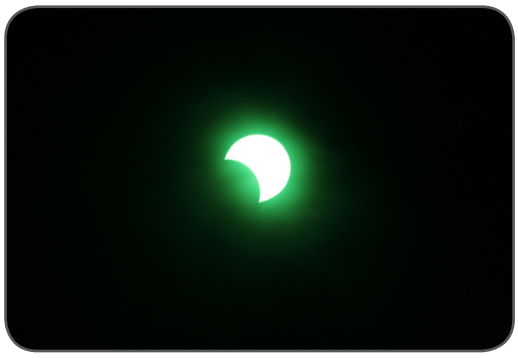
Getting to Know: Eclipses

In ancient times, astronomical events were a mystery. In particular, eclipses of the Sun and moon were mystical occurrences. Many ancient people developed stories to explain these mysterious events. Some cultures built observatories to study the Sun, moon, and stars, whereas others claimed that dragons were sent to the skies to "eat" the Sun and moon. Today, science explains eclipses. An *eclipse* can occur when an astronomical body passes between two other astronomical bodies.

The Sun, Earth, and moon are part of a system of astronomical bodies in space. The moon orbits Earth and Earth orbits the Sun. The position of Earth, the moon, and the Sun causes solar and lunar eclipses.

El Caracol is a temple built by the Mayans. It is believed to be an ancient astronomical observatory.



The moon's shadow can block our view of the sun and cause a partial solar eclipse.

What is a solar eclipse?

A *solar eclipse* occurs when the moon passes between the Earth and Sun. The moon blocks some of the Sun's light, projecting a shadow onto a small portion of Earth's surface. As Earth rotates and the moon and Sun move through space, the shadow of the moon will move across Earth's surface. The path of the moon's shadow is known as the *path of totality*. An observer not in the path of totality will not see the eclipse.

Depending on the position of the moon in its orbit, a total or partial eclipse can be visible from certain locations on Earth. A *total eclipse* occurs when the moon's *umbra*, or full shadow, completely blocks the Sun from view. A *partial eclipse* is visible from Earth in areas of the moon's shadow called the *penumbra*, where the moon blocks just a small portion of the Sun. Another type of solar eclipse is called an *annular eclipse*. During an annular eclipse, the moon is farther from Earth and its shadow doesn't quite reach us. In this case, Earth lies just past the moon's shadow, and our view of the central portion of the Sun is blocked. We can, however, see a ring of visible light around the shadow's circumference.

Misconception 1: ***Do you need eye protection to look at a solar eclipse?***

You should *never* look directly at a solar eclipse without proper eye protection. Even a small portion of the visible Sun is enough to damage your eyes. However, looking at a lunar eclipse does not pose any danger to an observer.

Is a solar eclipse different from a lunar eclipse?

A solar eclipse occurs when the moon passes between Earth and the Sun. The moon casts a shadow on a portion of Earth's surface. By contrast, a *lunar eclipse* occurs when Earth passes between the moon and the Sun. When this happens, the moon moves into Earth's shadow. A lunar eclipse is visible everywhere on the night side of Earth.

A solar eclipse can only occur during a new moon, when the moon is in between the Sun and Earth. A lunar eclipse can only occur during a full moon when Earth is between the moon and the Sun.

The movements of the Earth, moon, and Sun create different types of lunar eclipses. Sometimes the moon falls completely within Earth's darkest shadow and a *total lunar eclipse* occurs. Sometimes, just a portion of the moon falls into Earth's shadow. Yet another type of lunar eclipse occurs when the moon falls into a less dark portion of Earth's shadow.

This astronomer is demonstrating how to use a solar telescope to safely view the Sun.

How often do eclipses occur?

Scientists can predict eclipses with great accuracy. Each year, there are a minimum of two lunar eclipses and a maximum of five. A person has the potential to see a total lunar eclipse at least twice per year because lunar eclipses are always visible on the night side of Earth.

A maximum of five solar eclipses can happen in any given year. The next time a total solar eclipse will be visible from the United States is August 21, 2017. Your chances of seeing a total lunar eclipse are much better than seeing a total solar eclipse. Solar eclipses are only seen in a small region somewhere on the daylight side of Earth.

Although the causes of eclipses are no longer mysterious, this phenomenon is still amazing. In this concept, you will learn more about lunar and solar eclipses.

Misconception 2: ***Does a lunar eclipse occur every time the moon is full?***

If the moon is full, there is the potential for a lunar eclipse to occur. However, the moon's orbital plane is tilted at an angle from Earth's orbital plane. The moon must pass through Earth's shadow for a lunar eclipse to occur. Thus, the tilt of the moon's orbital plane prevents a lunar eclipse from occurring during every full moon.