

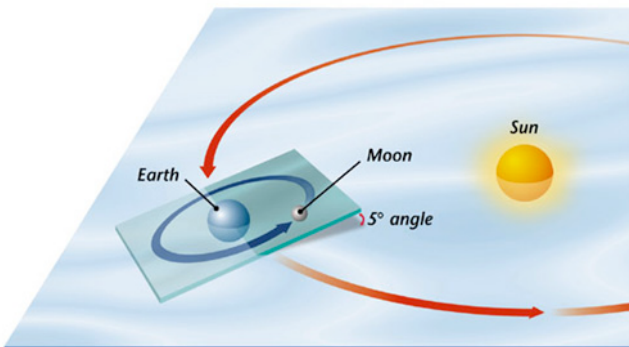
## Eclipses

What would you think if you were walking home from school on a sunny afternoon and the sun began to disappear? Would you be frightened? On rare occasions, the moon completely blocks the sun. The sky grows as dark as night even in the middle of a clear day. The air gets cool and the sky becomes an eerie color. If you don't know what is happening, you can become very frightened.

The moon doesn't usually go directly between Earth and the sun or directly behind Earth. As the diagram below shows, the moon's orbit around Earth is slightly tilted with respect to Earth's orbit around the sun. As a result, in most months the moon revolves completely around Earth without the moon moving into Earth's shadow or the moon's shadow hitting Earth.

**When the moon's shadow hits Earth or Earth's shadow hits the moon, an eclipse occurs.**

An **eclipse** (ih klips) occurs when an object in space comes between the sun and a third object, and casts a shadow on that object. There are two types of eclipses: solar eclipses and lunar eclipses. (The words *solar* and *lunar* come from the Latin words for "sun" and "moon.")



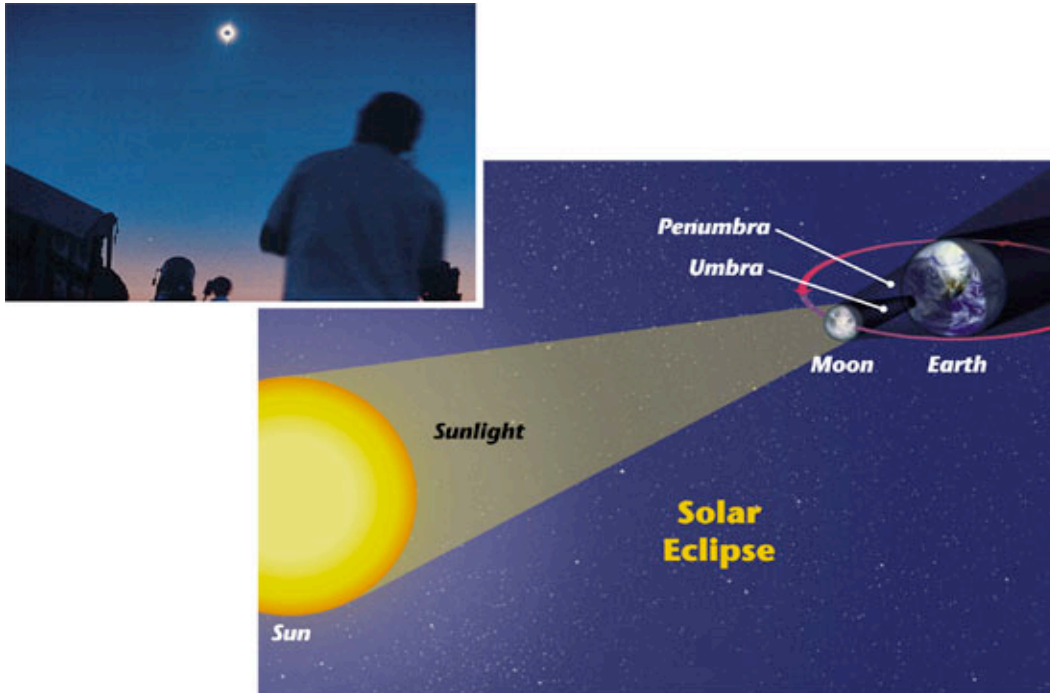
**The Tilt of the Moon's Orbit** The moon's orbit is tilted with respect to Earth's orbit. So the moon rarely goes directly between Earth and the sun.

### Solar Eclipses

During a new moon, the moon is almost exactly between Earth and the sun. But most months, as you have seen, the moon travels a little above or below the sun in the sky. A **solar eclipse** occurs when the moon passes between Earth and the sun, blocking the sunlight from reaching Earth. The moon's shadow then hits Earth, as shown in the diagram below. So a solar eclipse is really just a new moon in which the moon blocks your view of the sun.

**Total Solar Eclipses** The darkest part of the moon's shadow, the **umbra** (um bruh), is cone-shaped. From any point in the umbra, light from the sun is completely blocked by the moon. The moon's umbra happens to be long enough so that the point of the cone can just reach a small part of Earth's surface. Only the people within the umbra experience a total solar eclipse. During a total solar eclipse, the sky is dark. You can see the stars and the solar corona, which is the faint outer atmosphere of the sun.

**Partial Solar Eclipses** In the diagram below, you can see that the moon casts another shadow that is less dark than the umbra. In this larger part of the shadow, called the **penumbra** (pih num bruh), part of the sun is visible from Earth. During a solar eclipse, people in the penumbra see only a partial eclipse. Since part of the sun remains visible, it is not safe to look directly at the sun during a partial solar eclipse (just as you wouldn't look directly at the sun at any other time).



**Total Solar Eclipse** During a solar eclipse, the moon blocks light from the sun, preventing the light from reaching Earth's surface. The solar corona surrounding the dark disk of the moon is visible during a solar eclipse, as shown in the photo.

## Lunar Eclipses

During most months, the moon goes near Earth's shadow but not quite into it. A **lunar eclipse** occurs at a full moon when Earth is directly between the moon and the sun. You can see a lunar eclipse in the photos below. During a lunar eclipse, Earth blocks sunlight from reaching the moon. The moon is then in Earth's shadow and looks dark from Earth. Because the moon is closest to Earth's shadow during the full moon, lunar eclipses occur only at full moon.

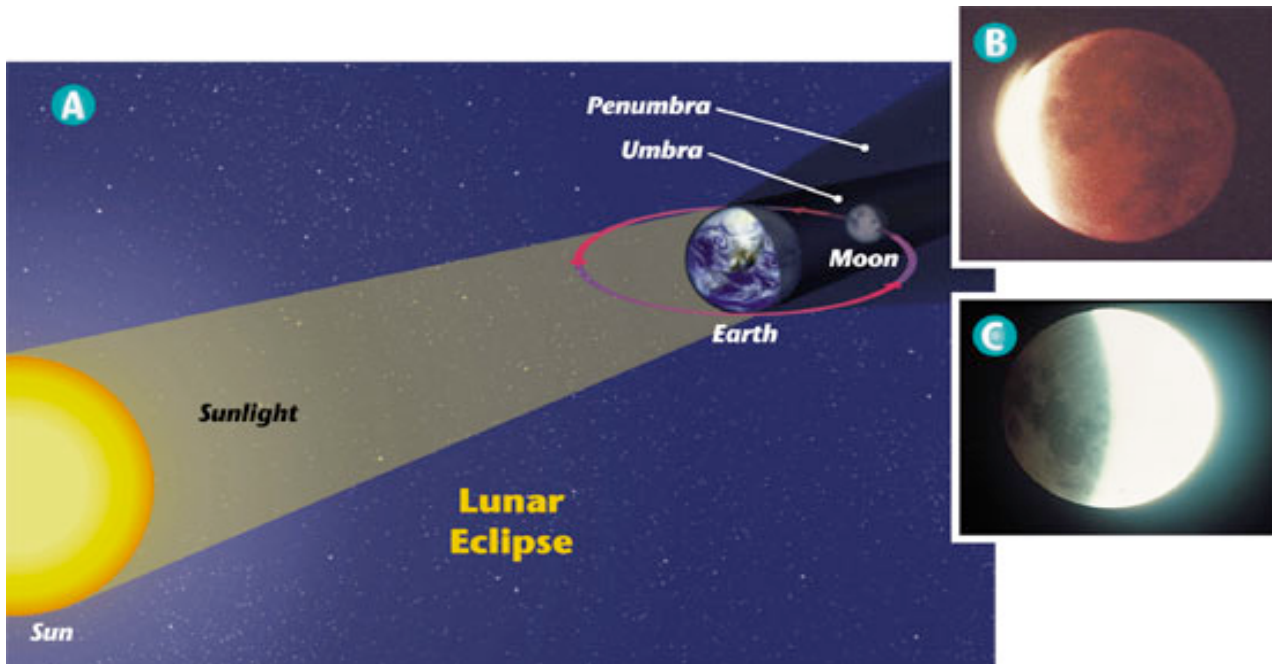
**Total Lunar Eclipses** Like the moon's shadow, Earth's shadow has an umbra and a penumbra. When the moon is in Earth's umbra, you see a total lunar eclipse. You can see Earth's shadow on the moon before and after the total part of a lunar eclipse.

Unlike a solar eclipse, a lunar eclipse can be seen anywhere on Earth that the moon is visible. So you are more likely to see a total lunar eclipse than a total solar eclipse.

**Lunar Eclipses (A)** During a lunar eclipse, Earth blocks sunlight from reaching the moon's surface. **(B)** This photo of the moon was taken during a total lunar eclipse. **(C)** This photo was taken during a partial lunar eclipse.

For most lunar eclipses, Earth, the moon, and the sun are not quite in line, and a partial lunar eclipse results. A partial lunar eclipse occurs when the moon passes

partly into the umbra of Earth's shadow. The edge of the shadow appears blurry, and you can watch it pass across the moon for two or three hours.



### Partial Lunar Eclipses

For most lunar eclipses, Earth, the moon, and the sun are not quite in line, and a partial lunar eclipse results. A partial lunar eclipse occurs when the moon passes partly into the umbra of Earth's shadow. The edge of the shadow appears blurry, and you can watch it pass across the moon for two or three hours.