

Eclipses

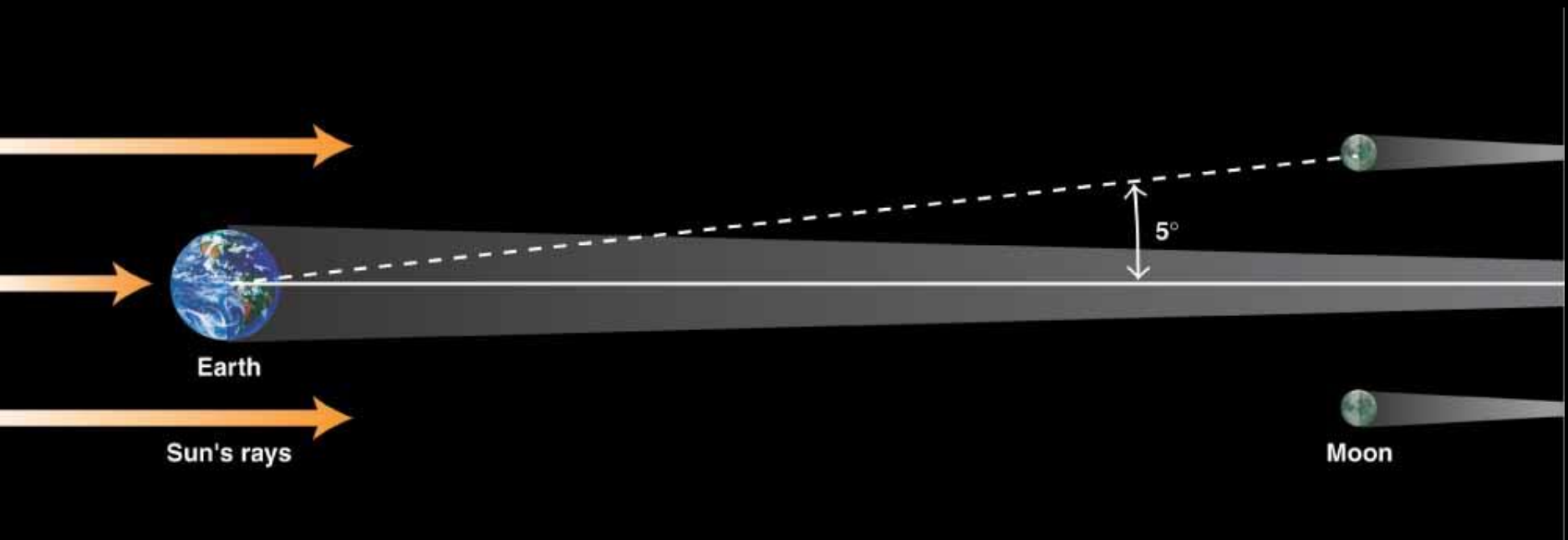


A penny will hide the biggest star in the universe if you hold it close enough to your eye.

-- **Samuel Grafton**

Eclipses occur when the Sun, the Earth and the Moon all lie along a straight line.

The Moon's orbit is tilted 5° with respect to the ecliptic so there are only two times a year when the paths overlap.



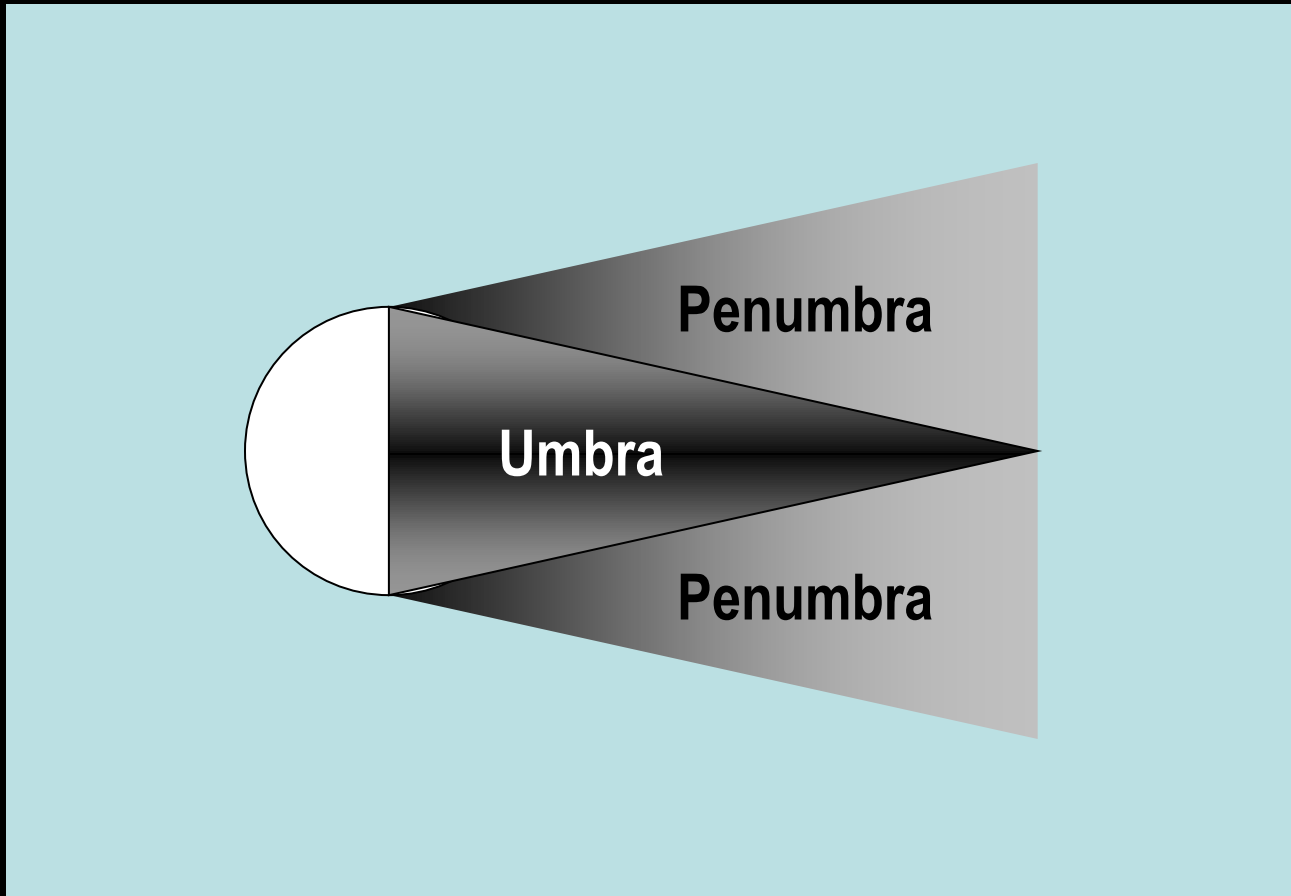
Total Lunar Eclipse - 2000 Jan 20-21



Lunar Eclipse

- A **lunar eclipse** is the passing of the Moon through the Earth's shadow.
- The Earth is between the Sun and the Moon.
- Lunar eclipses are visible from anywhere on the night side of Earth.
- Lunar eclipses can only occur during **Full Moon phase**.
- Lunar eclipses are more common than solar eclipses.
 - The Earth's shadow is much larger.
 - Occur every 2-3 years.
 - Totality lasts up to 1 hour 40 minutes.

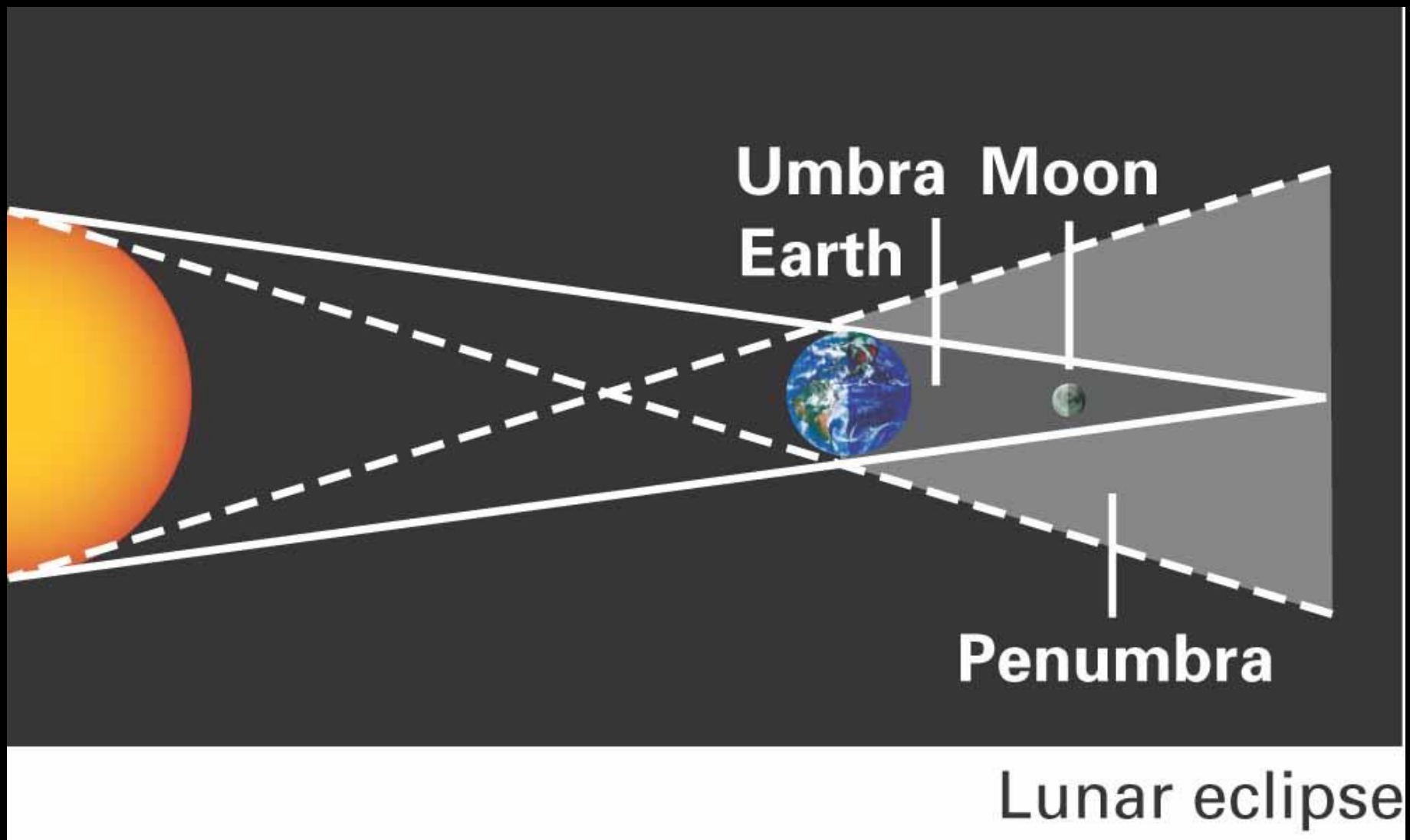
Shadow Structure



- ❖ **Umbra** is part of shadow where the sun is totally obscured, the dark part.
- ❖ **Penumbra** is the part of the shadow where the sun is partially obscured, the light part.

Progress of a Lunar eclipse. The red glow is refracted red light from the Earth's atmosphere, much like the red glow we see before sunrise and after sunset.



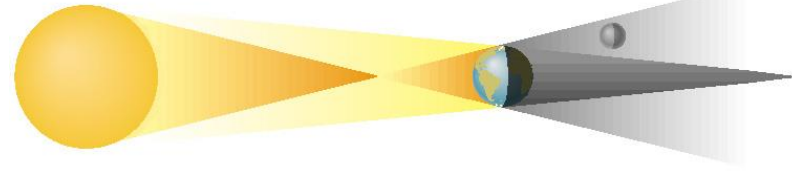


When can Lunar eclipses occur?

- Lunar eclipses happens when the Moon is in the shadow of the Earth
- **Lunar eclipses** can occur only at *full moon*.
- Lunar eclipses can be **penumbral**, **partial**, or **total**.

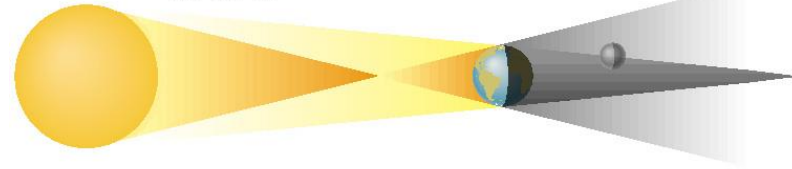
Penumbra Lunar Eclipse

Moon passes through penumbra.



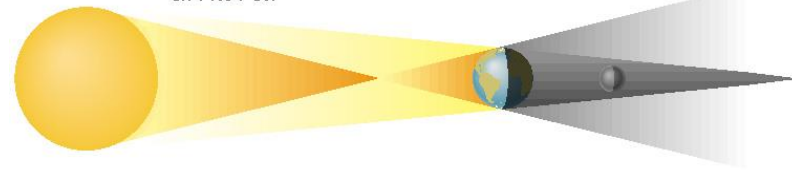
Partial Lunar Eclipse

Part of the Moon passes through umbra.



Total Lunar Eclipse

Moon passes entirely through umbra.



Total Eclipse
of the Moon

November 8-9,
2003

Earth's Umbra

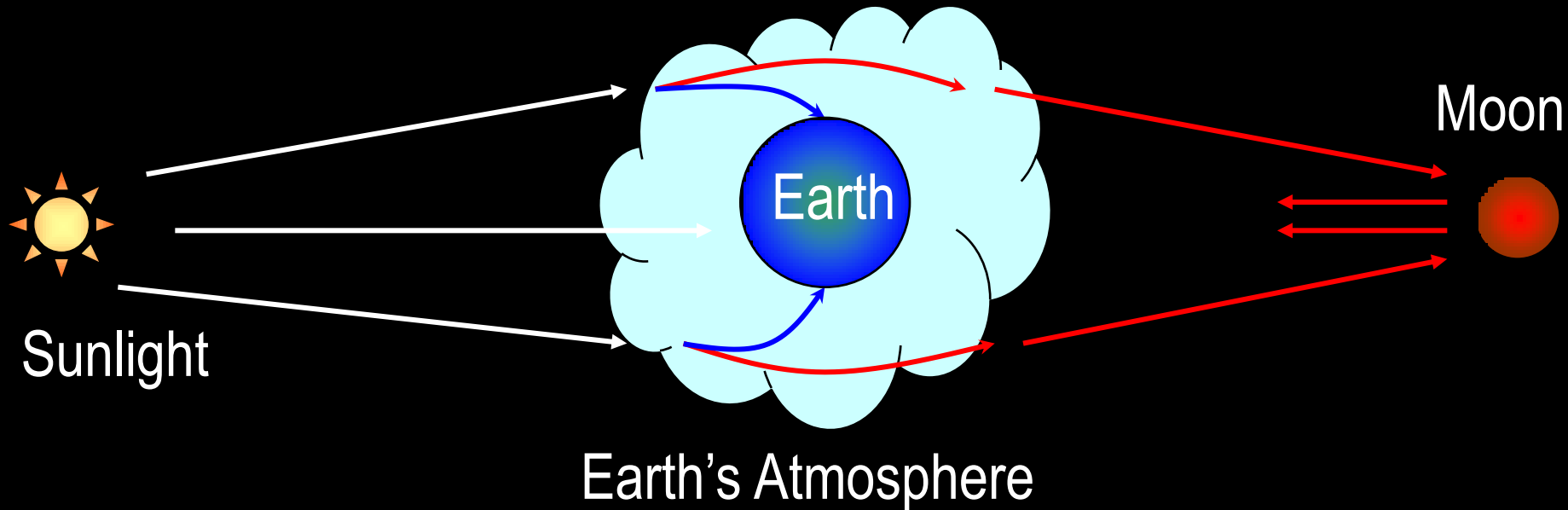
Earth's Penumbra





The moon becomes a blood red color during a total lunar eclipse. No wonder that ancient cultures feared the appearance of the moon during a lunar eclipse.

The Blood Moon



The moon often does not totally disappear during a total lunar eclipse. Instead it can be seen as a very dark red color because of the refraction of sunlight through the Earth's atmosphere.

Solar Eclipses



Nature responds to a solar eclipse just as it was sunset. Birds begin to roost. Crickets begin to chirp, and flowers close their petals.



Солоня



Solar Eclipse

- The Moon is between the Sun and the Earth.
 - As seen from the Earth, the Moon blocks the Sun.
 - The eclipse may be either a partial or total eclipse.
- The Sun and the Moon have the same apparent size in the sky.
 - Sun is 400 times larger than the Moon, but 400 times farther away.



Earth



Moon



Sun



Solar eclipse

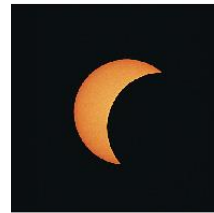
When can Solar eclipses occur?

- Solar eclipses occur when the shadow of the Moon falls on the surface of Earth
 - Only people in the shadow see the eclipse
- **Solar eclipses** can occur only at *new moon*.
- Solar eclipses can be **partial, total, or annular**.



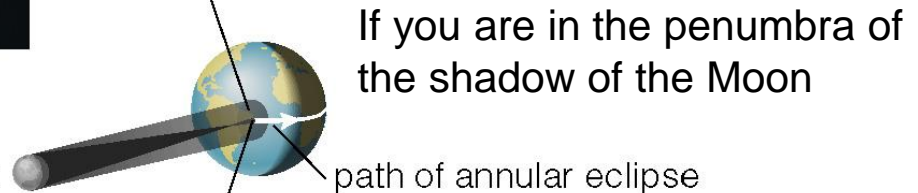
A total solar eclipse occurs in this region.

Moon



A partial solar eclipse occurs in the lighter area surrounding the area of totality.

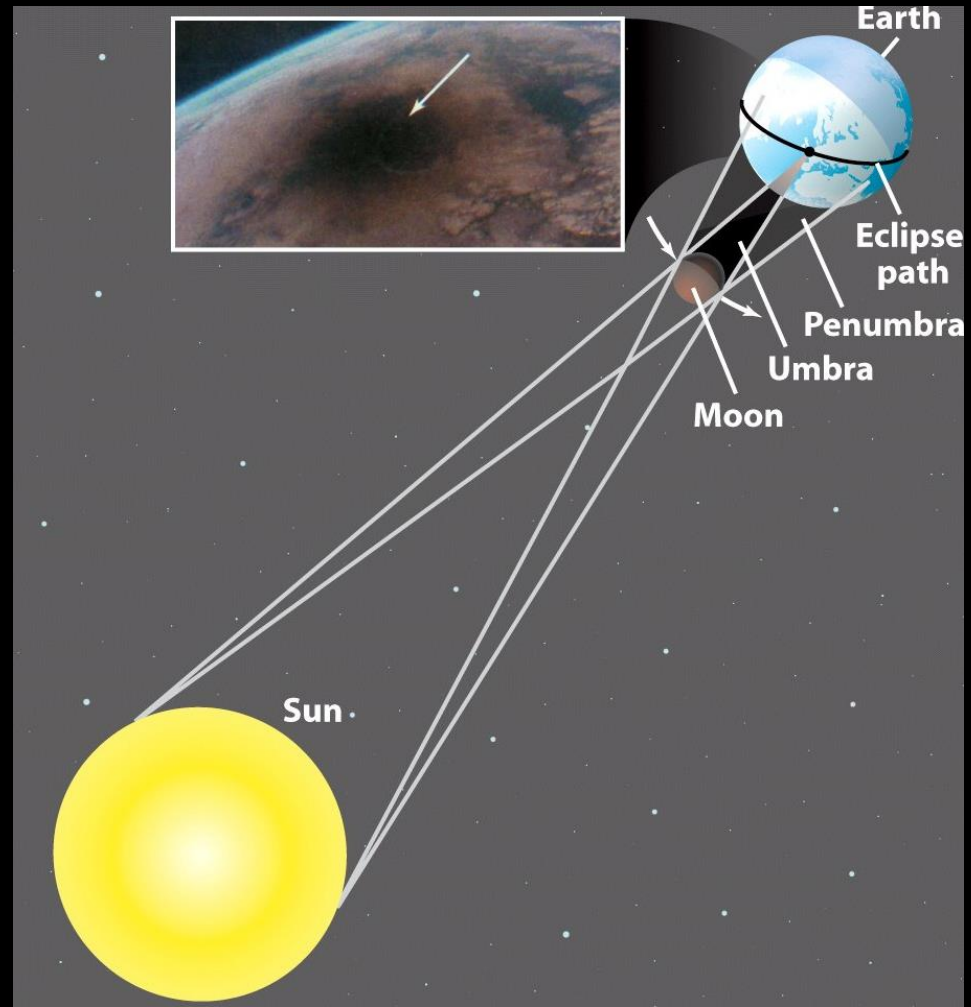
Moon



If the Moon's umbral shadow does not reach Earth, an **annular eclipse** occurs in this region.

Frequency of Solar Eclipses

- Solar Eclipses occur during the **New Moon phase**.
- Like lunar eclipses, we do not get solar eclipses at every new moon because of the tilt of the Moon's orbit.
 - At most new moons the Moon is either above or below the Sun.
 - Solar eclipses are possible twice a year.



The Sun's Corona

Like Earth, the Sun has an atmosphere. The outer layer of the Sun's atmosphere is called the corona. Because the sun is so bright, it is not visible unless the Sun's surface is blocked out during an eclipse.



Solar Eclipse Images

