

Eclipses



Preliminary Topics

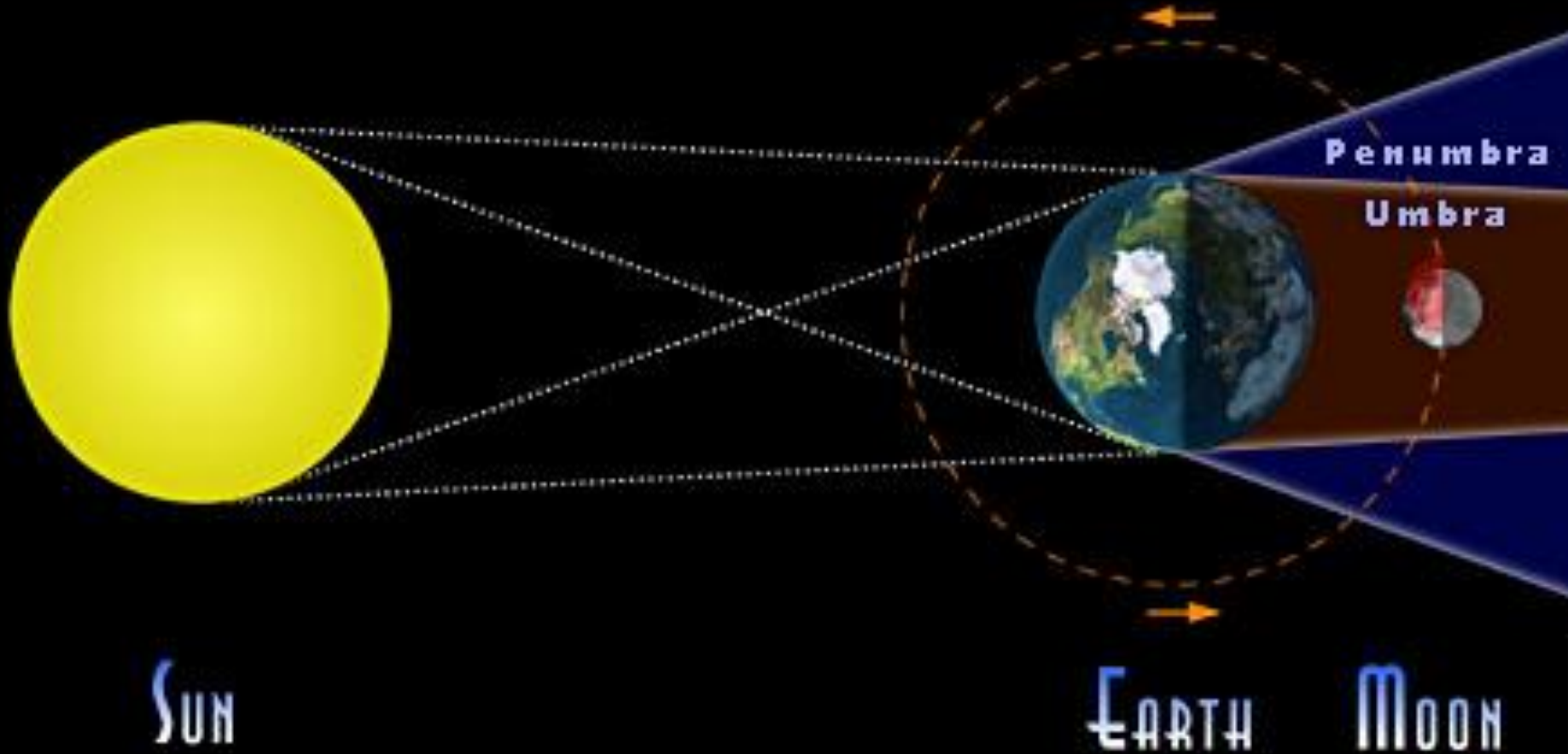
- The Moon orbits the Earth
- The Moon orbit at an angle with respect to the Earth's orbit around the Sun
- The Moon doesn't shine on its own; it reflects sunlight



Eclipses

- The Sun and Moon occasionally line up so that we have an eclipse.
 - These eclipses happen every year
 - To see a lunar eclipse, you need to be on a particular side of the Earth
 - To see a solar eclipse, you need to be on a particular part of the Earth

LUNAR ECLIPSE GEOMETRY



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When the Earth's shadow covers the Moon, we have a lunar eclipse

Three types of Lunar Eclipses

- Penumbral lunar eclipse—the Moon only passes through the penumbra of Earth's shadow
- Partial lunar eclipse—part of the Moon passes through the umbra of Earth's shadow
- Total lunar eclipse—the entire Moon passes through the umbra of Earth's shadow

- Who on Earth will be able to see a lunar eclipse?

Anyone who can see the Moon (anyone who is on the nighttime side of the Earth during the eclipse)



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Images from Fred Espenak
<http://www.mreclipse.com/LEphoto/LEgallery1/LEgallery1.html>

Why is the Moon red during an eclipse?

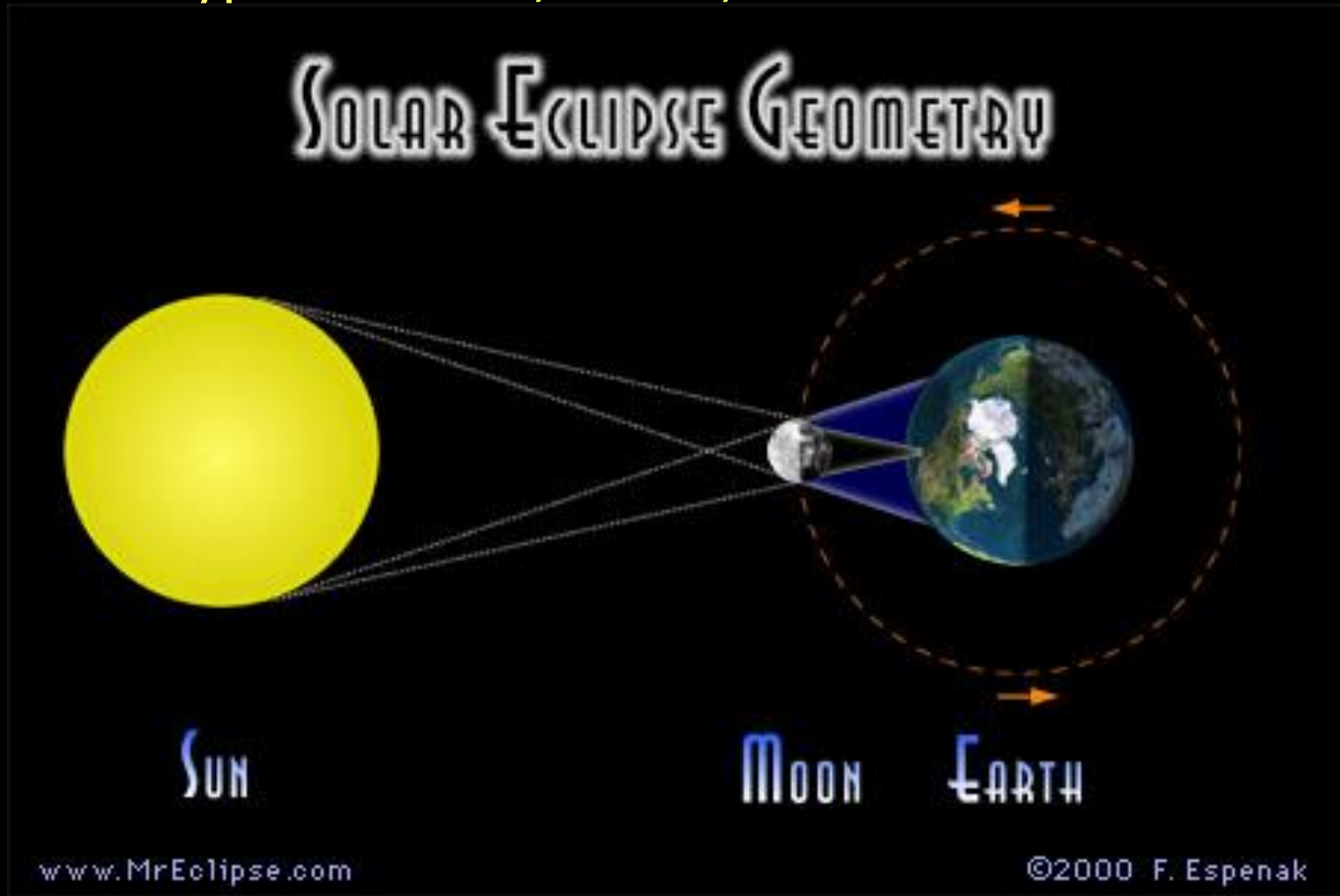
- The Earth's atmosphere filters some sunlight and allows it to reach the Moon's surface
- The blue light is removed—scattered down to make a blue sky over those in daytime
- Remaining light is red or orange
- Some of this remaining light is bent or refracted so that a small fraction of it reaches the Moon
- Exact appearance depends on dust and clouds in the Earth's atmosphere

Upcoming Lunar Eclipses

Total Lunar Eclipse in USA
April 15, 2014

Solar Eclipses

- When the Moon's shadow covers part of the Earth
- Only happens at New Moon
- Three types: Annular, Partial, and Total



Total Solar Eclipse

- Observers in the “umbra” shadow see a total eclipse (safe to view the Sun); can see the corona
- Those in “penumbra” see a partial eclipse—not safe to look directly at Sun
- Only lasts a few minutes
- Path of Totality about 10,000 miles long, only 100 miles wide

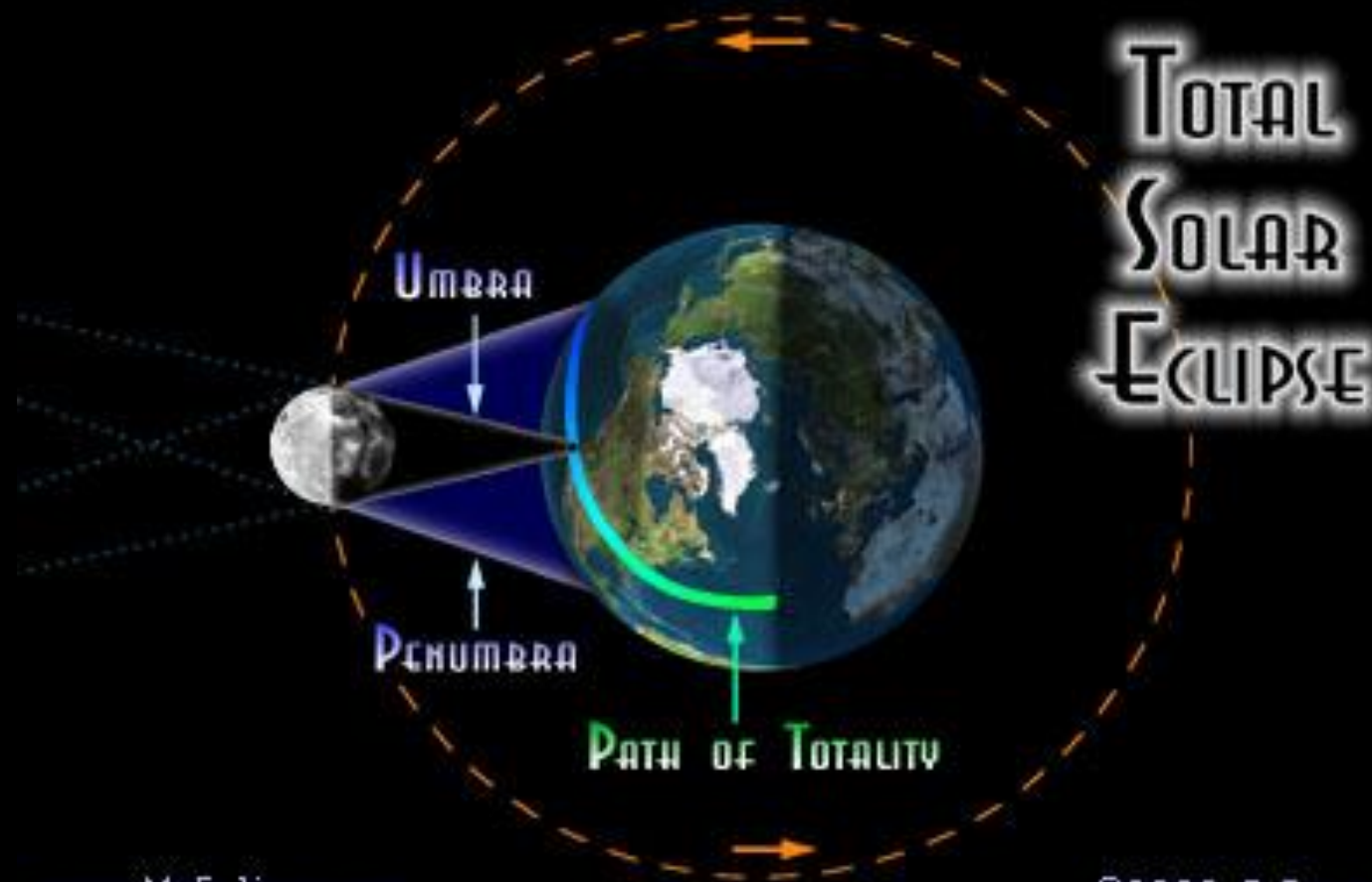


Photo of a Total Eclipse

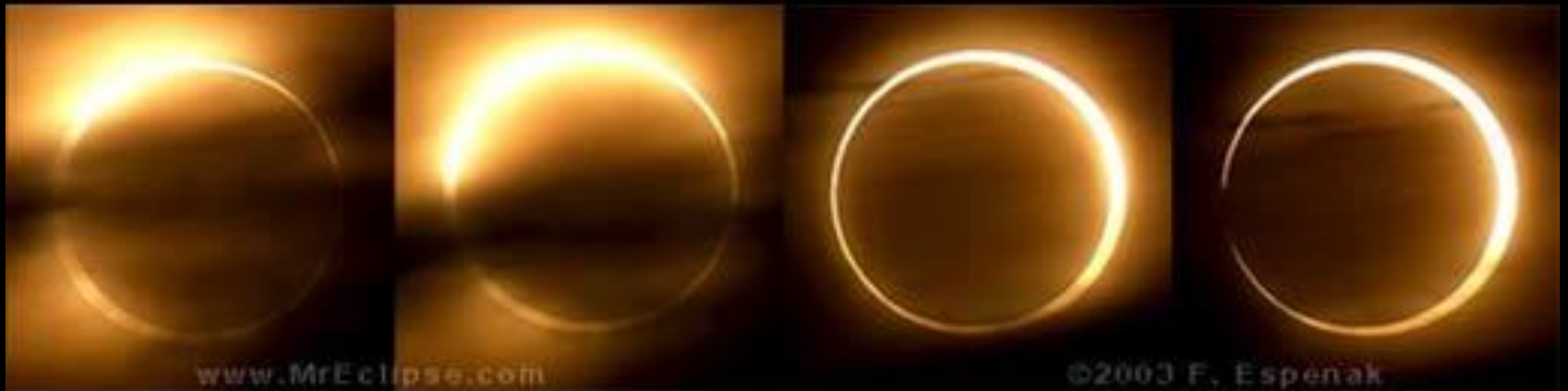


Annular Solar Eclipse

- When the Moon is too far to completely cover the Sun—the umbra doesn't reach the Earth
- Sun appears as a donut around the Moon



Photos of an Annular Eclipse



Upcoming Solar Eclipses

Next Total Solar Eclipse in USA
August 21, 2017