The Sun - Earth - Moon System

BIG Q: What natural phenomena do the motions of the Earth and Moon produce?

Lesson 1 Earth's Motion

Snow Today, Gone Tomorrow

Skiers should enjoy the snow—and snowmen—while the wintry weather lasts. When spring comes, warm temperatures will melt the snow away.

1. How does the weather where you live change with the seasons?
2. Are weather patterns the same everywhere on Earth? Give examples.
3. Does the Sun appear to move across the sky the same way from season to season? Discuss.

The Sun-Earth-Moon System

Bellringer LESSON 1

The Earth and Sun

The Sun is 150 km from Earth
Its diameter is 100 time greater
The mass is 300,000 times greater

It is a NUCLEAR FUSION reactor
Core temperature 15,000,000ºC
Surface temperature 5,500ºC

Earth’s Orbit

AN ORBIT = The path it follows AROUND the Sun.

This motion of one object around another = REVOLUTION

Gravitational PULL

The Sun’s gravity holds the Earth in orbit

Gravity is the Force of Attraction between two objects based on their masses and the distance between them

The axis of any object is an imaginary line through its center.

The Earth rotates (spins) around this axis
COUNTERCLOCKWISE -
from west to east once every 24 hours

This creates day and night

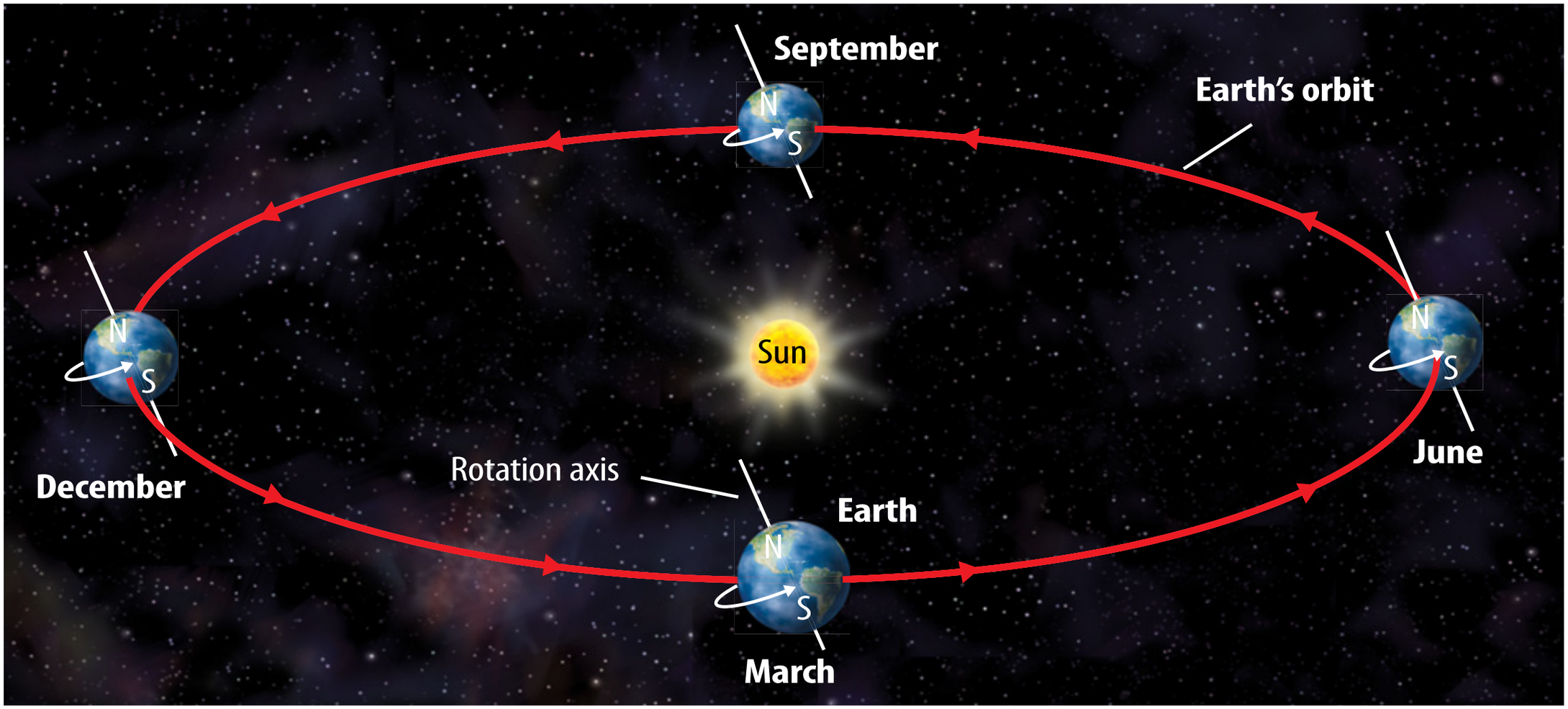
The apparent motion of the Sun is from east to west
Sunrise = east
Sunset = west

The axis of the Earth is TILTED

It is always tilted in the same direction and by the same amount (23º)

Earth spends half of its revolution tilted TOWARD the Sun and the other half tilted AWAY from the Sun

Earth's Rotation Axis



Temperature and Latitude

The Earth is round and tilted

The energy from the Sun tends to spread out the farther from the equator you go

The poles receive less energy from the Sun than the equator

The equator is warmer than the poles

Seasons
are the result of the Earth's tilted axis

In OUR winter - we are closest to the Sun but TILTED AWAY FROM IT

In OUR summer - we are farther away from the Sun but TILTED TOWARD IT

Spring and Summer in the Northern Hemisphere

Tilted toward the Sun

Get more energy

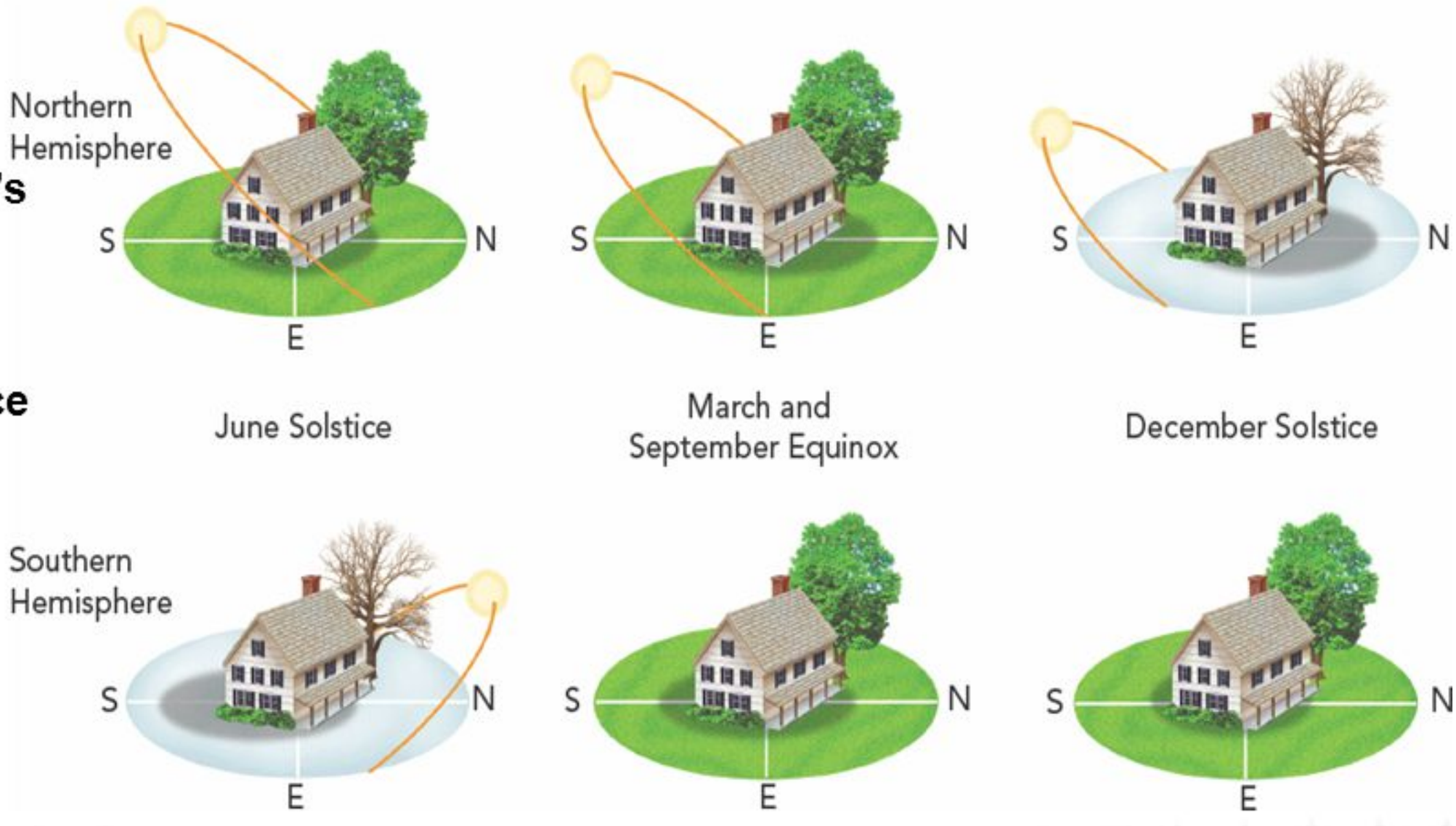
Days have longer amounts of sunlight

Temperatures increase

Solstices and Equinoxes

The diagrams show the apparent path of the sun at the solstices and equinoxes in the Northern Hemisphere. What is the sun's path at the equinoxes and the December solstice for the Southern Hemisphere?

Draw the sun's Path at the Equinoxes And the Winter solstice For the Southern Hemisphere.



Solstice is a day when the Earth's rotational axis is the most toward OR the most away from the Sun (2)

Equinox is a day when Earth's rotational is NEITHER toward nor away from the Sun (2)

These four days indicate the change of season

Shadows

Your shadow is visible whenever you are in sunlight. People, trees, basketball hoops: each of these objects casts a shadow when the Sun shines.

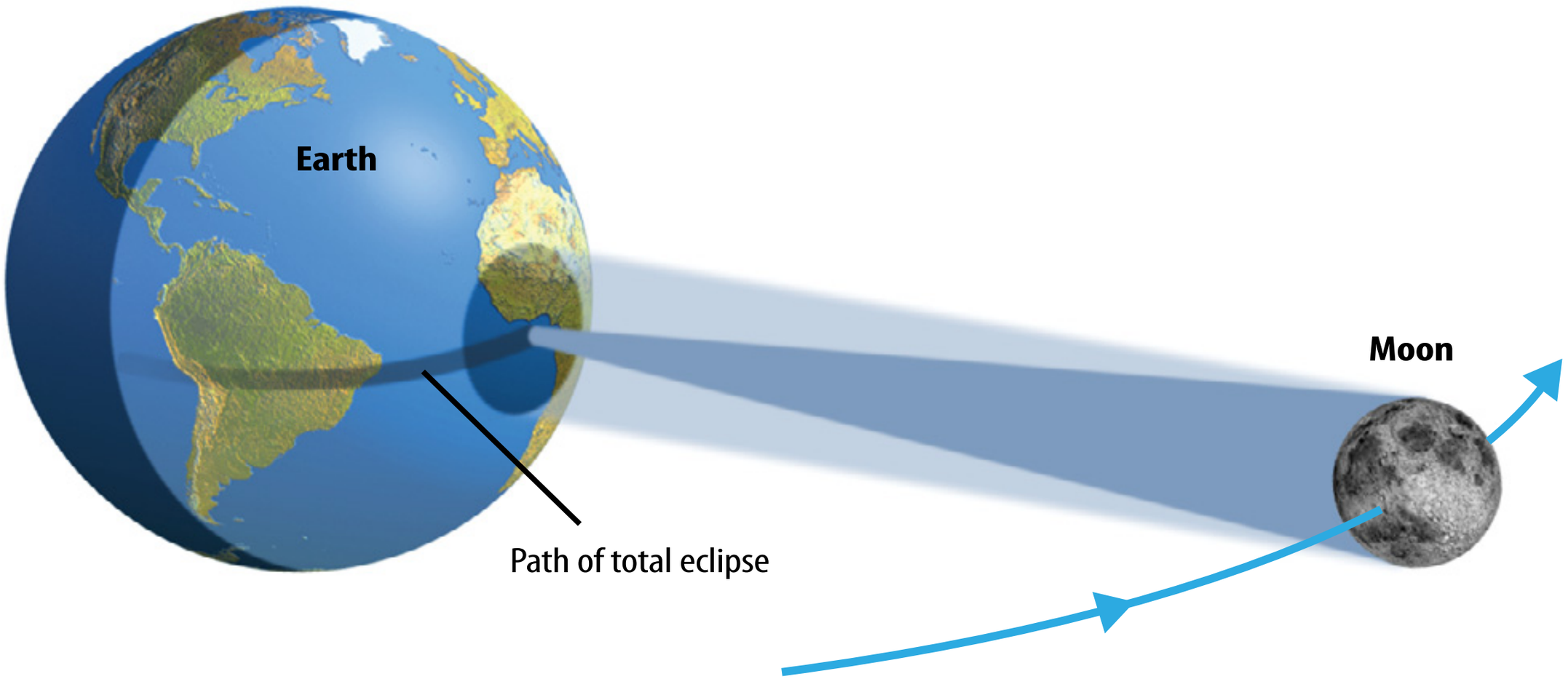
1. When this photograph was taken, where was the Sun in relation to the camera? Was it in front, behind, or directly above the camera?
2. Why do shadows of a stationary object change in size and direction throughout the day?
3. Do you think that Earth and the Moon cast shadows in space? Discuss.

Lesson 3 Eclipes and Tides

Light from the Sun casts a shadow with TWO distinct parts: the UMBRA is the CENTER, darker part where the light is totally blocked

and the PENUMBRA is the lighter part because the light is only partially blocked.

Solar Eclipse



Solar Eclipse

When the Moon passes between the Earth and the Sun in the NEW MOON phase.

The moon casts a shadow on the Earth

You can only see a TOTAL eclipse if you are in the UMBRA

Totality lasts about 7 minutes

Solar Eclipses (cont.)

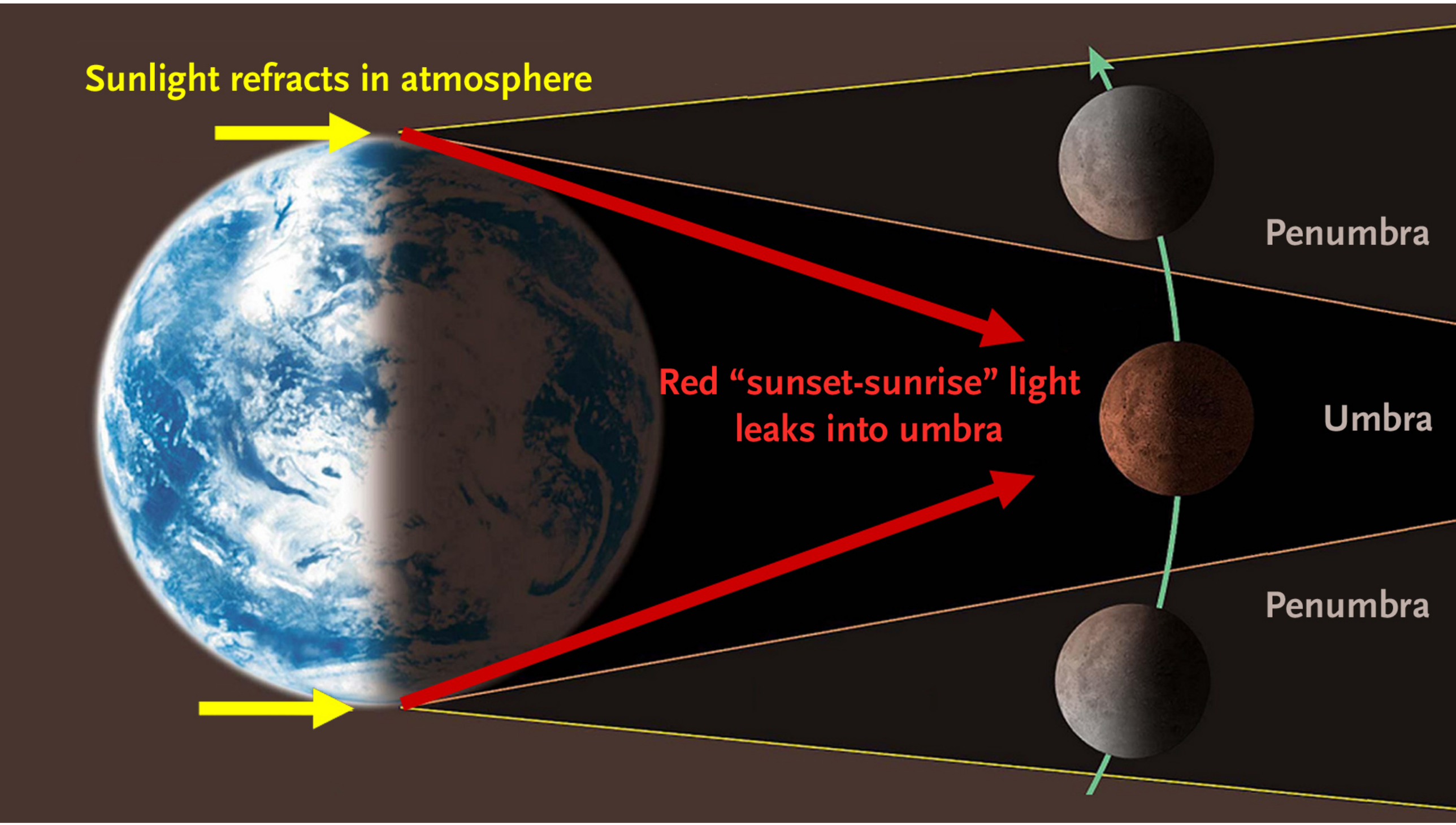
- You can see a partial solar eclipse from within the Moon's much larger penumbra.
- The Sun's appearance changes during an eclipse as the moon moves in the sky.

Lunar Eclipses

When the Moon moves into Earth's shadow

Sun - Earth - Moon

Can only occur during the FULL MOON


Sunlight refracts in atmosphere
Penumbra
Red “sunset-sunrise” light
leaks into umbra
Umbra
Penumbra

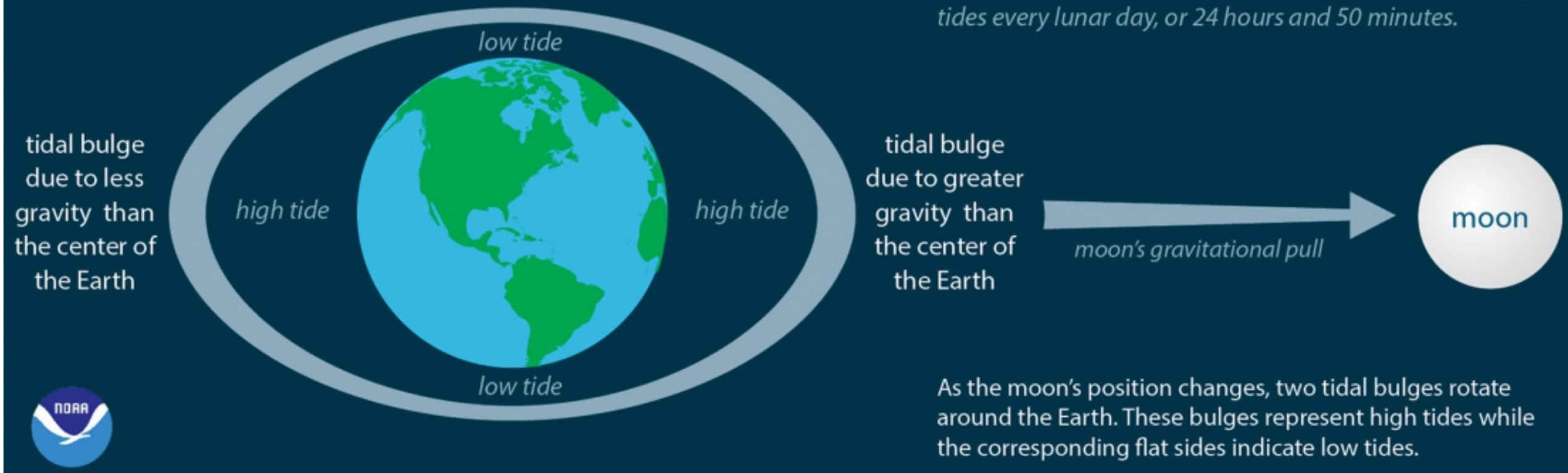
Tides

Also affected by the position of the Moon and the Sun

A tide is the daily rise and fall of sea level - happens twice per day - 2 high tides and 2 low tides

FREQUENCY OF TIDES

Most coastal areas experience two low tides and two high tides every lunar day, or 24 hours and 50 minutes.



As the moon's position changes, two tidal bulges rotate around the Earth. These bulges represent high tides while the corresponding flat sides indicate low tides.

Spring vs Neap

Spring tides happen during the FULL MOON and NEW MOON as the gravitational pull of the SUN and the MOON creates higher high tides and lower low tide

Neap tides happen one week after spring tides - right angle arrangement of Sun and Moon where the Sun’s effect reduces the Moon’s effect on tides - high tides are lower and low tides are higher