

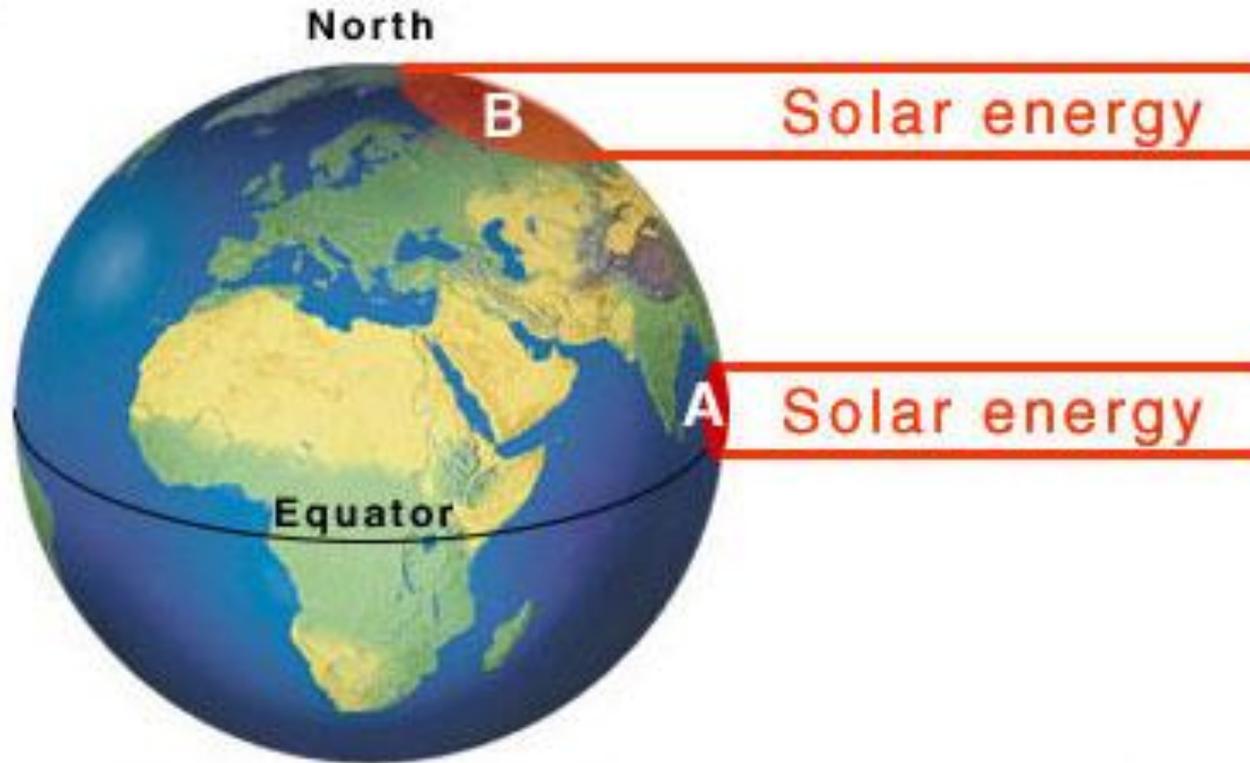


Earth Moon Sun Relationships

Rotation versus Revolution

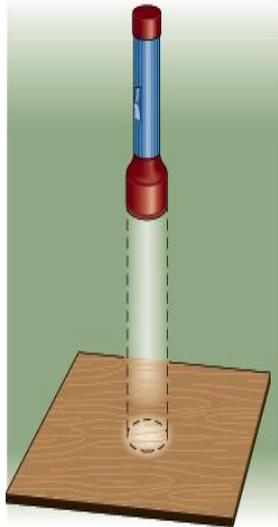
- **Rotation** is the turning of a body about an axis.
 - The earth rotates once every 24 hours.
- **Revolution** is the motion of one body around another.
 - The earth revolves around the sun once every 364 $\frac{1}{4}$ days.

What is Insolation?

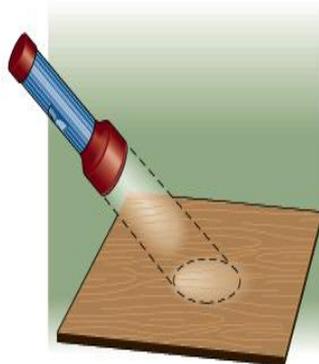


Insolation is the amount of radiation per area that reaches the earth's surface. The more direct the sun's rays hit the surface, the greater the amount of surface heating.

Examples of Insolation

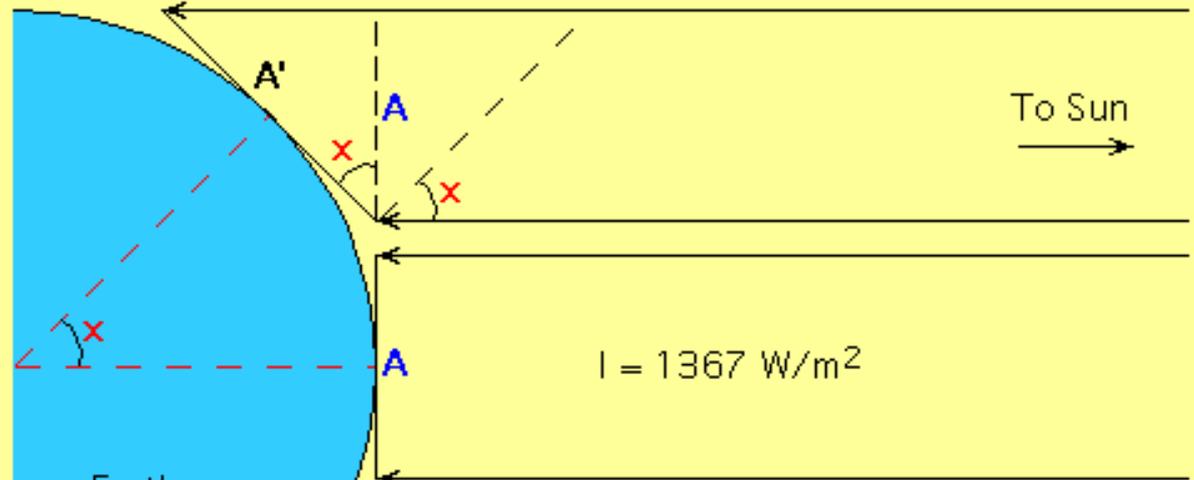


(a)



(b)

As the angle of incidence (x) increases, insolation decreases.



$$I = 1367 \text{ W/m}^2$$

x = degrees latitude away from subsolar point.

$$\cos x = \frac{A}{A'}$$

$$A' = \frac{A}{\cos x}$$

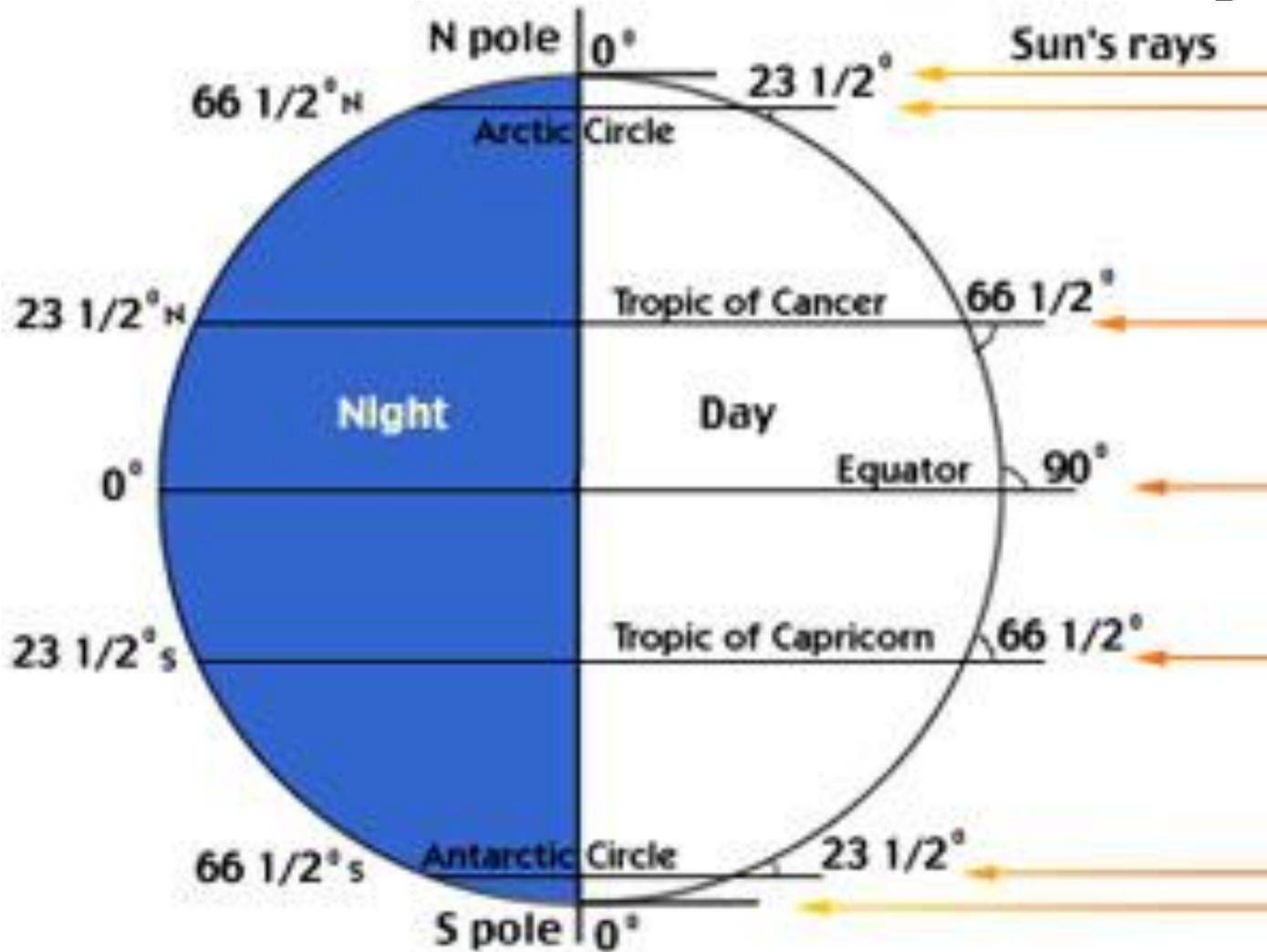
ADG/LP



Why Does the Length of Day on Earth Change?

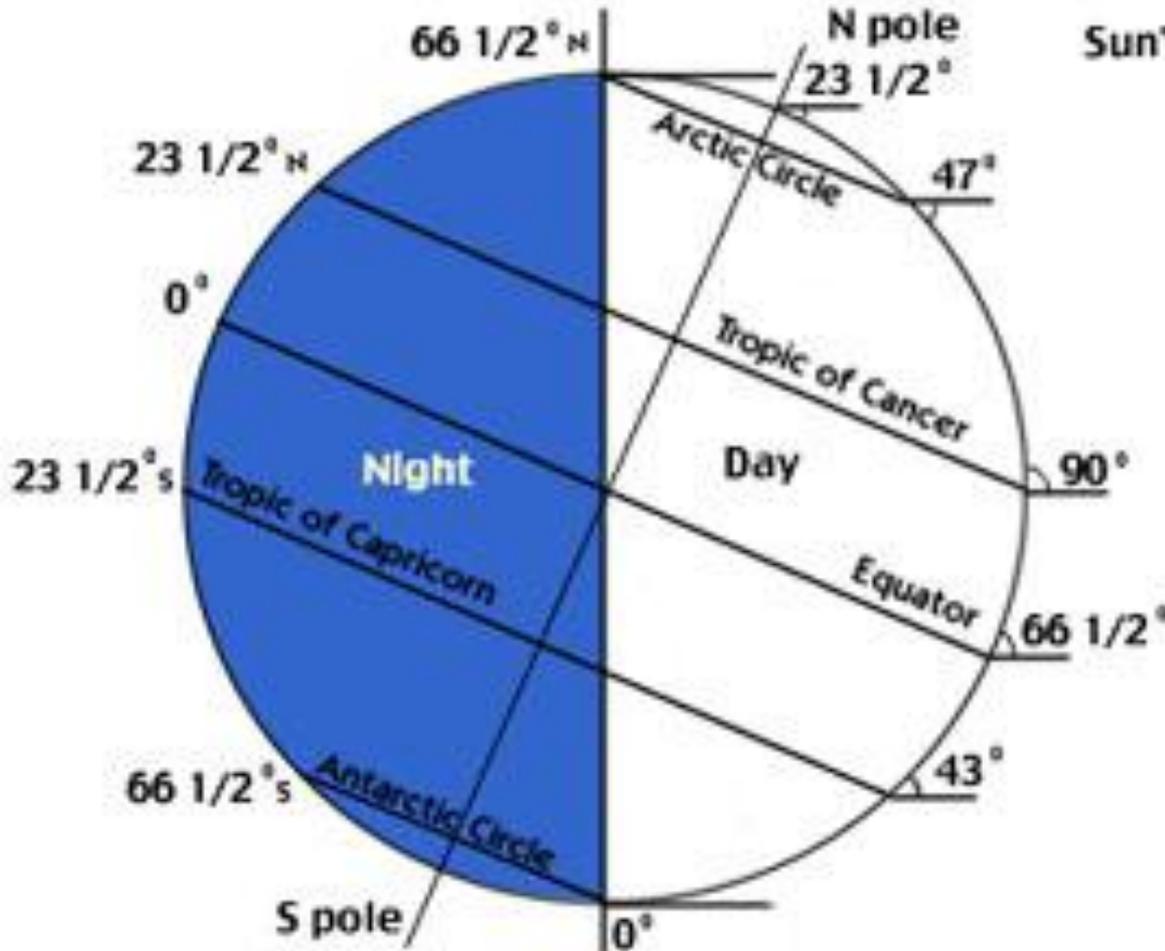
- The **tilt of the Earth's axis**, and the **rotation and revolution of the Earth** is responsible for the changes in the length of day and night.

Equal Day and Night Vernal and Autumnal Equinox



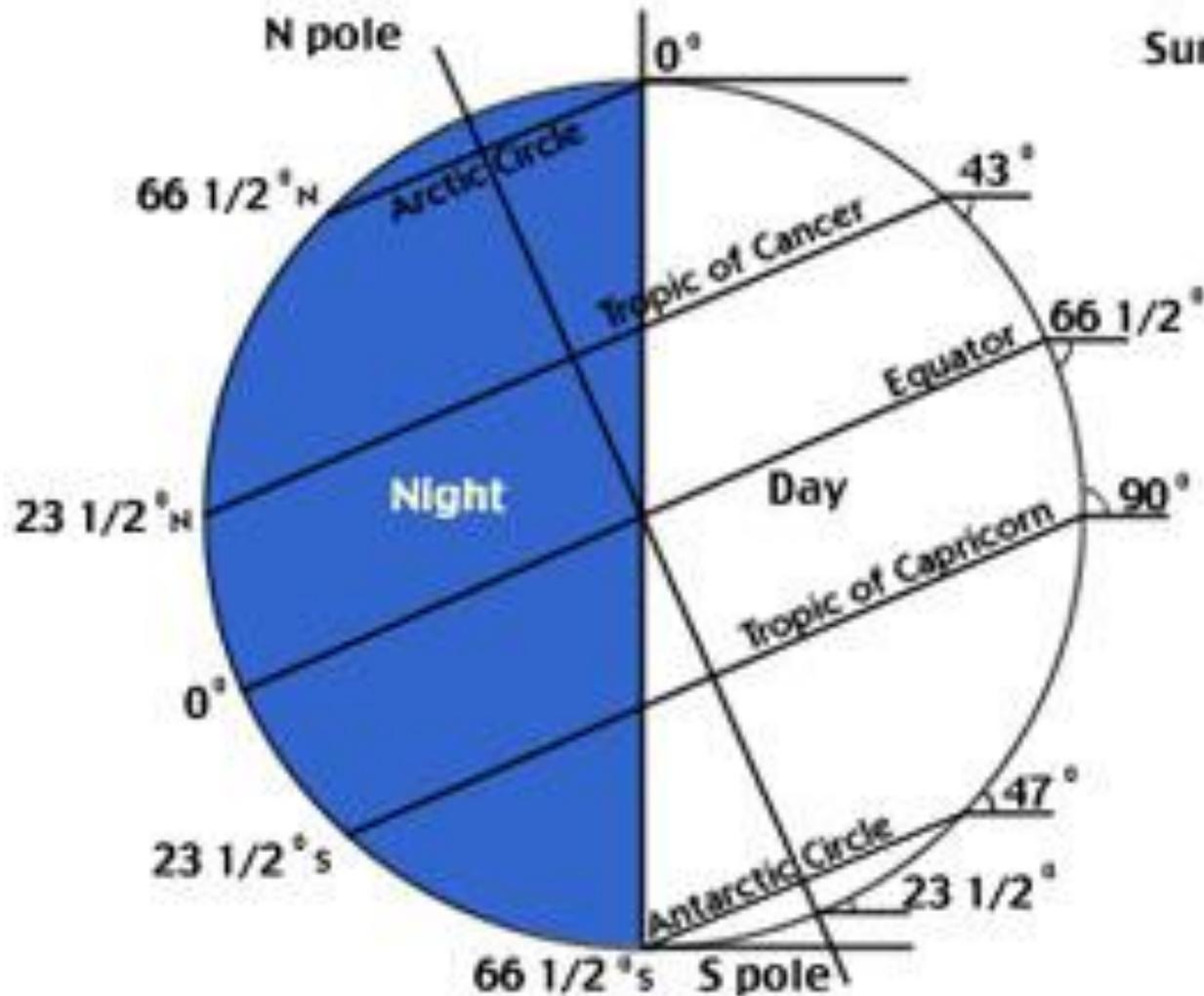
Sun is directly over the Equator

Longer Days, Shorter Nights In Northern Hemisphere



**Sun is
directly
over the
Tropic
of
Cancer**

Shorter Days, Longer Nights in Northern Hemisphere

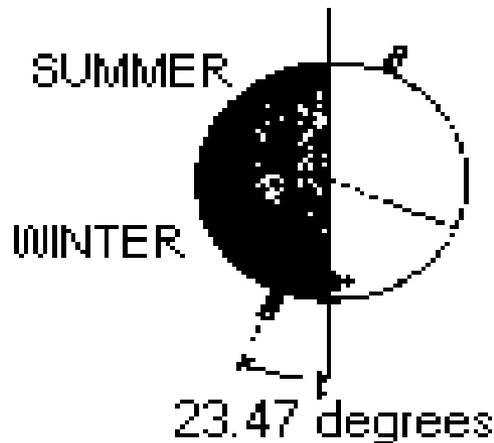
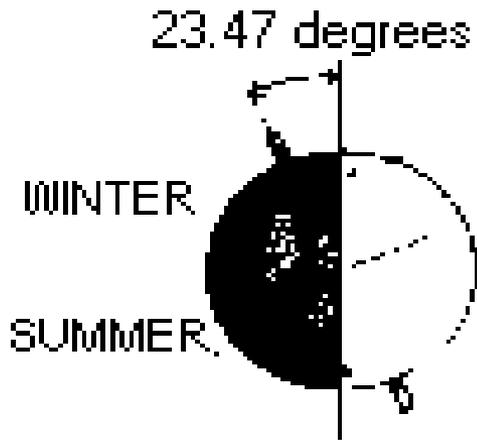


**Sun is
directly
over the
Tropic of
Capricorn**

Why Do We Have Seasons?

- **The tilt of the Earth's axis and the revolution around the Sun cause the Earth to have seasons.**

Effects of axis tilt



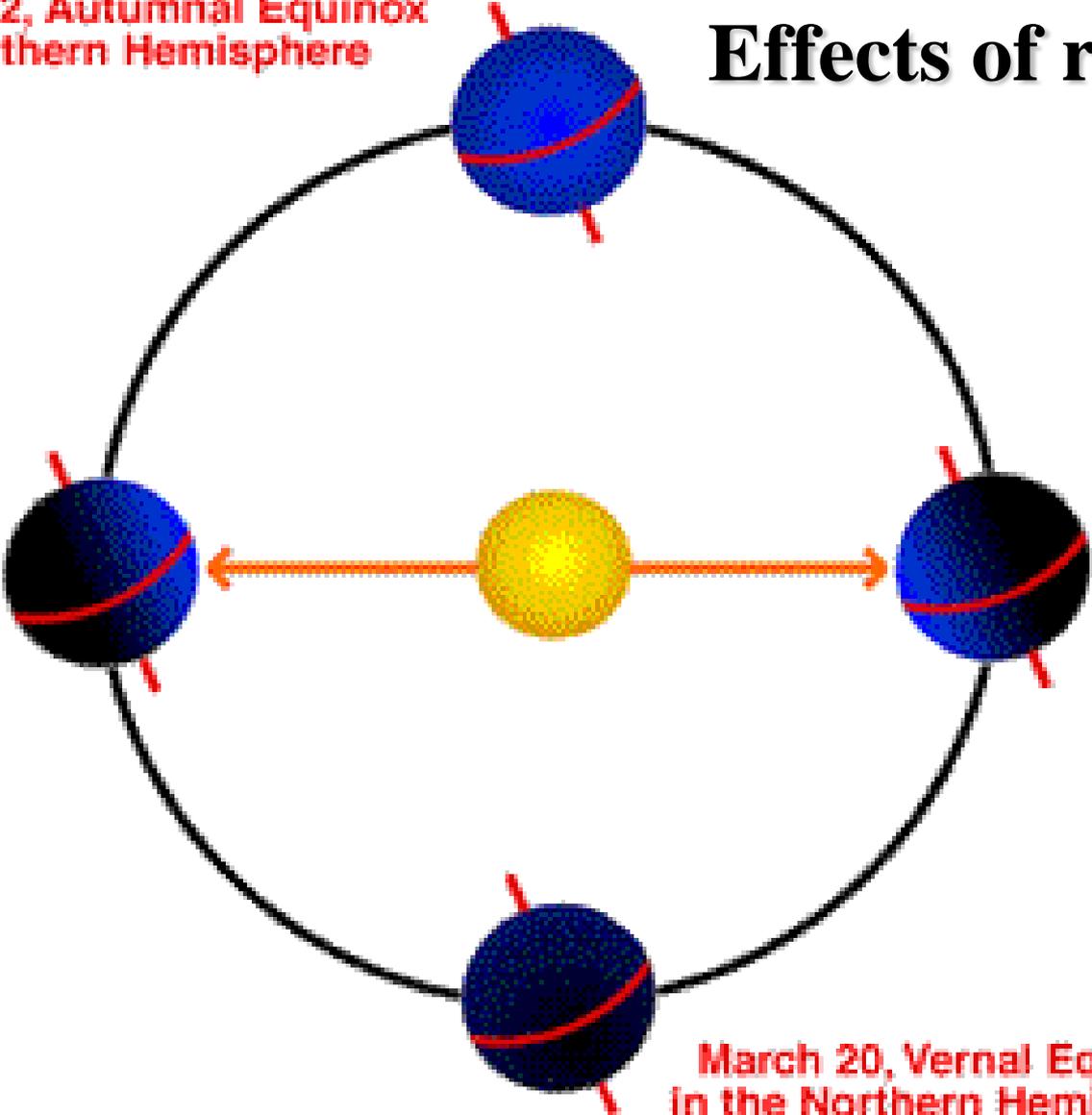
Effects of revolution

September 22, Autumnal Equinox
in the Northern Hemisphere

December 21,
Winter Solstice
in the
Northern
Hemisphere

June 21,
Summer Solstice
in the
Northern
Hemisphere

March 20, Vernal Equinox
in the Northern Hemisphere

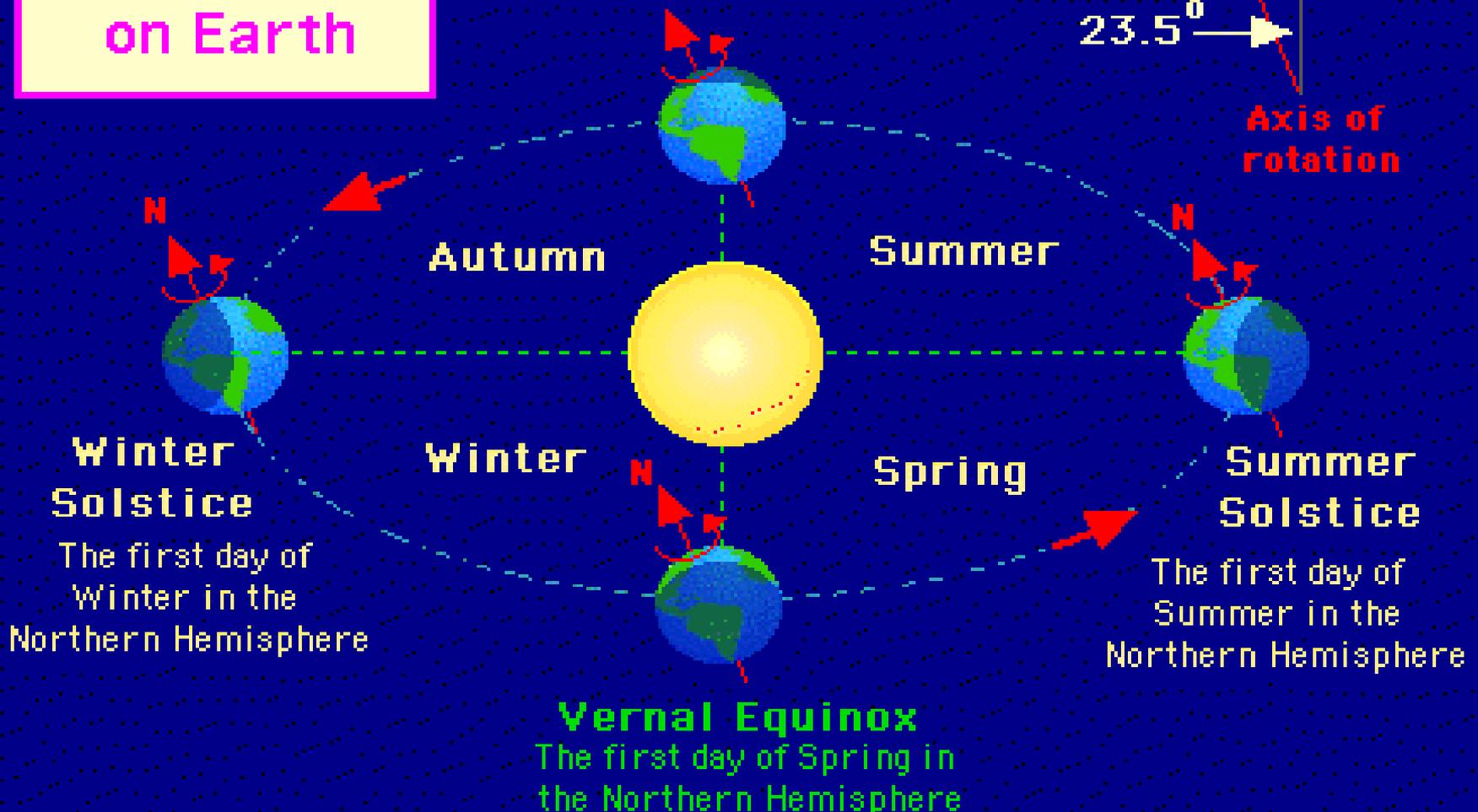


Combined Effects of Tilt and Revolution

The Seasons on Earth

Autumnal Equinox

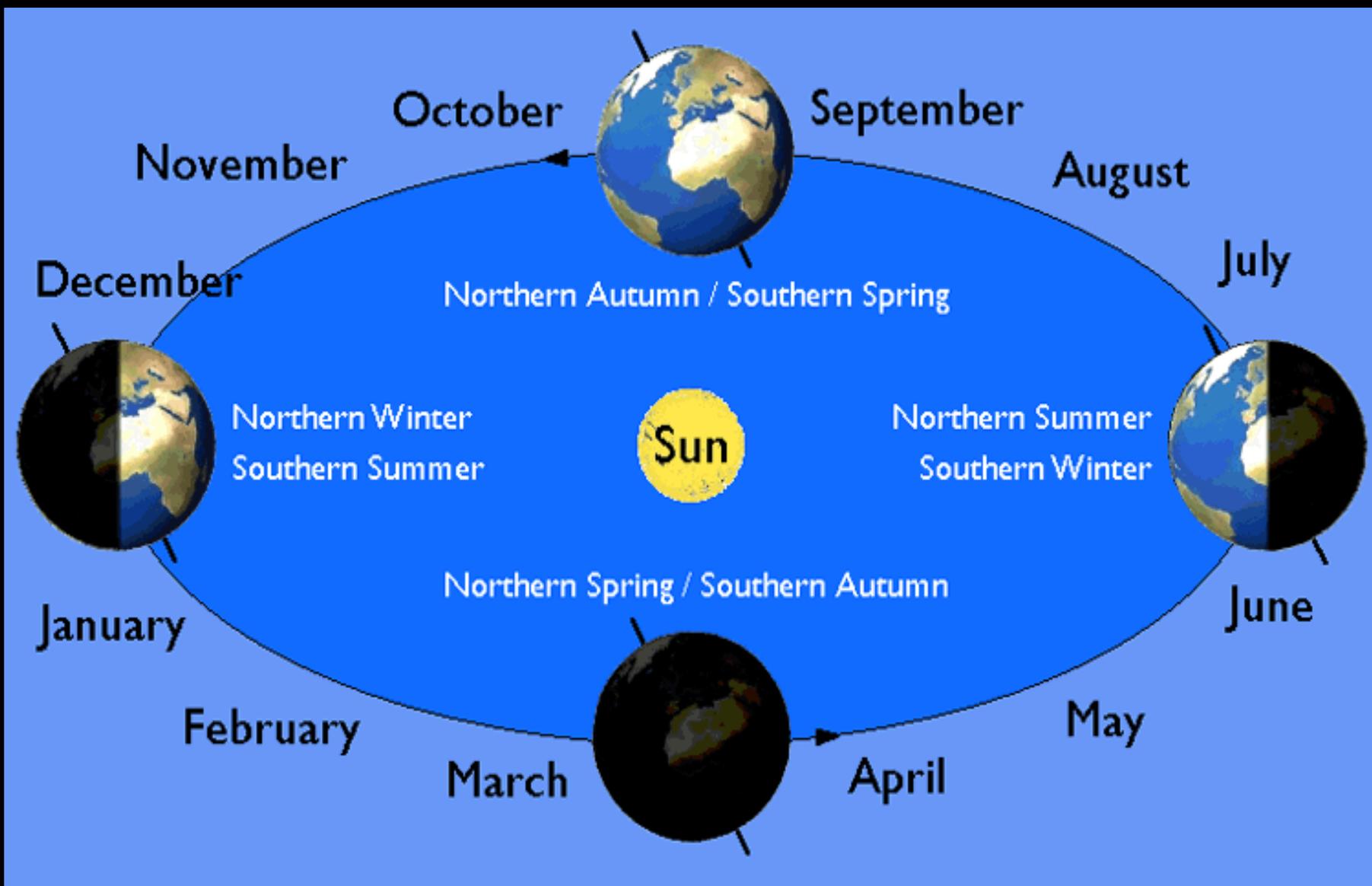
The first day of Autumn in the Northern Hemisphere



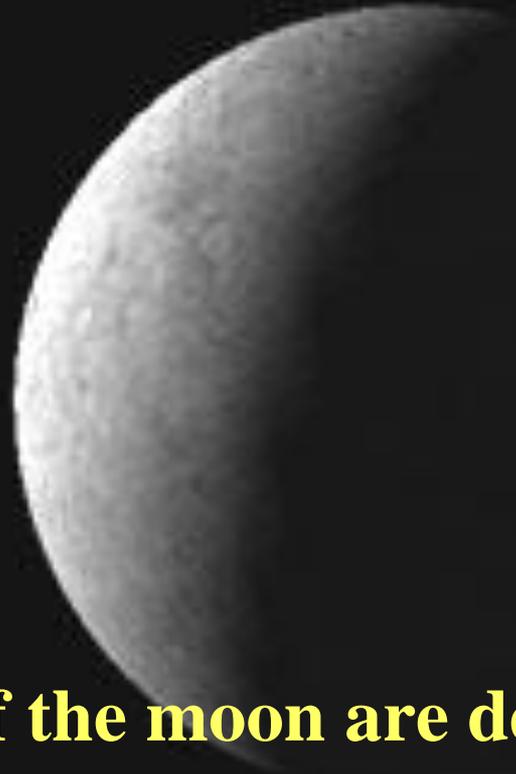
The Sun and the Earth are not to scale in this drawing.

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Earth's Seasons - Year



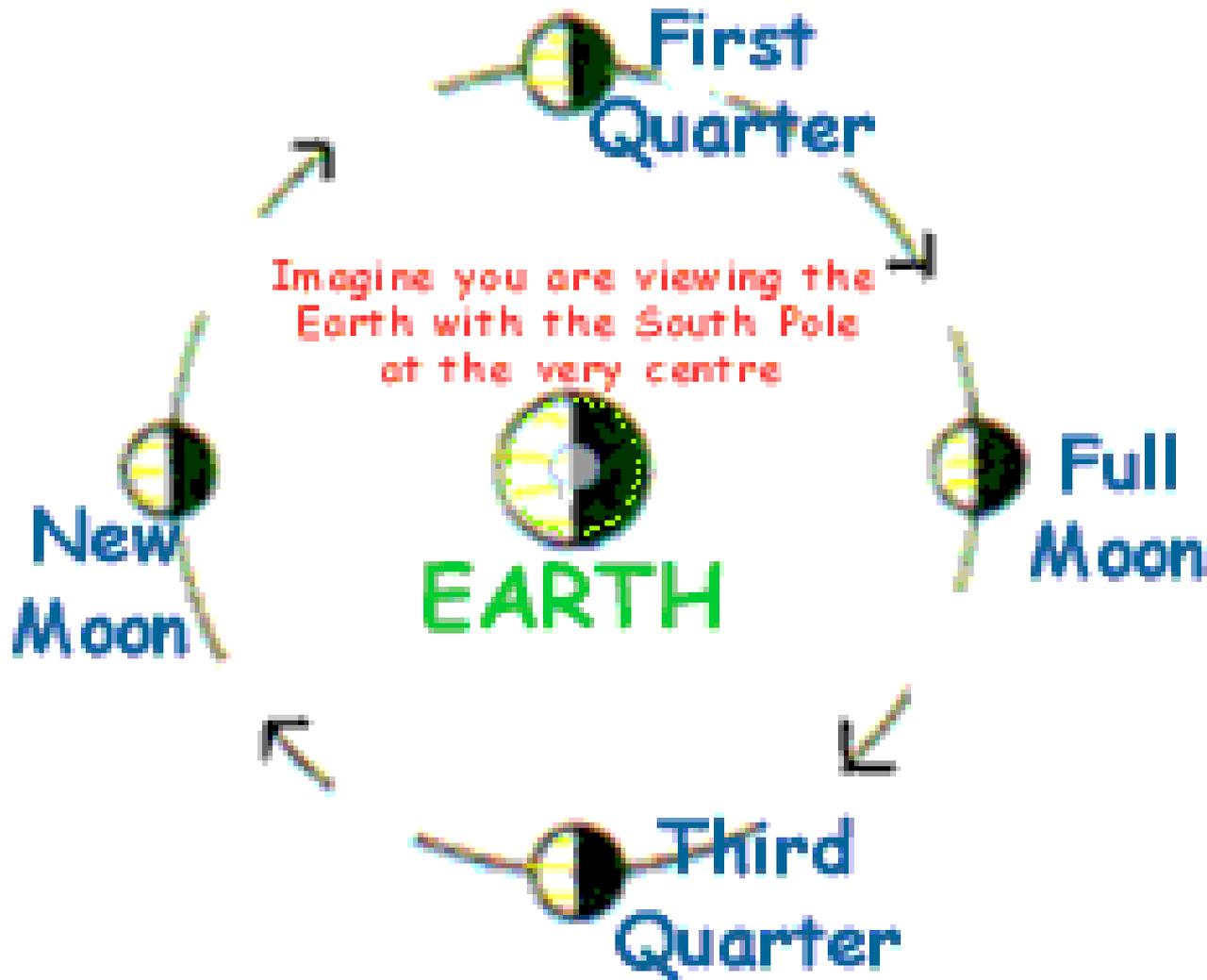
Why Does The Moon Have Phases?



- **Phases of the moon are determined by:**
 - **The relative positions of the earth, moon and sun.**
 - **Revolution of moon around the earth.**
 - **Your position on the earth.**

MOON PHASES

SUN



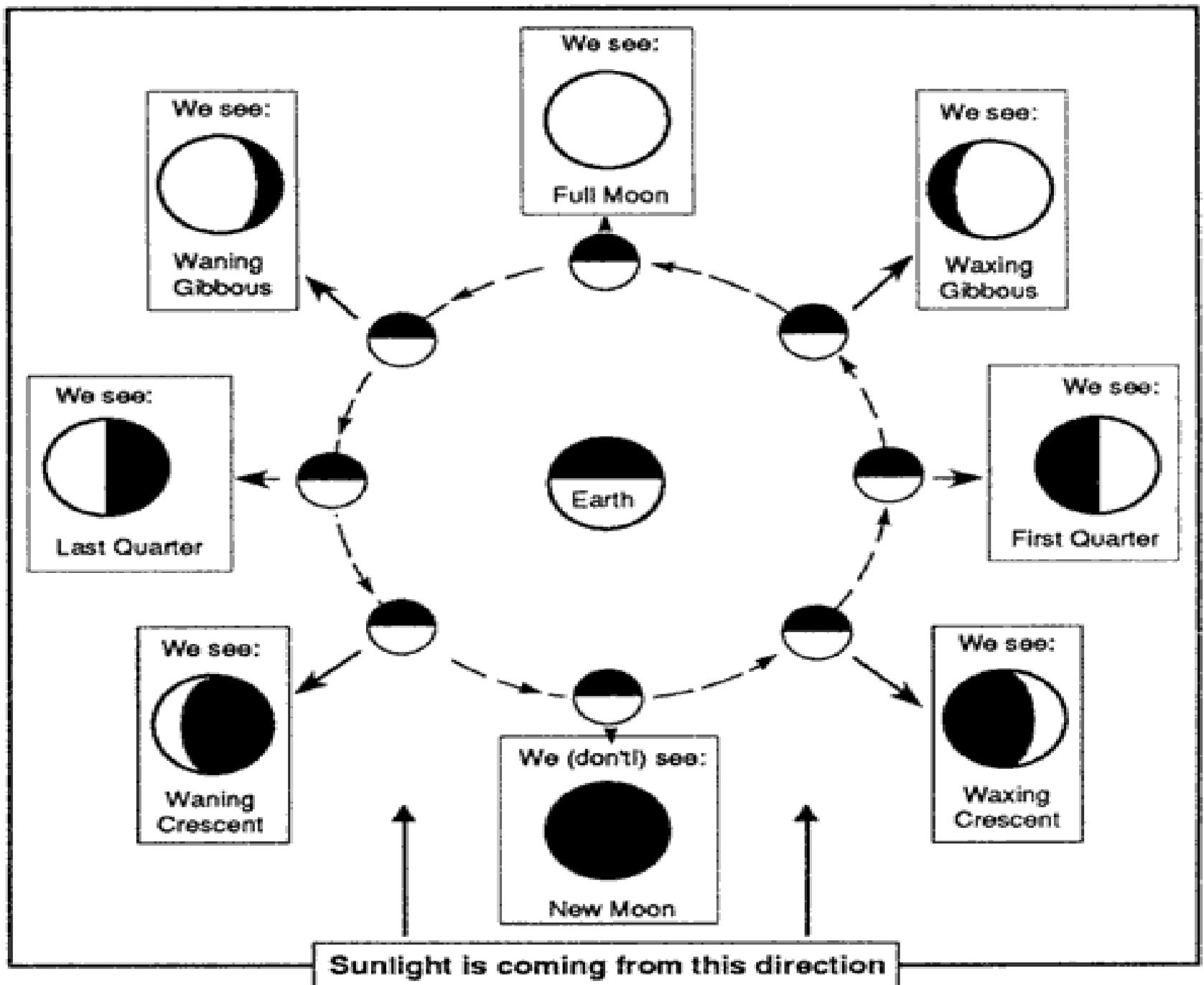
New Moon

First Quarter

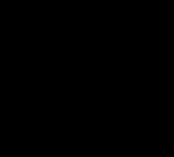
Full Moon

Third Quarter

EARTH



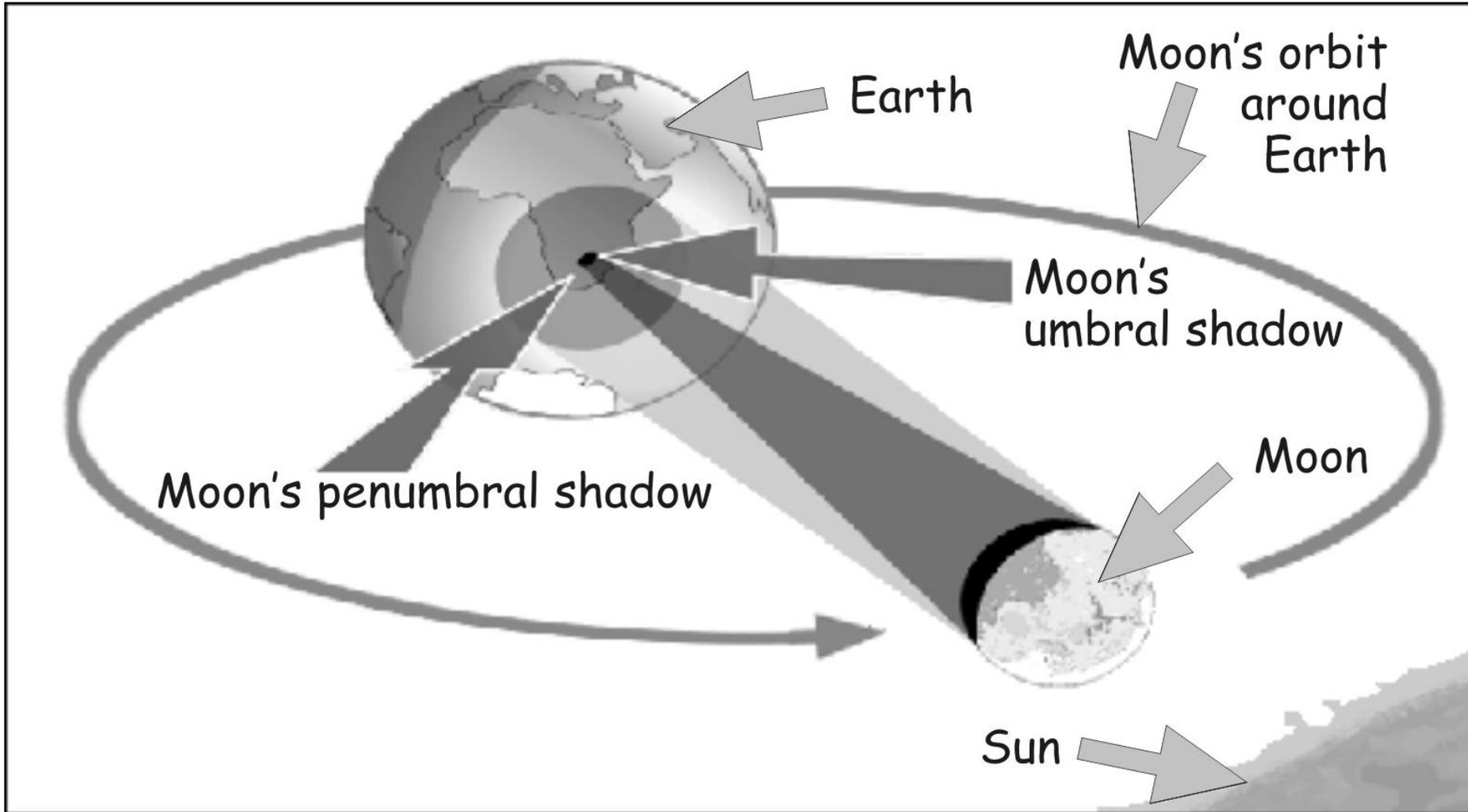
Phases of the Moon October 2003

Mon	Tue	Wed	Thur	Fri	Sat	Sun
		1	2	3	4	5
						
6	7	8	9	10 Full	11	12
						
13	14	15	16	17	18	19
						
20	21	22	23	24	25 New	26
						
27	28	29	30	31		
						

What is a **Solar** Eclipse?

- A **Solar** Eclipse is when the **Sun** is **blocked** from view by the moon.
 - The moons orbital path places it in between the earth and the sun.

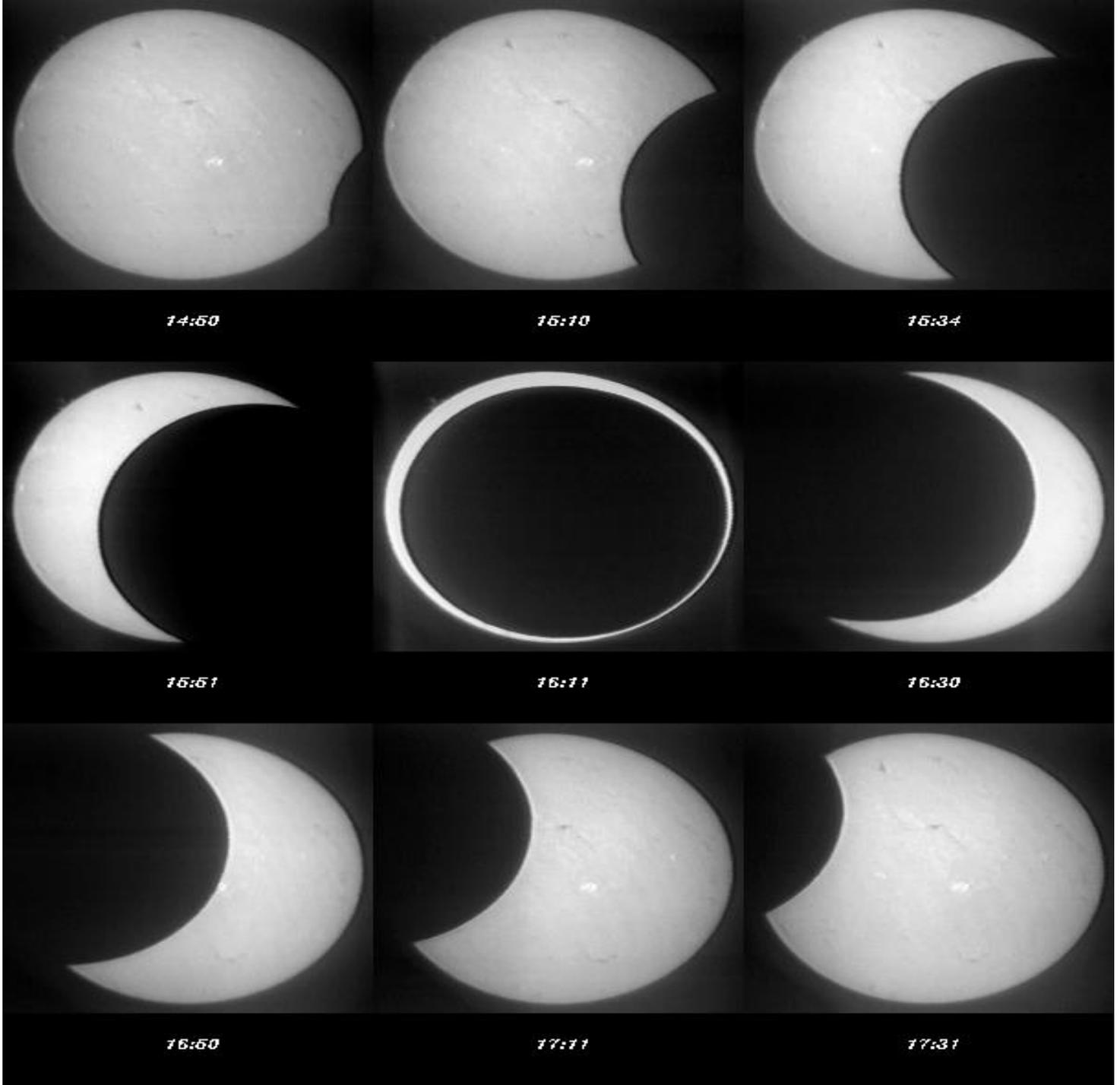
Total Eclipse line-up 8:19am on 4 December 2002



A Total Solar Eclipse



Phases of a solar eclipse



**Solar eclipse, notice
solar prominence in
corona.**



Solar Eclipse



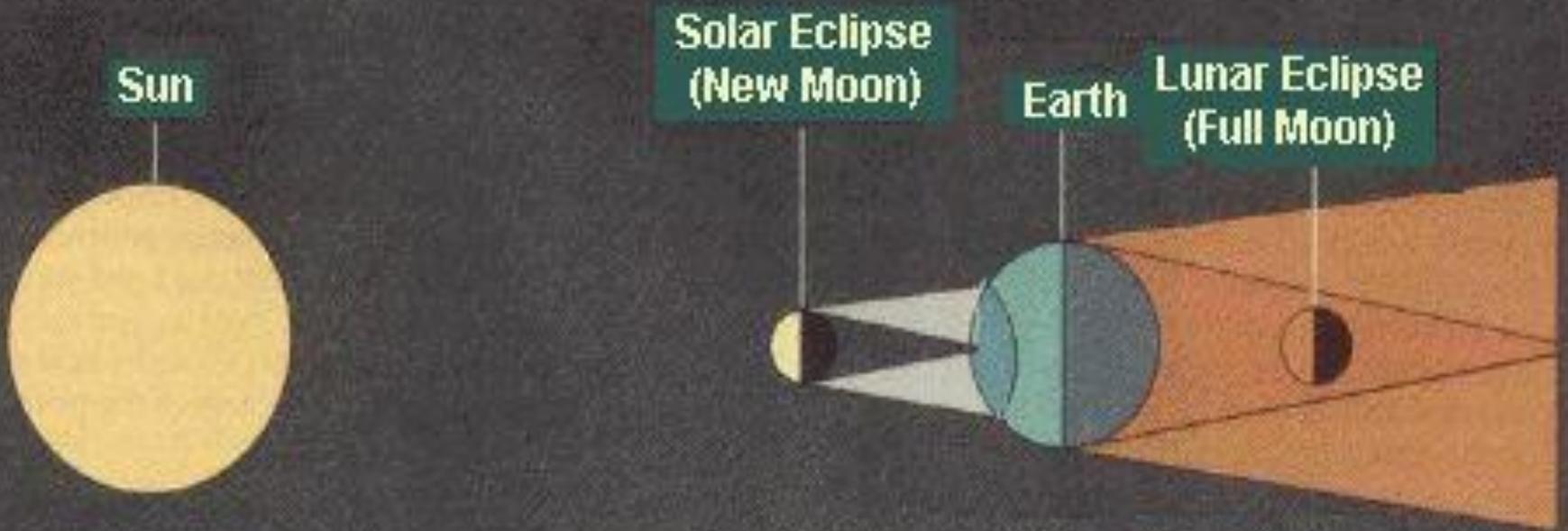
What is a Lunar Eclipse?

- A **Lunar eclipse** is when the **moon** is **blocked** by the shadow of the earth.
 - The moon's orbital path takes it into the shadow of the earth.

Phases of a Lunar eclipse



Solar versus Lunar Eclipse



Note: Solar eclipse = sun blocked; Lunar eclipse = moon blocked