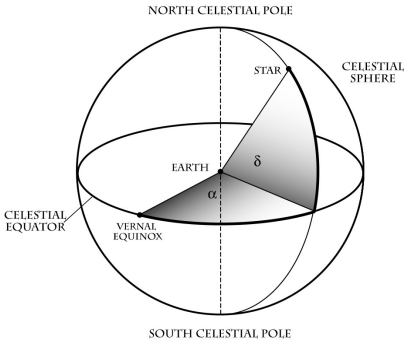
The Seasons

Questions

Why does it get dark every day?

Why do we have hot and cold seasons?

Celestial Coordinates



Celestial Poles are above the North & South Poles.

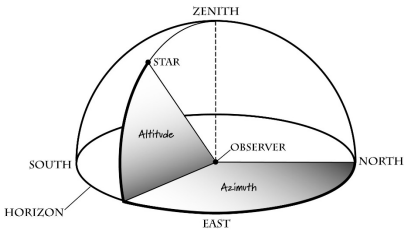
Celestial Equator is directly above the Earth's Equator.

Star Positions

Longitude = Right Ascension (α)

Latitude = Declination (δ)

Local Coordinates



Relative to the Observer

Zenith is a point directly over-head.
Meridian is a line through the Celestial Poles and the Zenith.

Star Positions

Azimuth is angle from North

Altitude is angle from Horizon

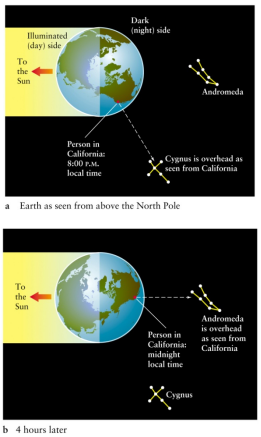
The Sun and Seasons

Two Motions

Rotation – The spinning of a body around its axis (one day).

Revolution – The orbital motion of a body around another due to Gravity (one year).

Effects Due to Rotation

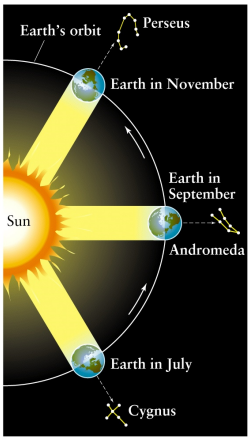


Gives us **Night** and **Day**.

Causes the Sun and Stars to rise in the East and set in the West.

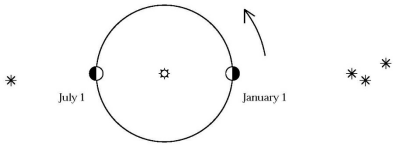
If there was no Revolution, then each night sky would be the same.

Effects Due to Revolution

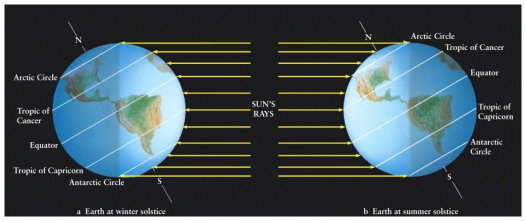


Gives us the **Year**.

Has a role in producing the **Seasons**, which are not due to a change in distance.



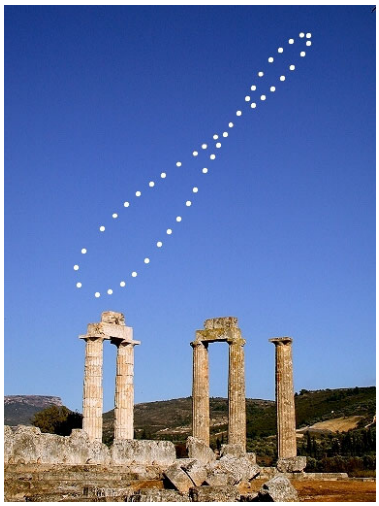
Path of the Sun



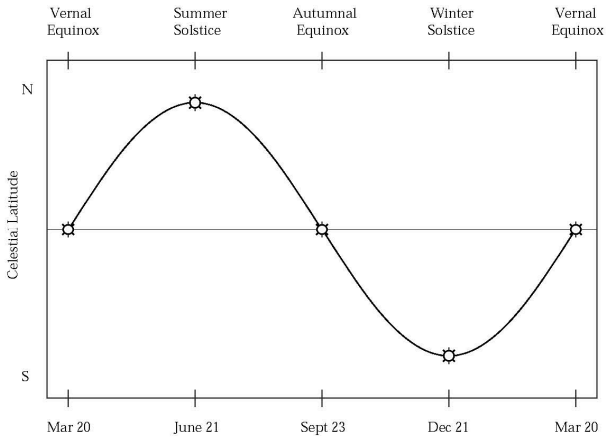
Sun's Path on the sky is the Ecliptic.

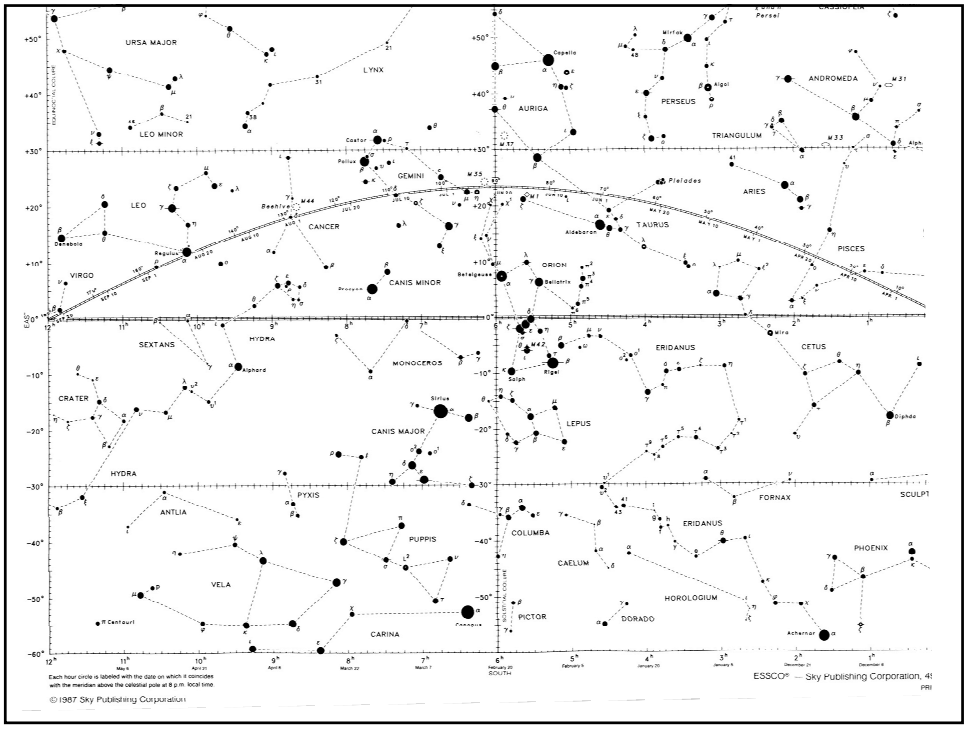
The Earth's tilt (obliquity) of 23.5° is what causes the Sun's path not to be on the Celestial Equator.

Yearly Solar Motion



Yearly Solar Motion




URSA MAJOR
LYNX
LEO MINOR
AURIGA
PERSEUS
ANDROMEDA
TRIANGULUM
LEO
GEMINI
ARIES
CANCER
TAURUS
PISCES
VIRGO
ORION
CANIS MINOR
SEXTANS
HYDRA
MONOCEROS
ERIDANUS
CETUS
CRATER
CANIS MAJOR
LEPUS
HYDRA
PYXIS
FORNAX
SCULPT
ANTLIA
COLUMBA
ERIDANUS
PUPPIS
PHOENIX
CAELUM
VELA
HOROLOGIUM
PICTOR
DORADO
CARINA
Each hour circle is labeled with the date on which it coincides with the meridian above the celestial pole at 8 p.m. local time.
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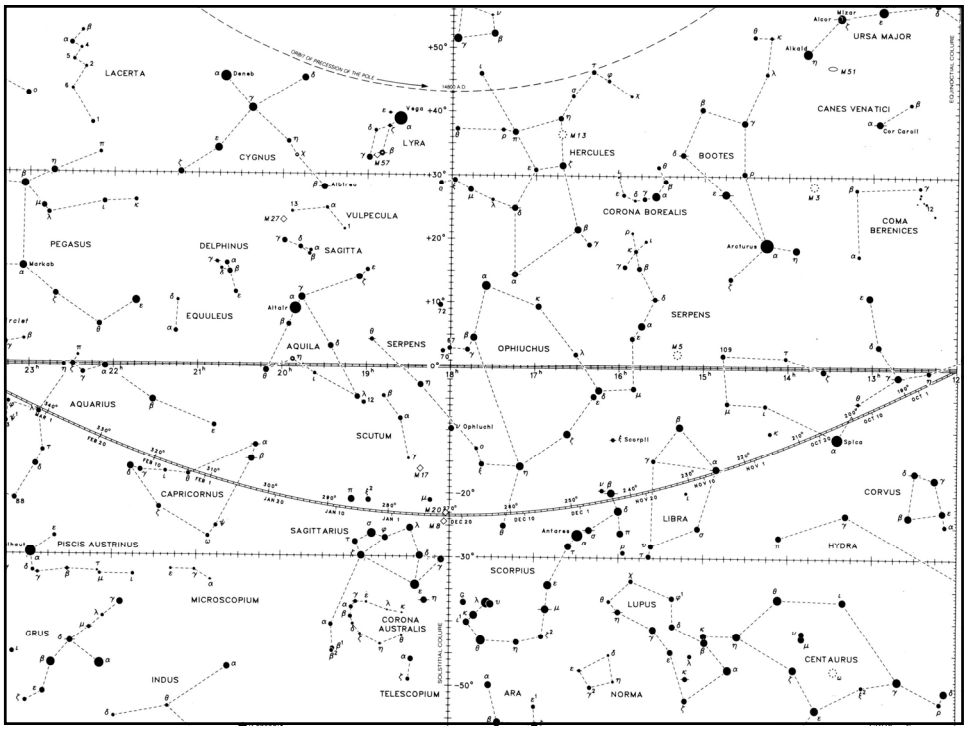
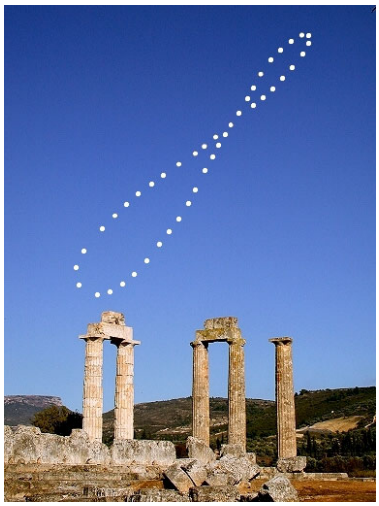
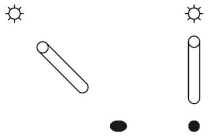

LACERTA
CYGNUS
LYRA
URSA MAJOR
CANES VENATICI
HERCULES
BOOTES
CORONA BOREALIS
VULPECULA
COMA BERENICES
PEGASUS
DELPHINUS
SAGITTA
SERPENS
EQUULEUS
OPHIUCHUS
AQUILA
SERPENS
AQUARIUS
SCUTUM
CORVUS
CAPRICORNUS
LIBRA
SAGITTARIUS
HYDRA
PISCIS AUSTRINUS
SCORPIUS
MICROSCOPIUM
LUPUS
CORONA AUSTRALIS
CENTAURUS
GRUS
INDUS
TELESCOPIUM
ARA
NORMA

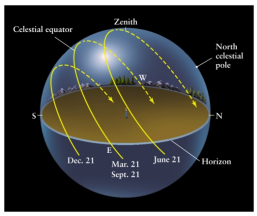
Yearly Solar Motion



Effective Heating



When the Sun is high in the sky, the Effective Heating is greater (a smaller area is heated by the same amount of light).



When the Sun is low in the sky, the Effective Heating is weaker (a larger area is illuminated by the same amount of light).

Why Are There Seasons?

The Earth's rotation axis is tilted 23.5° with respect to its orbital plane.

Because of the tilt, the Sun's yearly motion in the sky goes from a highest point to a lowest point and back to a highest point.

Because Effective Heating is greatest when the Sun is high in the sky, Summer occurs. Effective Heating is least when the Sun is low, giving us Winter. Spring and Autumn are transition seasons.

Yearly Solar Motion