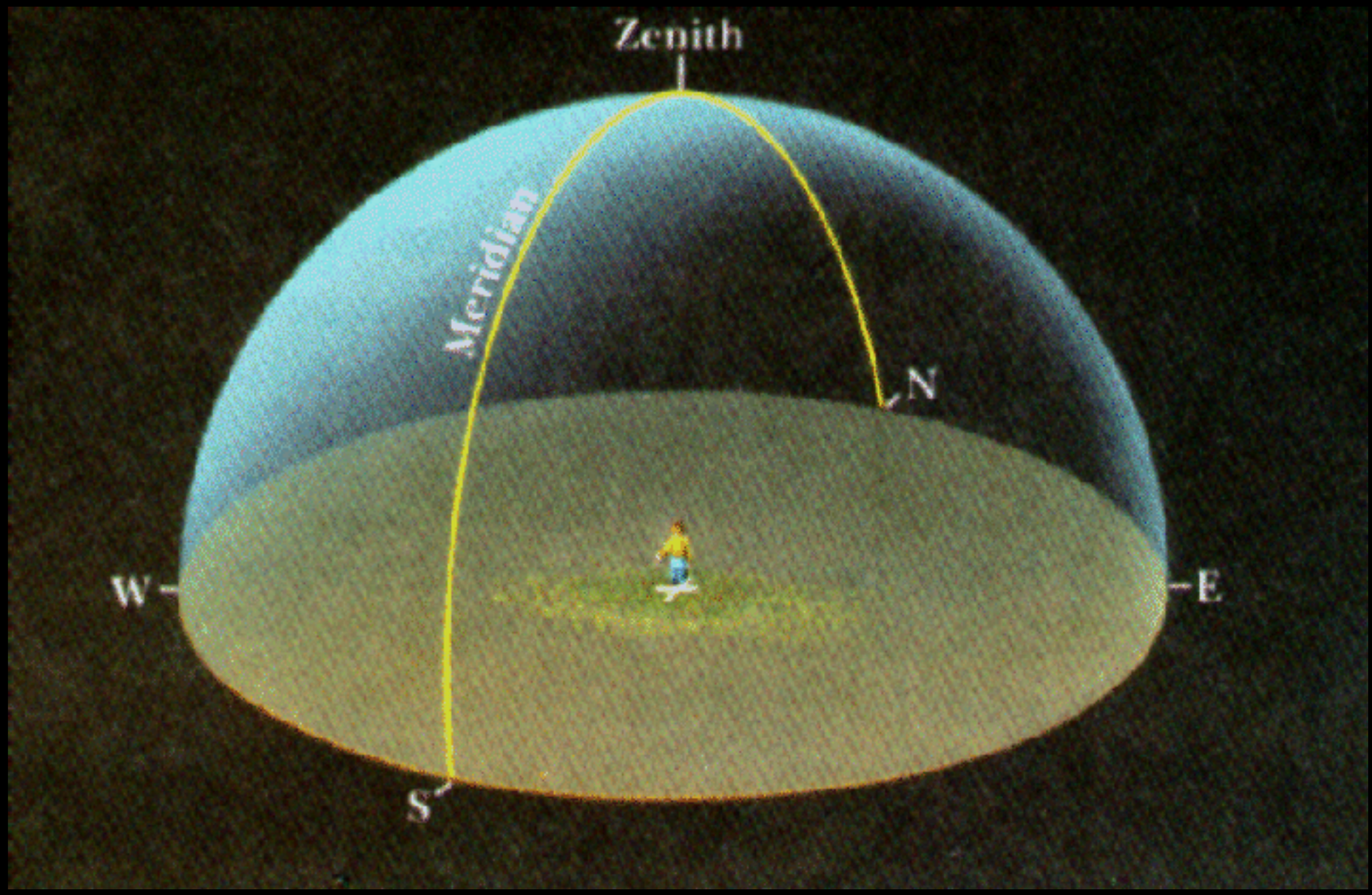
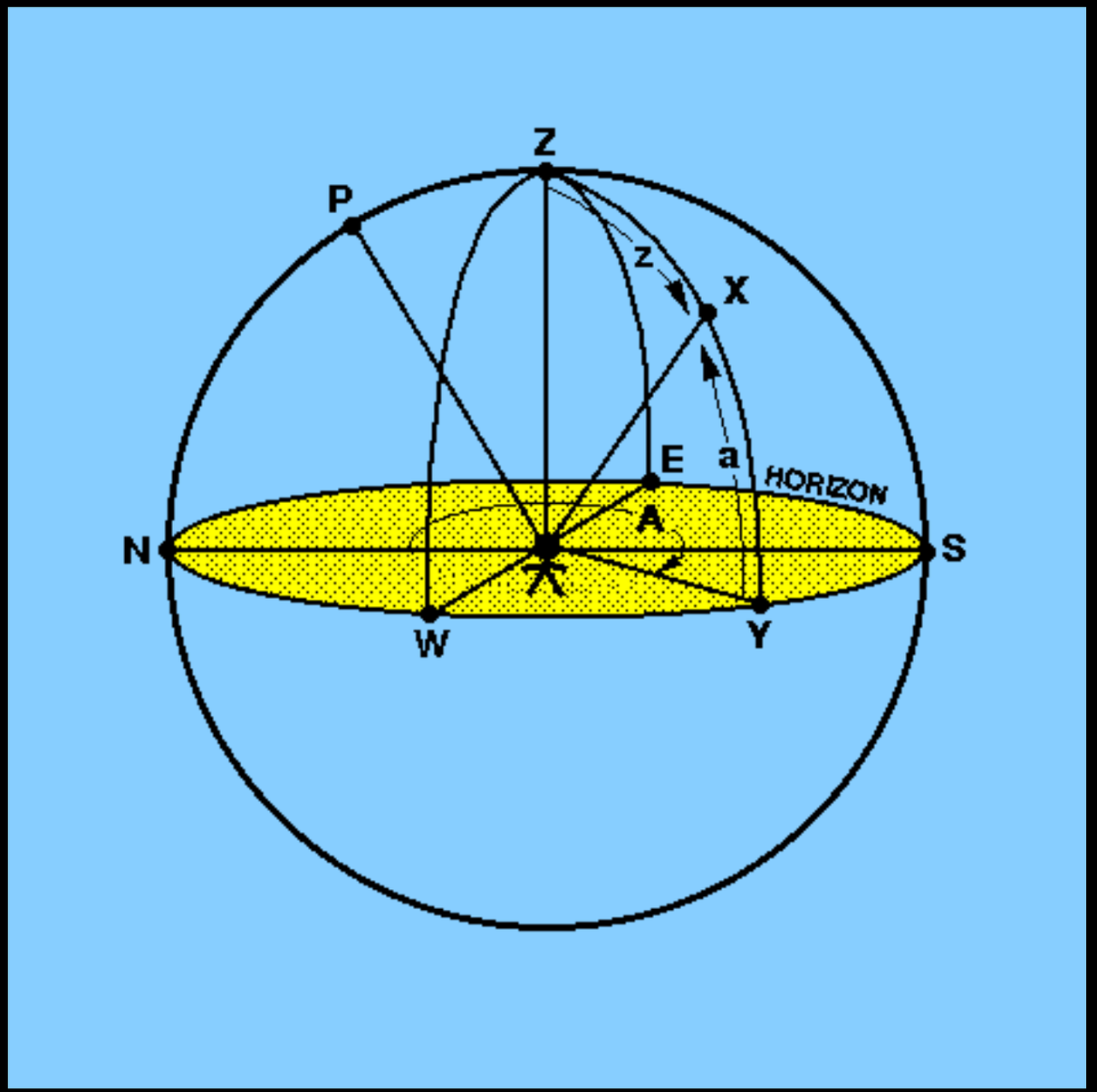
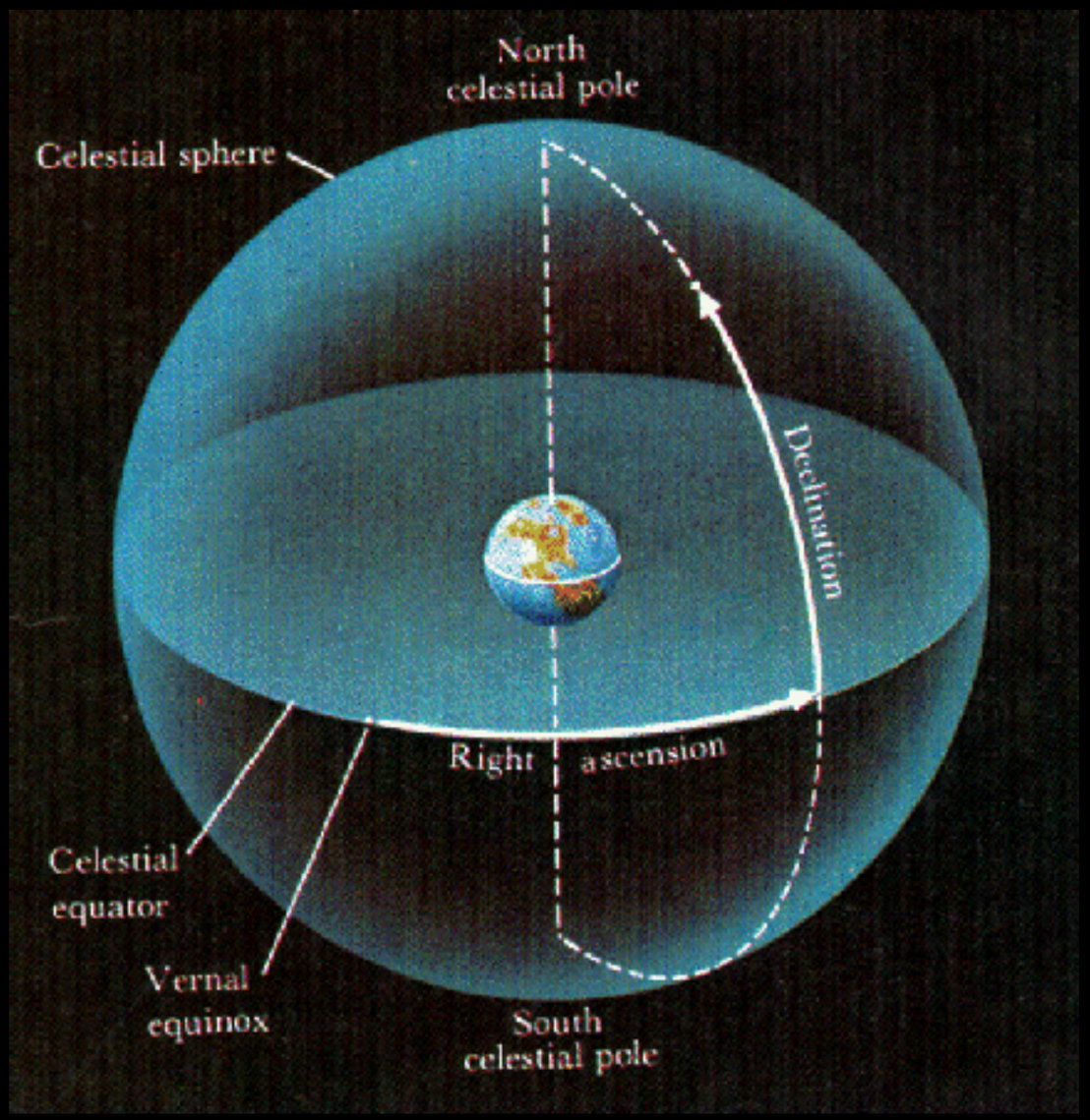
From the Earth's surface we envision a hemisphere and mark the compass points on the horizon. The circle that passes through the south point, north point and the point directly over head (zenith) is called the meridian.



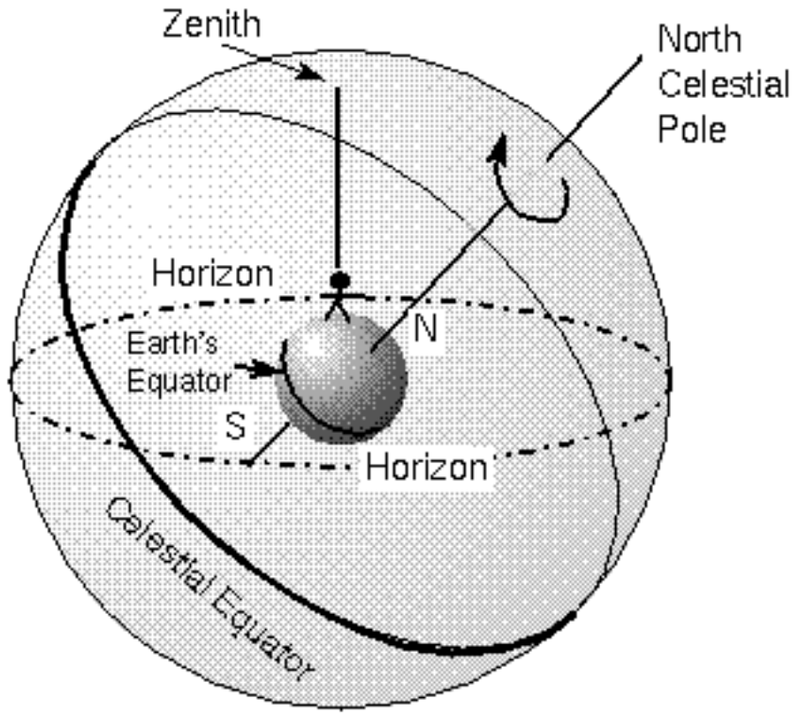
This system allows one to indicate any position in the sky by two reference points, the time from the meridian and the angle from the horizon. Of course, since the Earth rotates, your coordinates will change after a few minutes.

The horizontal coordinate system (commonly referred to as the alt-az system) is the simplest coordinate system as it is based on the observer's horizon. The celestial hemisphere viewed by an observer on the Earth is shown in the figure below. The great circle through the zenith Z and the north celestial pole P cuts the horizon NESYW at the north point (N) and the south point (S). The great circle WZE at right angles to the great circle NPZS cuts the horizon at the west point (W) and the east point (E).

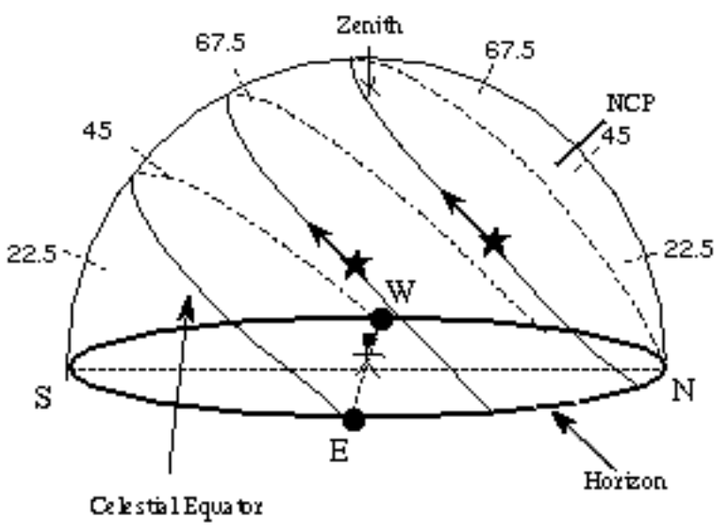




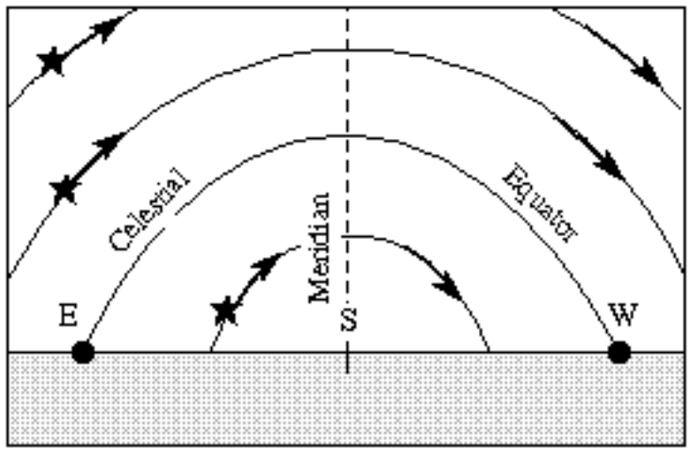
The celestial sphere has a north and south celestial pole as well as a celestial equator which are projected reference points to the same positions on the Earth surface. Right Ascension and Declination serve as an absolute coordinate system fixed on the sky, rather than a relative system like the zenith/horizon system.



The celestial sphere for an observer in Seattle.
The angle between the zenith and the NCP = the angle between the celestial equator and the horizon.
That angle = 90° – observer's latitude.

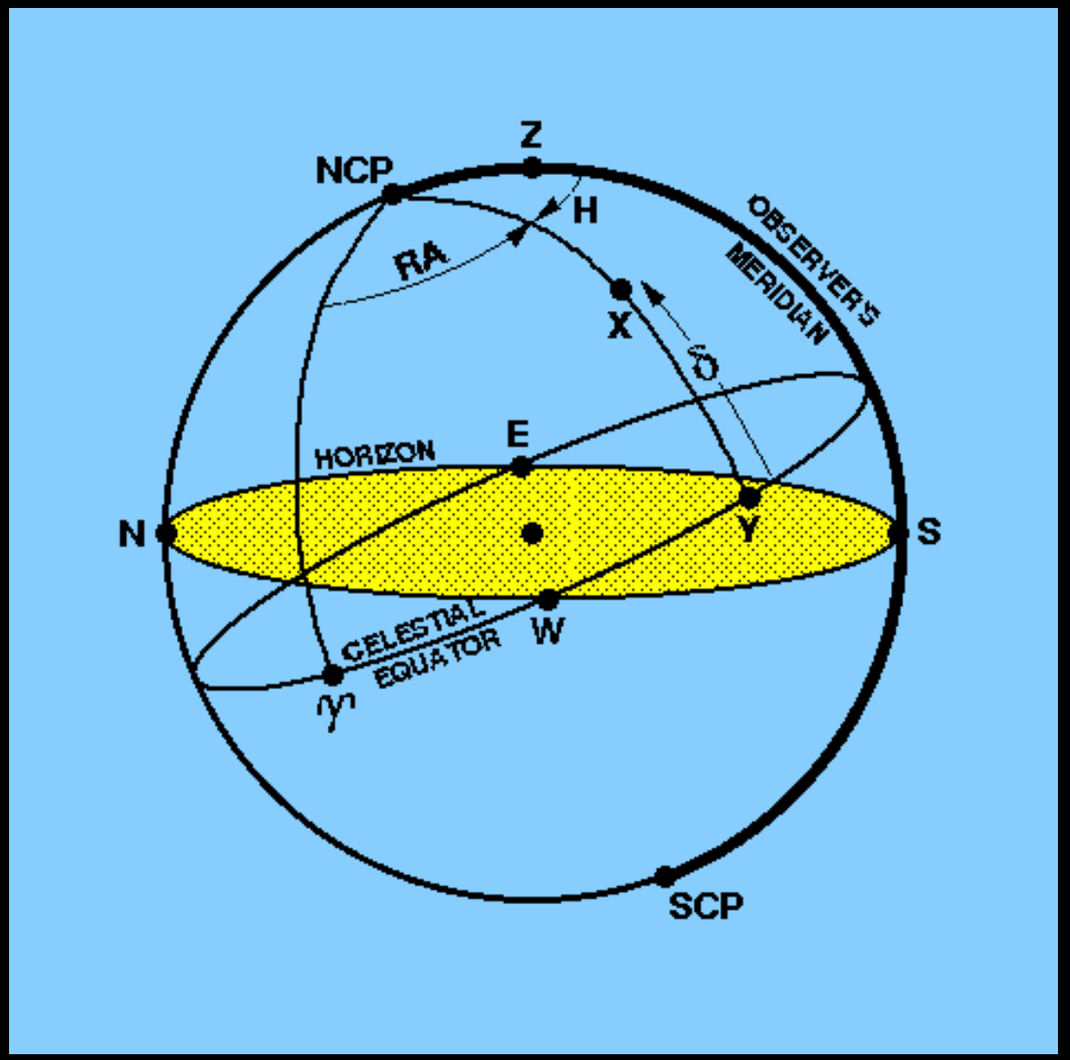


Stars motion at Seattle. Stars rotate parallel to the Celestial Equator, so they move at an angle with respect to the horizon here. Altitudes of 1/4, 1/2, and 3/4 the way up to the zenith are marked.

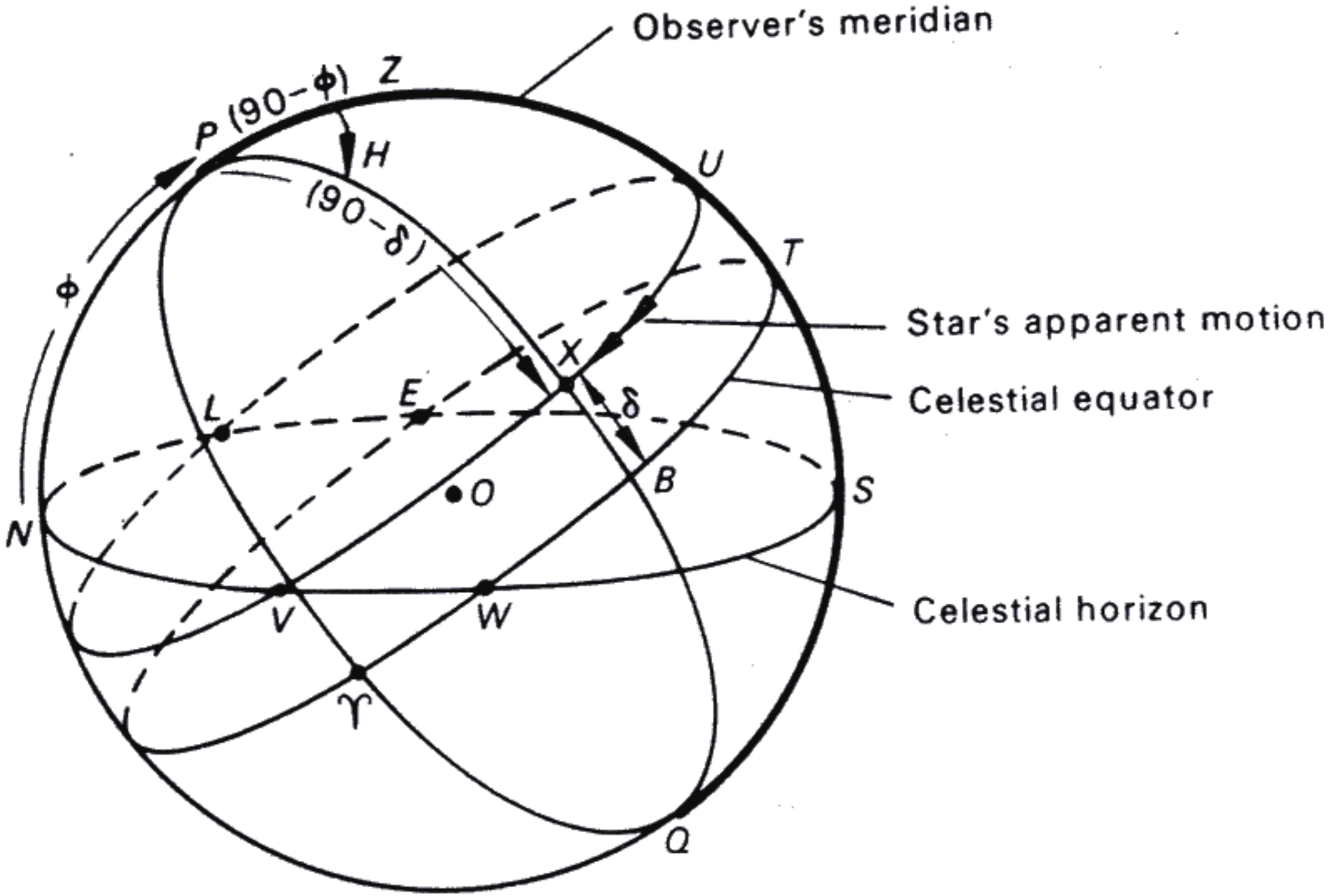


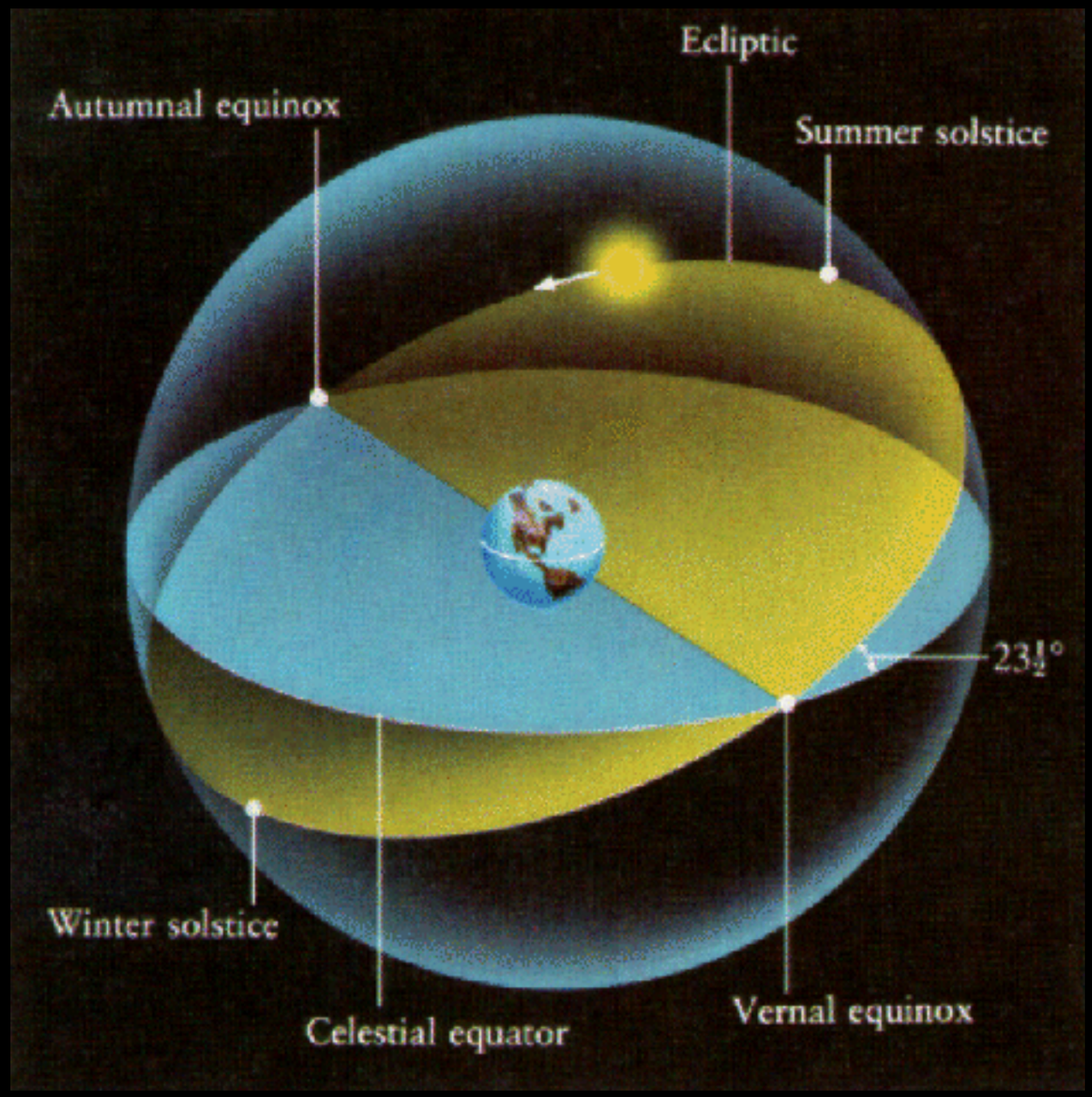
Your view from Seattle. Stars rise in the East half of the sky, reach maximum altitude when crossing the meridian (due South) and set in the West half of the sky. The Celestial Equator goes through due East and due West.

In this system, known as the equatorial coordinate system, the analog of latitude is the declination, δ. The declination of a star is its angular distance in degrees measured from the celestial equator along the meridian through the star. It is measured north and south of the celestial equator and ranges from 0° at the celestial equator to 90° at the celestial poles

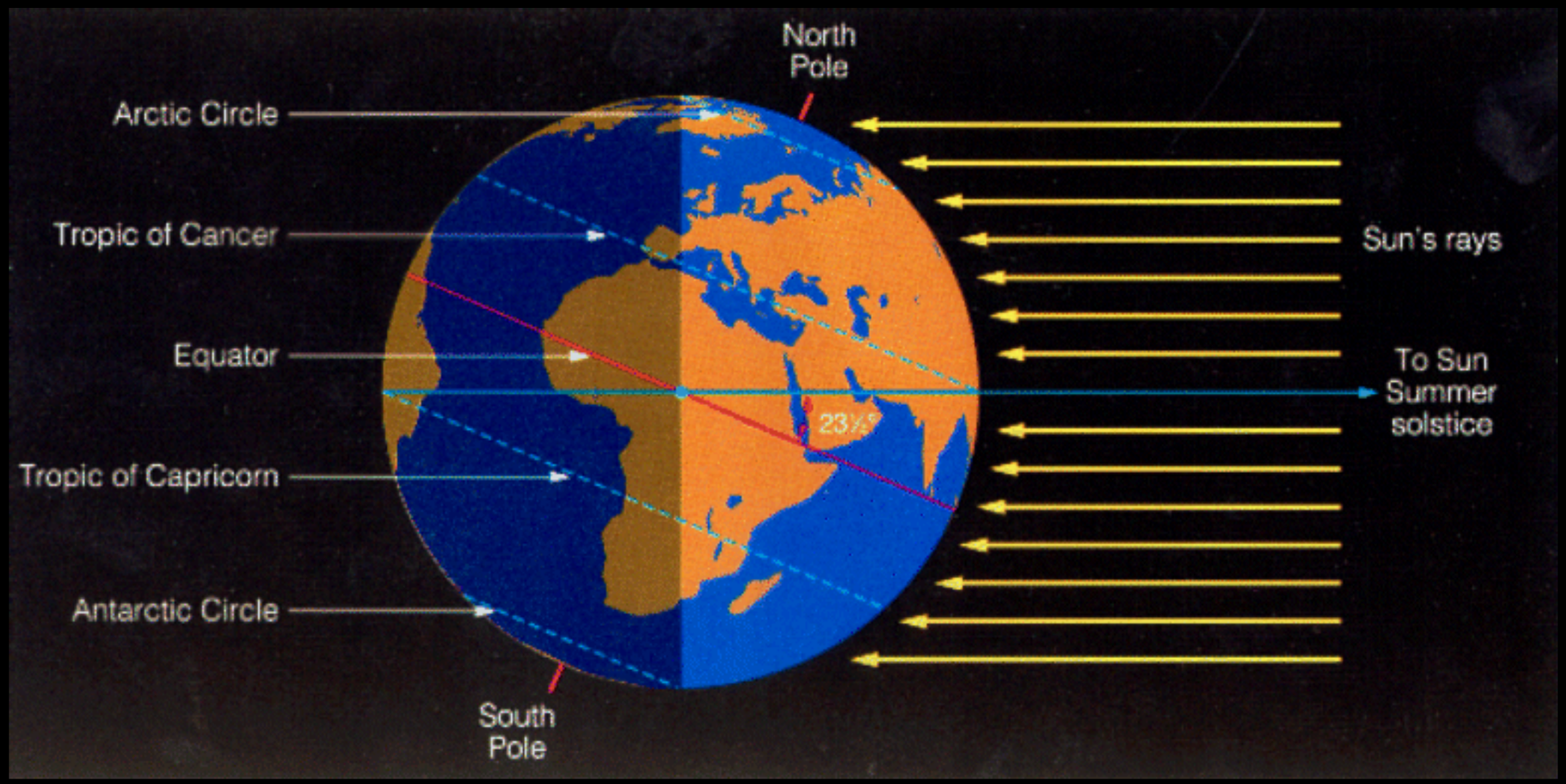


The analog of longitude in the equatorial system is the hour angle, H (you may also see the symbol HA used). Defining the observer's meridian as the arc of the great circle which passes from the north celestial pole through the zenith to the south celestial pole, the hour angle of a star is measured from the observer's meridian westwards to the meridian through the star (from 0° to 360°).


Observer's meridian
Z
P
(90−ϕ)
H
(90−δ)
U
T
ϕ
X
Star's apparent motion
E
L
δ
Celestial equator
O
B
S
N
V
W
Celestial horizon
γ
Q



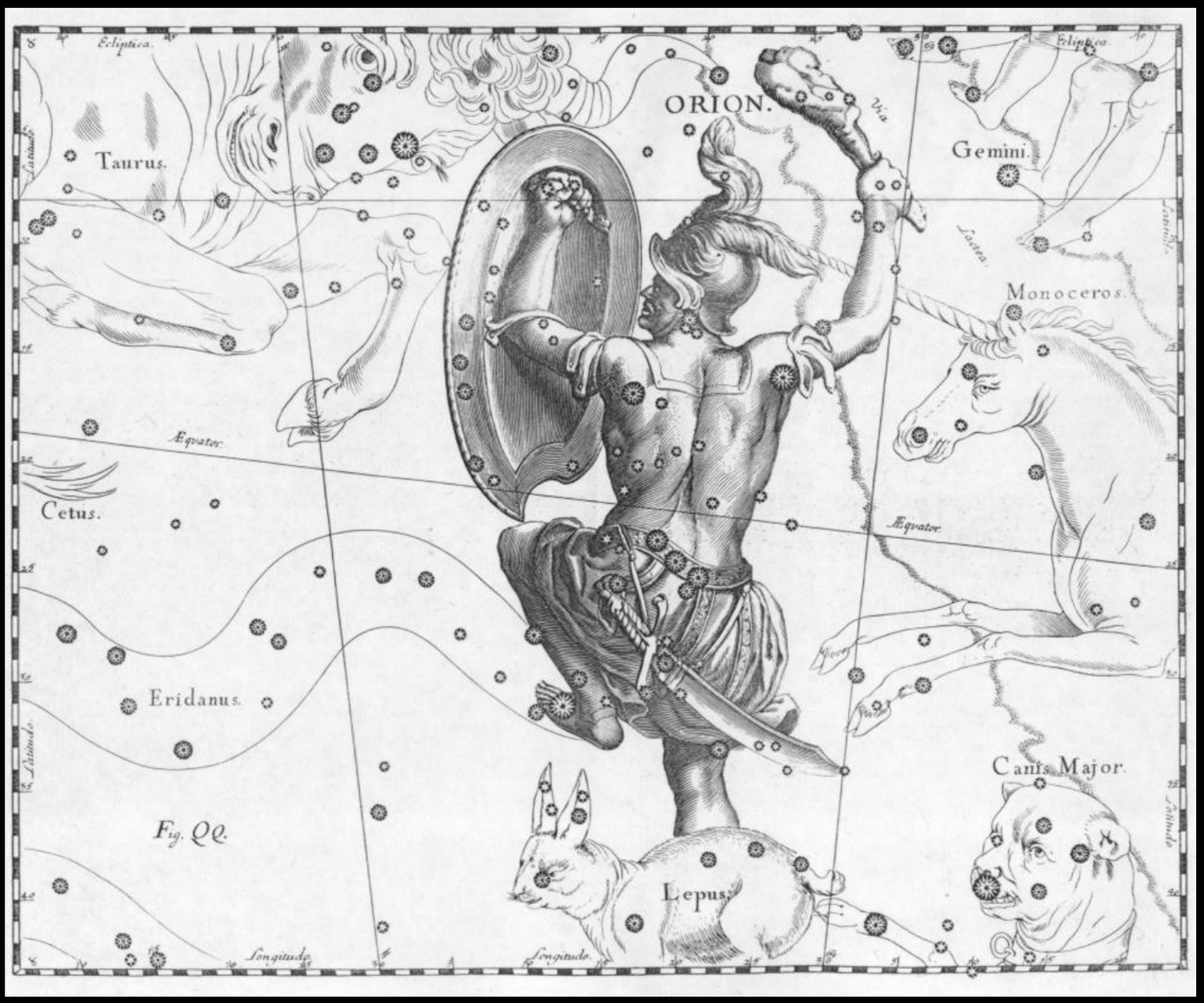
The projection of the Sun's path across the sky during the year is called the ecliptic. The points where the ecliptic crosses the celestial equator are the vernal and autumnal equinox's. The point were the Sun is highest in the northern hemisphere is called the summer solstice. The lowest point is the winter solstice.

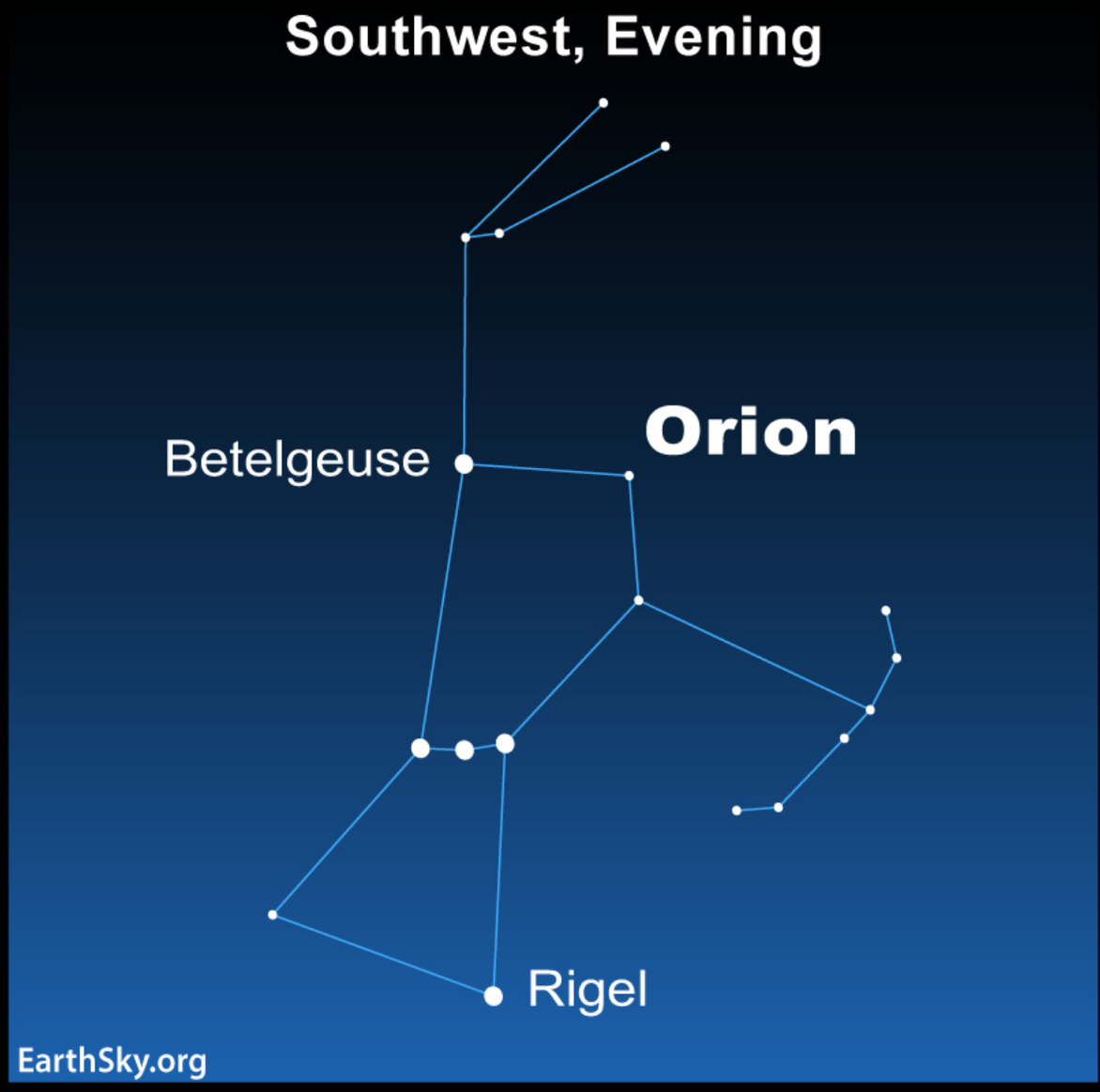


Days are longest in the summer for the northern hemisphere due to tilt of the Earth's axis allowing for more sunlight to be projected onto surface. Note also the reason for the "midnight" sun at the North Pole in summer. Longest day of the year is at the summer solstice

Drawn onto the celestial sphere are imaginary shapes called constellations, Latin for `group of stars'. These constellations organize the stars into more easily identifiable groups. No one knows the exact origin of the constellations that we use today, but 48 had been established by ancient Greek times.

The origin of the names of particular constellations is lost with time, dating back before written records. The ancient Greeks were the first to record the oral legends and, thus, constellations are often drawn in the shapes of mythical heros and creatures tracing a pattern of stars on the celestial sphere, recorded on a star map.


ORION.
Taurus.
Gemini.
Monoceros.
Cetus.
Eridanus.
Canis Major.
Lepus.
Ecliptica.
Æquator.
Via Lactea.
Fig. QQ.
Longitudo.
Latitudo.

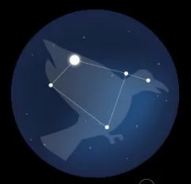

Southwest, Evening
Orion
Betelgeuse
Rigel
EarthSky.org

CORONA AUSTRALIS

- Southern crown
- α-CrA
- Ancient
- 0.3%
- May

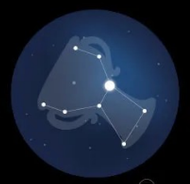
CORONA BOREALIS

- Northern crown
- Alphecca
- Ancient
- 0.4%
- May



CORVUS

- Crow sent by Apollo in search of water
- Gienah
- Ancient
- 0.4%
- March



CRATER

- Cup clutched by crow in search of water
- δ-Crt
- Ancient
- 0.7%
- April

CRUX

- Southern cross
- Acrux
- 1598
- 0.2%
- March

CYGNUS

- Swan, Zeus in disguise
- Deneb
- Ancient
- 1.9%
- Summer

DELPHINUS

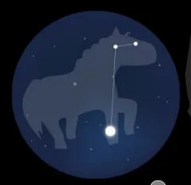
- Dolphin, messenger of Poseidon
- Rotanev
- Ancient
- 0.5%
- July

DORADO

- Swordfish
- α-Dor
- 1598
- 0.4%
- November

DRACO

- Dragon that guards the golden apple tree
- Eltanin
- Ancient
- 2.6%
- July



EQUULEUS

- Little horse
- Kitalpha
- Ancient
- 0.2%
- September

ERIDANUS

- Mythical river
- Achernar
- Ancient
- 2.8%
- November

FORNAX

- Furnace
- α-For
- 1756
- 1.0%
- October

GEMINI

- Mythical twins Castor and Pollux
- Pollux
- Ancient
- 1.2%
- Winter

GRUS

- Crane
- Alnair
- 1598
- 0.9%
- August

HERCULES

- Hercules, greatest hero in Greek mythology
- Kornephoros
- Ancient
- 3.0%
- May

HOROLOGIUM

- Pendulum clock
- α-Hor
- 1756
- 0.6%
- November

HYDRA

- Multi-headed water snake slain by Hercules
- Alphard
- Ancient
- 3.2%
- January

HYDRUS

- Lesser water snake
- β-Hyi
- 1598
- 0.6%
- October

INDUS

- Indian
- α-Ind
- 1598
- 0.7%
- August

LACERTA

- Lizard
- α-Lac
- 1690
- 0.5%
- August

LEO

- Lion of Nemea, slain by Hercules
- Regulus
- Ancient
- 2.3%
- February

LEO MINOR

- Lion cub
- 46-LMi
- 1687
- 0.6%
- February

LEPUS

- Hare chased by Orion's dogs
- Arneb
- Ancient
- 0.7%
- December

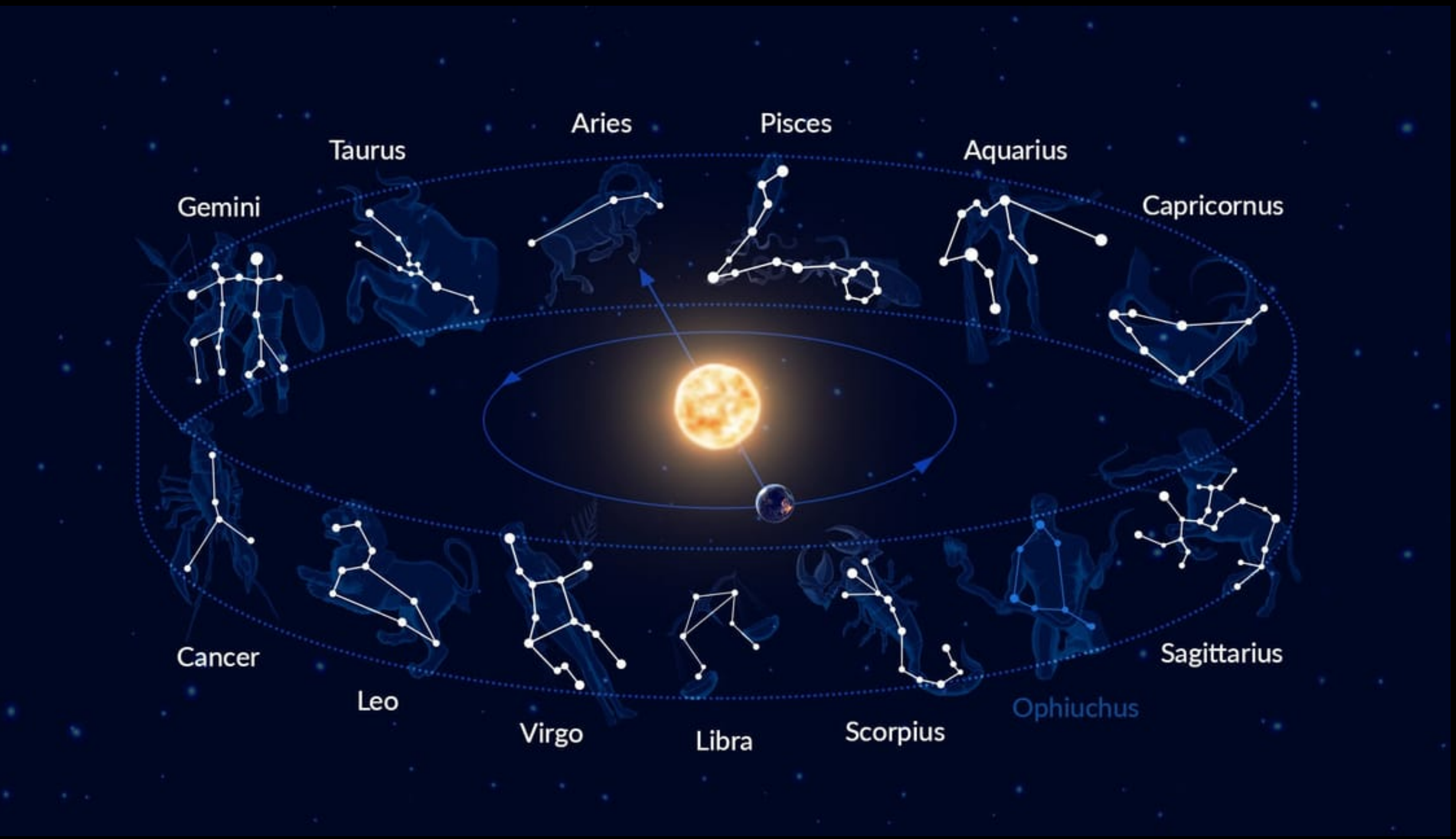
LIBRA

- Balance
- Zubeneschamali
- Ancient
- 1.3%
- May

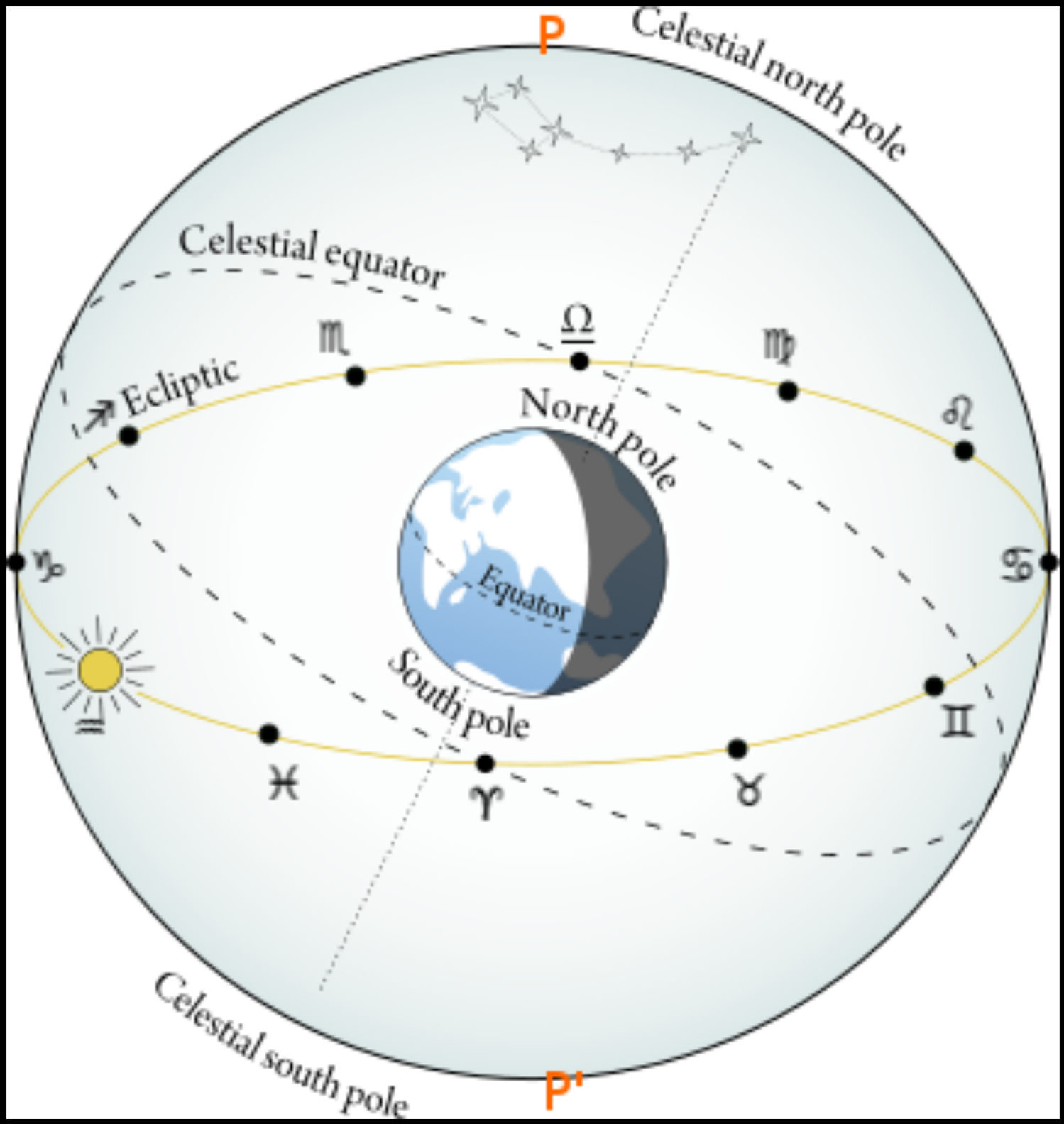
LUPUS

- Wolf
- α-Lup
- Ancient
- 0.8%
- May

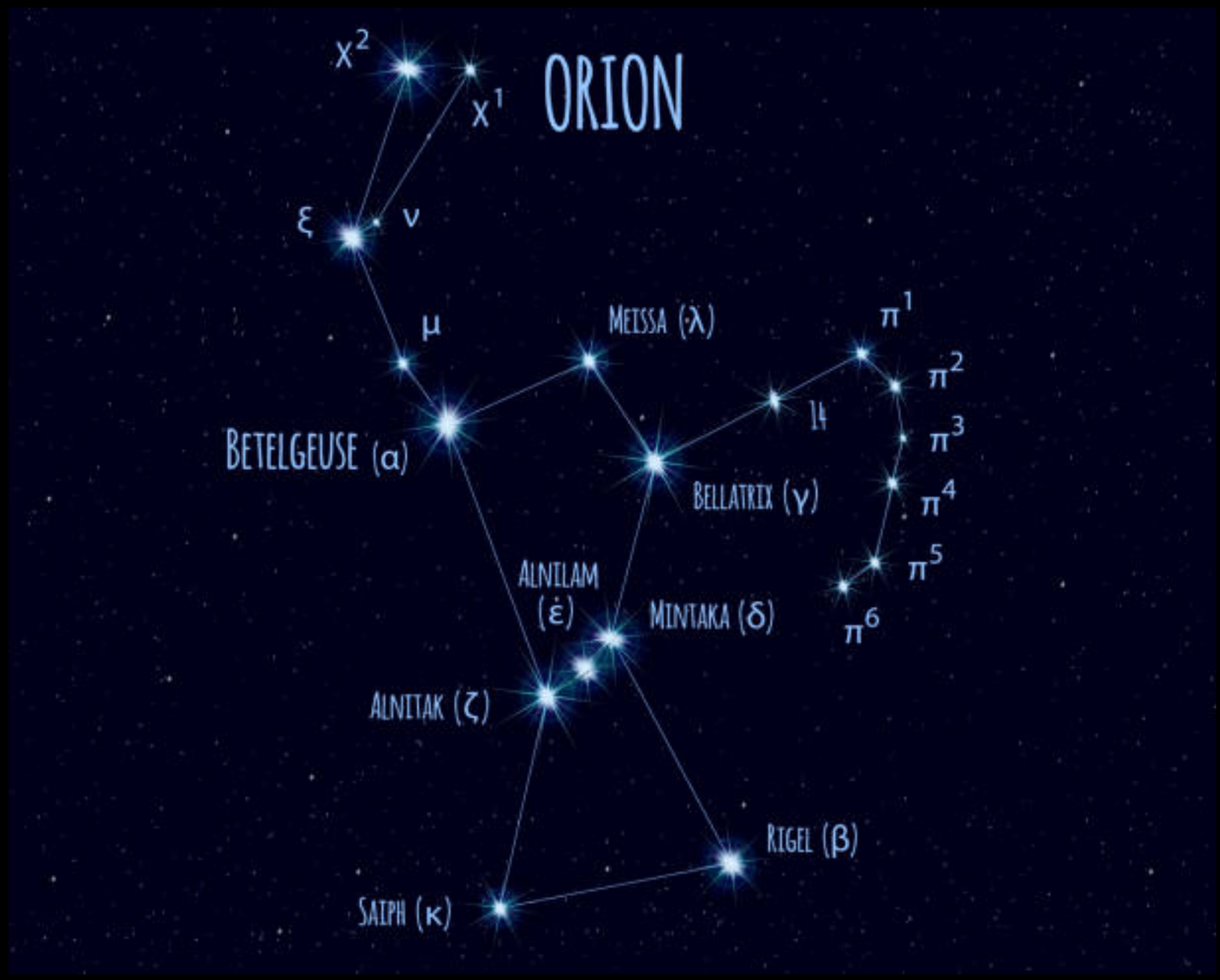

Ursa Minor
Purple Forbidden Court
(Little Bear)
Canopy
Cepheus
Cassiopeia
Hook
Kitchen
Draco
(Dragon)
Grain
Perseus
Boat
Charioteer
Basket
Flail
Judge
Administration
Auriga
Chariots
(Charioteer)
Dead
Bodies
Swine
Flying
Serpent
Cygnus
(Swan)
Lyra
(The Lyre)
River
Ford
Heracles
(Hero)
Seven
Dukes
Bootes
(Herdsman)
Ursa Major
(Great Bear)
Gemini
(Twins)
Pegasus
(Winged Horse)
Wall
Encampment
Court of
the Celestial
Market
Court of
the Privy
Council
Cancer
(The Crab)
Leo Yellow
(Lion Dragon
Orion
(Hunter)
Pisces
(Fish)
Fence
Canis Minor
(Small dog)
Virgo
(Virgin)
Willow
Corn
Granary
Aquarius
(Water carrier)
Libra
(Scales)
Paw
Horn
Wings
Cetus
(Whale)
Capricorn
(Goat)
Neck
Carriage
Hydra
(Snake)
Drawn bow
Eridanus
(River Po)
Orchards
Waste
Bin
Sagittarius
(Archer)
Nine
Wells
Scorpio
(Scorpion)
Tail
The wolf
Centaurus
(Centaur)
Arsenal
Barbarians
Temple
Small
Tortoise
Black Turtle
White Tiger
Green Dragon
Red Bird
© Chinasage.info



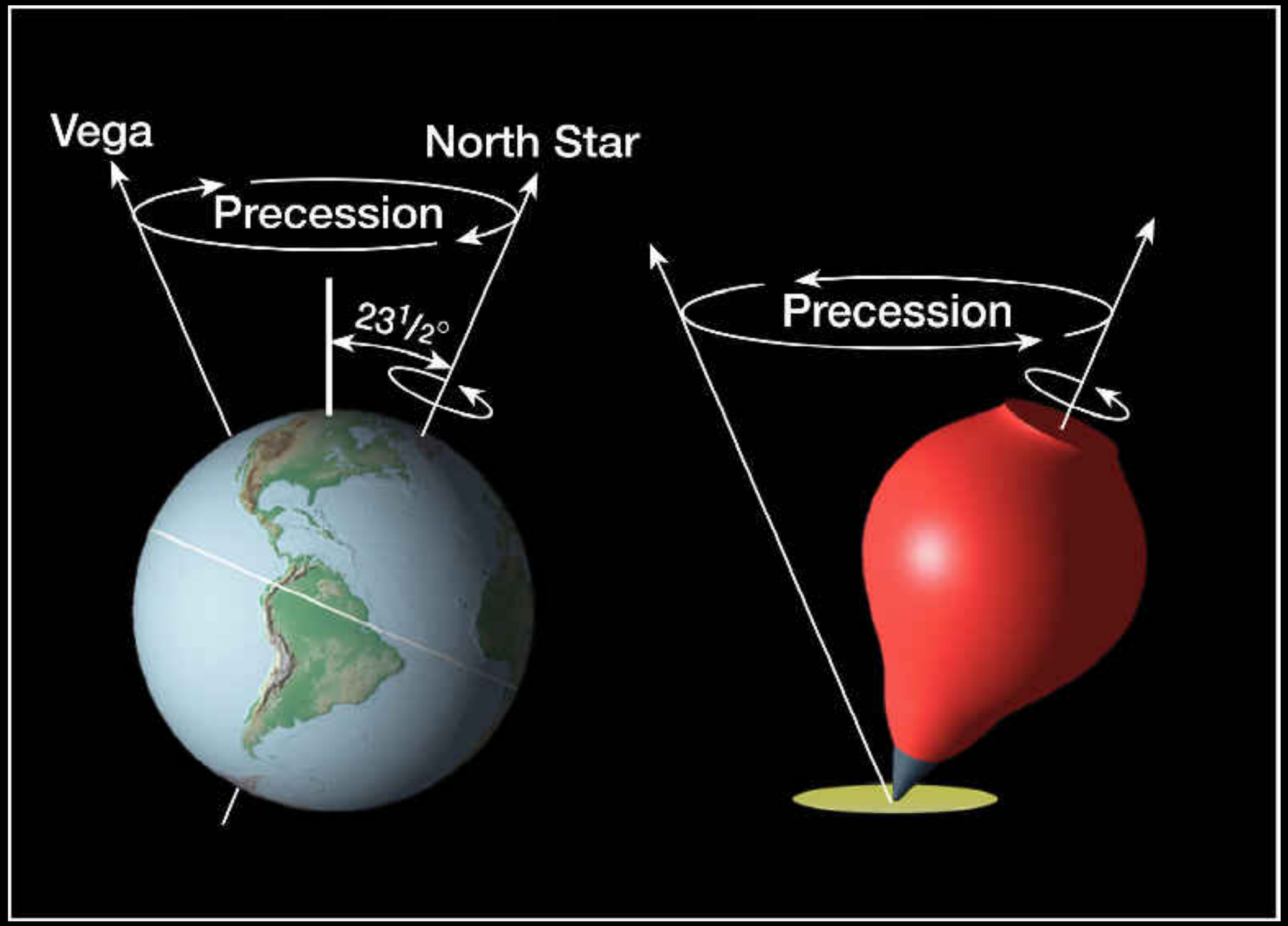
Since the Earth's axis is tilted 23 1/2 degrees from the plane of our orbit around the Sun, The apparent motion of the Sun through the sky during the year is a circle that is inclined 23 1/2 degrees from the celestial equator. This circle is called the ecliptic and passes through 12 of the 88 constellations that we call the zodiac.


P
Celestial north pole
Celestial equator
Ecliptic
North pole
Equator
South pole
Celestial south pole
P'

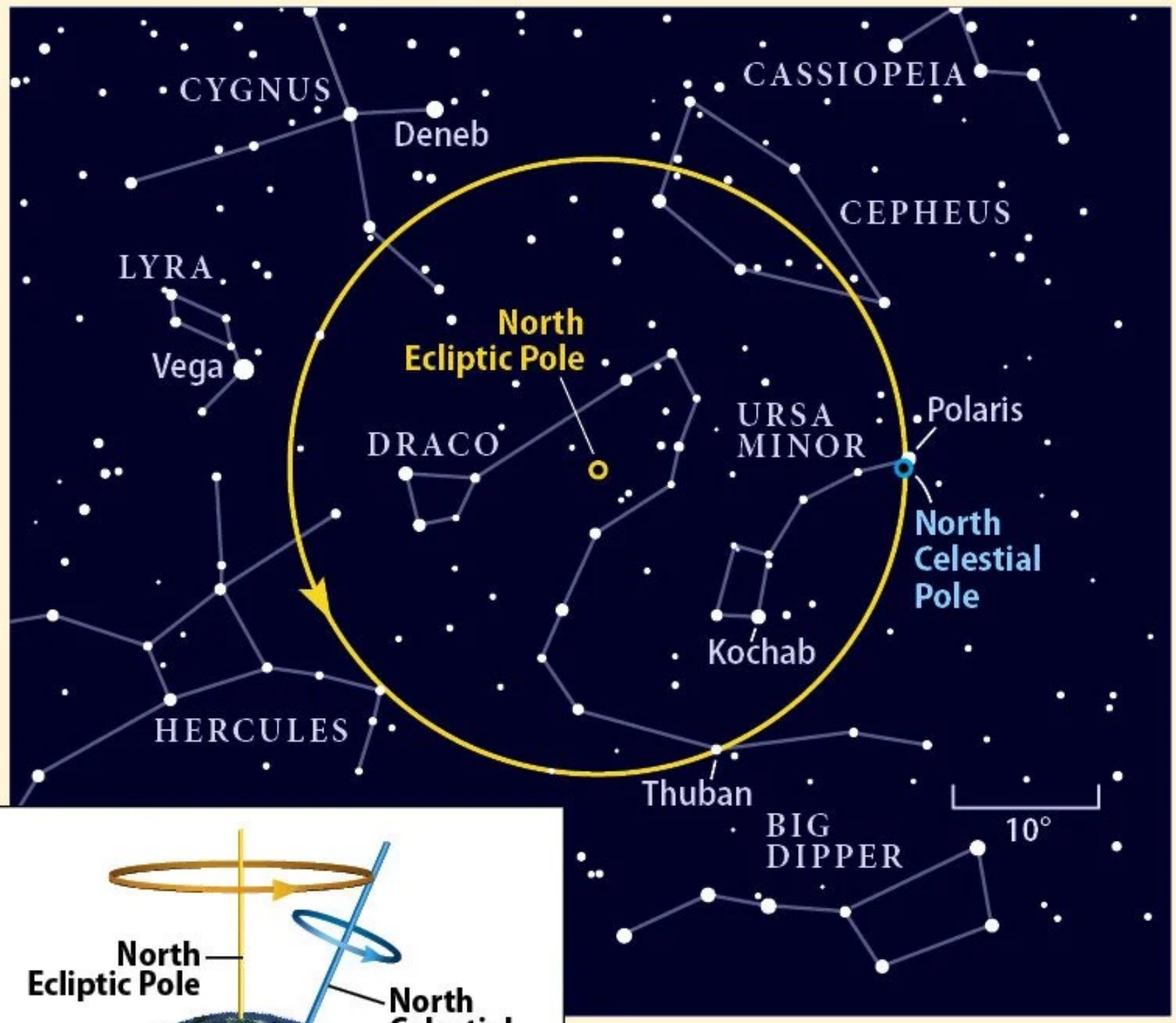
25 Brightest Stars in the Night Sky

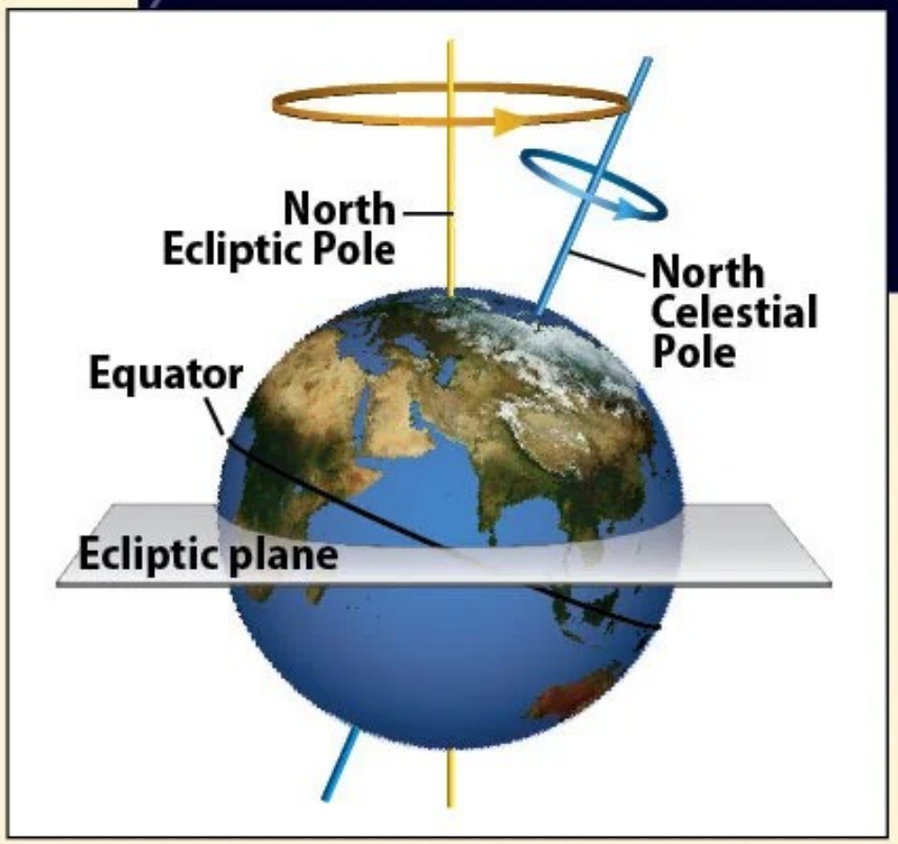


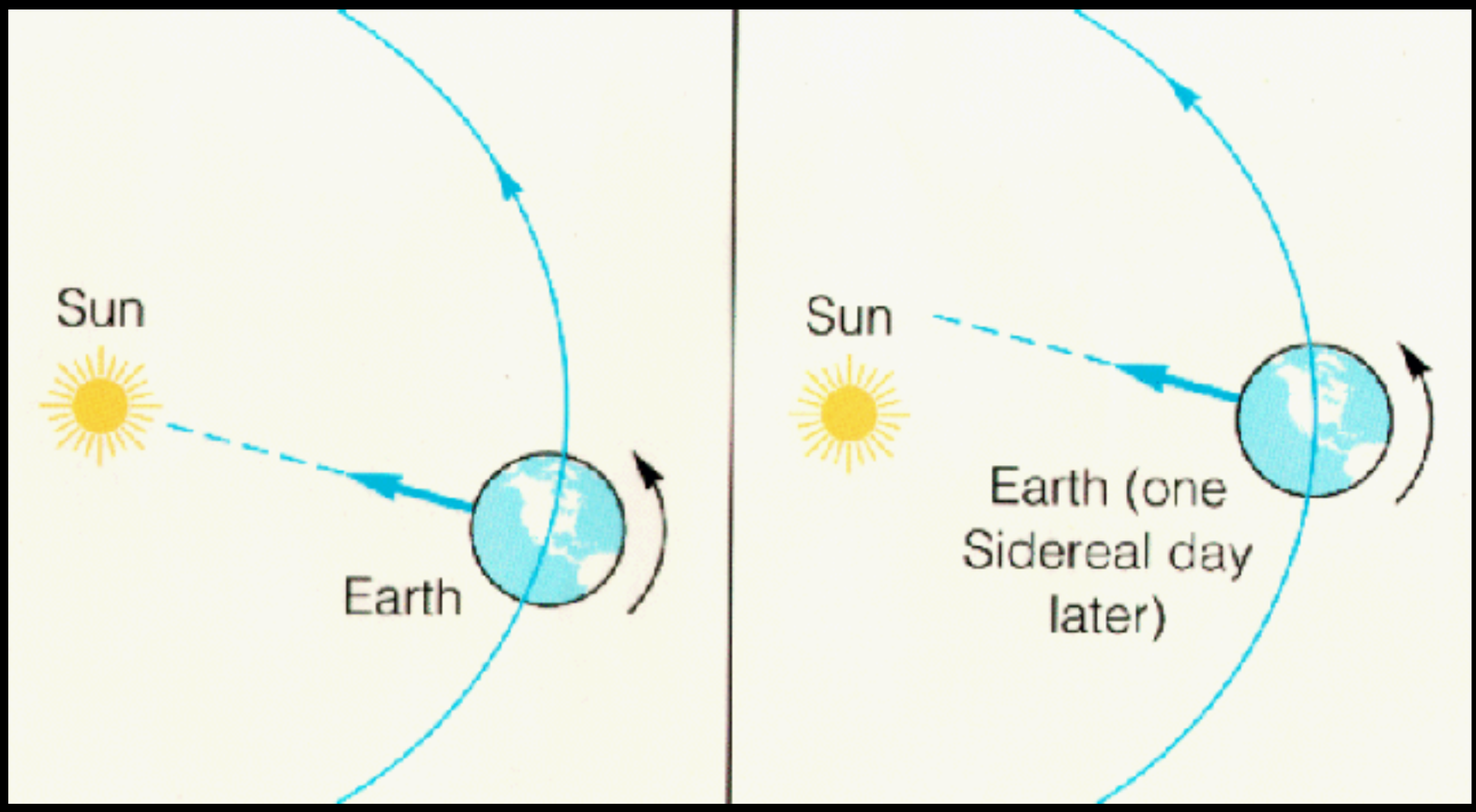
Hipparchus also developed a simply method of identifying the stars in the sky by using a letter from the Greek alphabet combined with the constellation name. In 1603, Johann Bayer developed the most influential nomenclature by assigning letters to each of the stars in a constellations in descending order of brightness, beginning with the Greek alphabet and then, if all those letters were exhausted, continuing with Roman letters then numbers.



Gravitation pull of the Sun and Moon causes a "wobble" in the Earth's axis with a period of 25,000 years (like pushing a gyroscope). This wobble is called precession and has the result of changing the point in the sky where the celestial poles are located and, therefore, changes the "pole star".

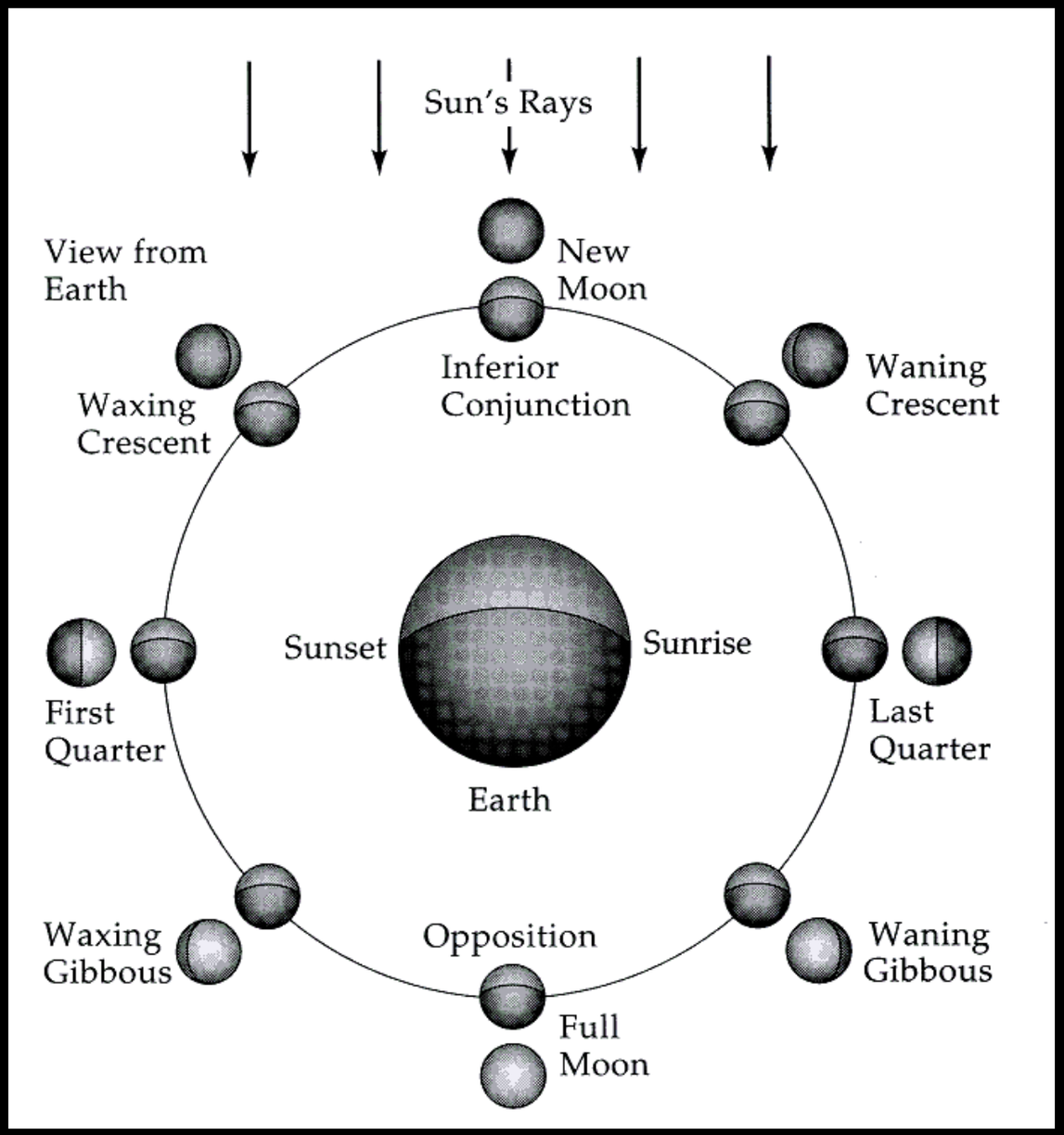

CYGNUS
Deneb
CASSIOPEIA
CEPHEUS
LYRA
Vega
North
Ecliptic Pole
DRACO
URSA
MINOR
Polaris
North
Celestial
Pole
Kochab
HERCULES
Thuban
BIG
DIPPER
10°


North
Ecliptic Pole
North
Celestial
Pole
Equator
Ecliptic plane



Typical we use synodic time, which means with respect to the Sun, in our everyday life. For example, noon, midnight, twilight are all examples of synodic time based on where the Sun is in the sky (e.g. directly overhead on the equator for noon). Astronomers often use sidereal time, which means time with respect to the stars, for their measurements.

The Moon is tidally locked to the Earth, meaning that one side always faces us (the nearside), whereas the farside is forever hidden from us. In addition, the Moon is illuminated on one side by the Sun, the other side is dark (night).



As the Moon moves counterclockwise around the Earth, the daylight side becomes more and more visible (i.e. we say the Moon is `waxing'). After full Moon is reached we begin to see more and more of the nighttime side (i.e. we say the Moon is `waning'). This whole monthly sequence is called the phases of the Moon.