

The Sky as the Eternal Sacred Skies HCPA7028

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Humans have looked to the sky and found consistency.

As a constant it became:

The place which never perishes.

A safe place for a people's stories – their histories.

A safe place for a people's cultural myths which described the world.

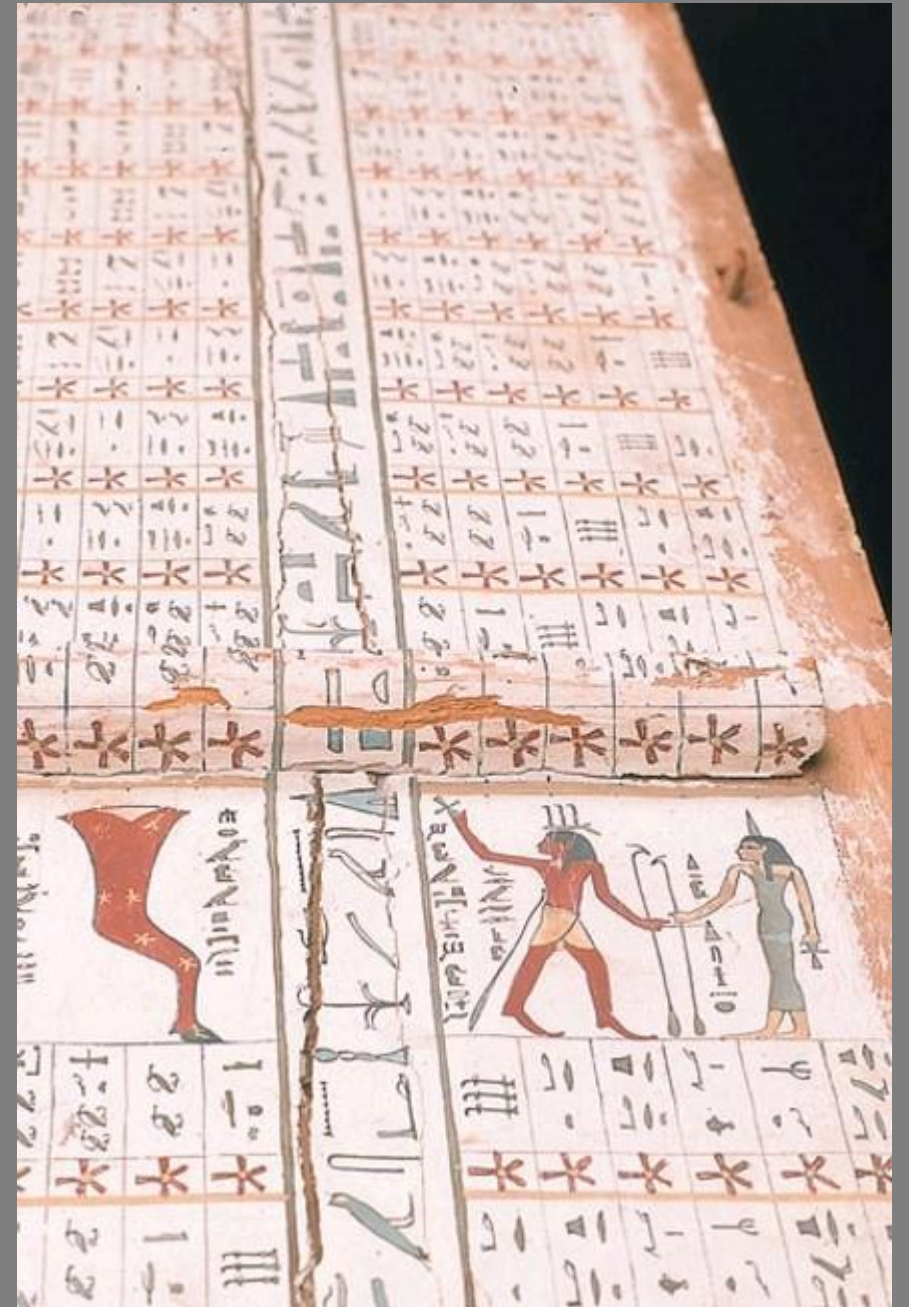
As a never perishing place it also represented the divine – the eternal spirit.

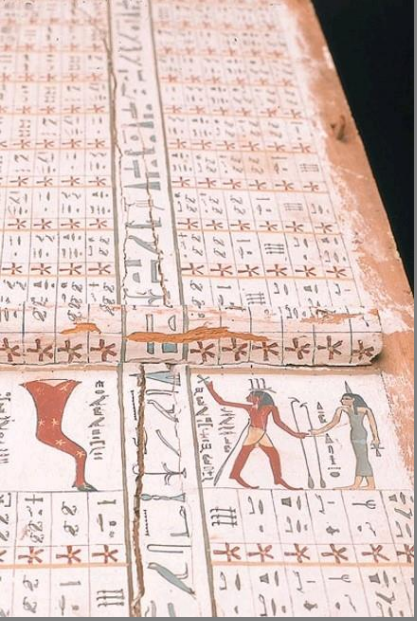
The location of heaven.



The sky consistency of the sky gave a
view of time.....

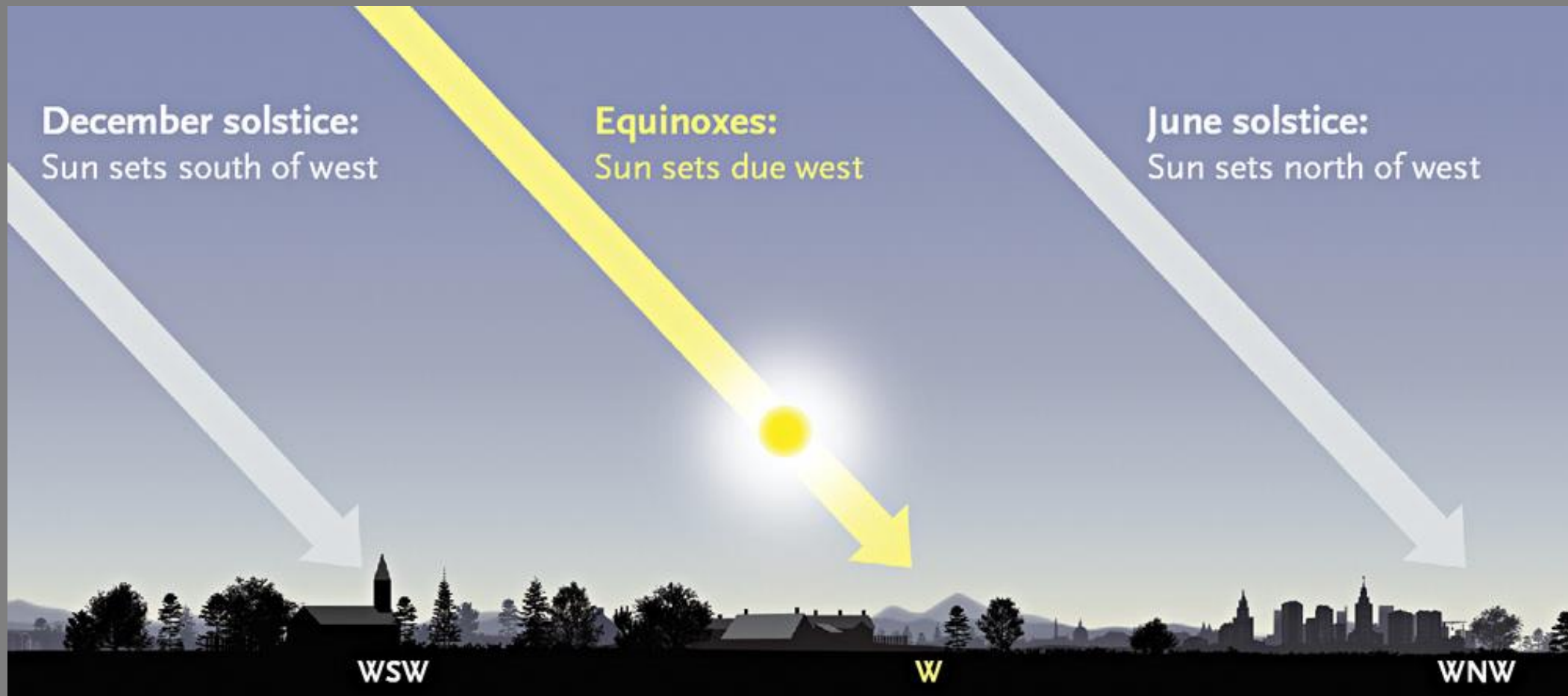
Hours, Days, Years and Cycles





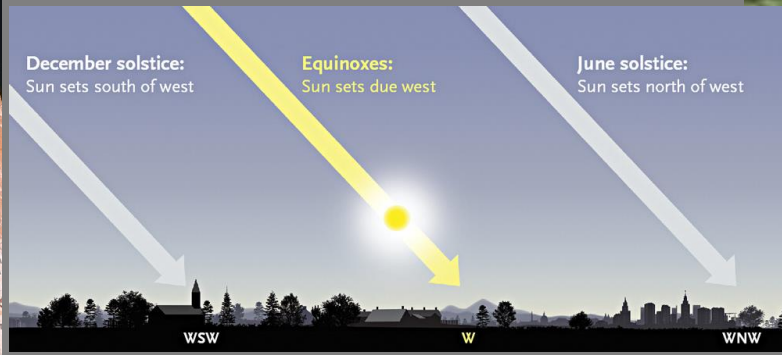
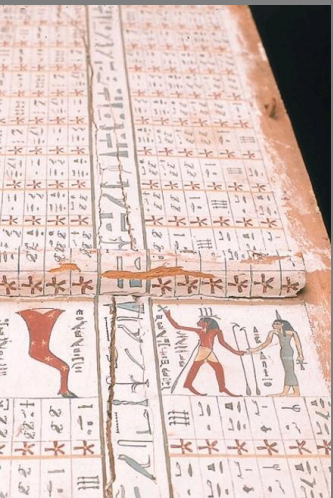
The sky consistency of the sky gave a view of time.....

Hours, Days, Years and Cycles



The sky consistency of
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time.....

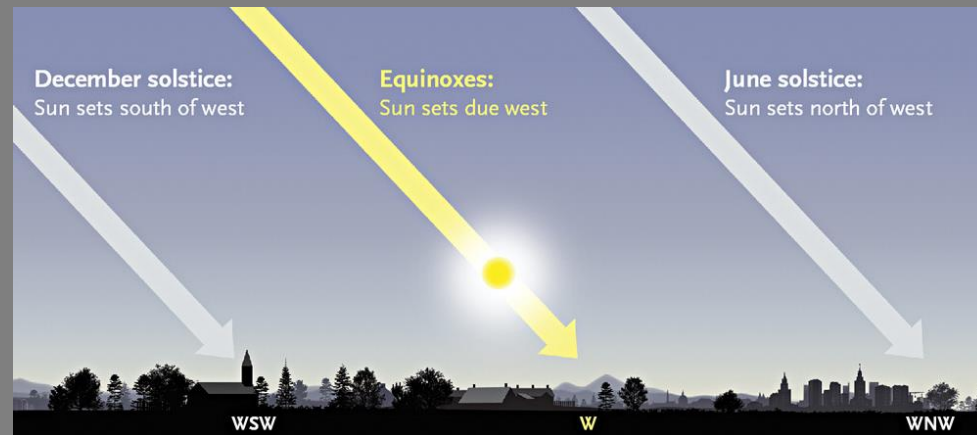
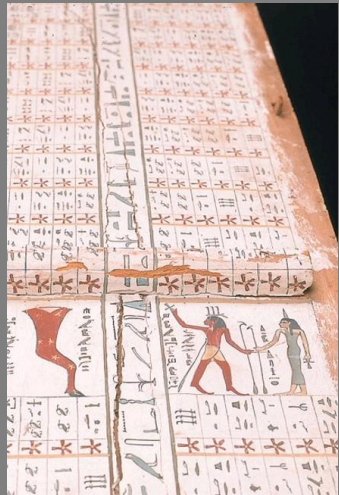
Hours, Days, Years
and Cycles



Newgrange, Ireland

The sky consistency of
the sky gave a view of
time.....

Hours, Days, Years and
Cycles



Plato *Timaeus* 37c-39e

Wherefore he resolved to have a moving image of eternity, and when he set in order the heaven, he made this image eternal but moving according to number, while eternity itself rests in unity; and this image we call time. ... They (the heavens) are all parts of time, and the past and future are created species of time.

Genesis 1:14 RSV

And God said, "Let there be lights in firmament of the heavens to separate the day from the night; and let them be for signs and for seasons, and for days and years, and let them be lights in the firmament of the heavens to give light upon the earth."

How we view the sky is influenced by our culture.

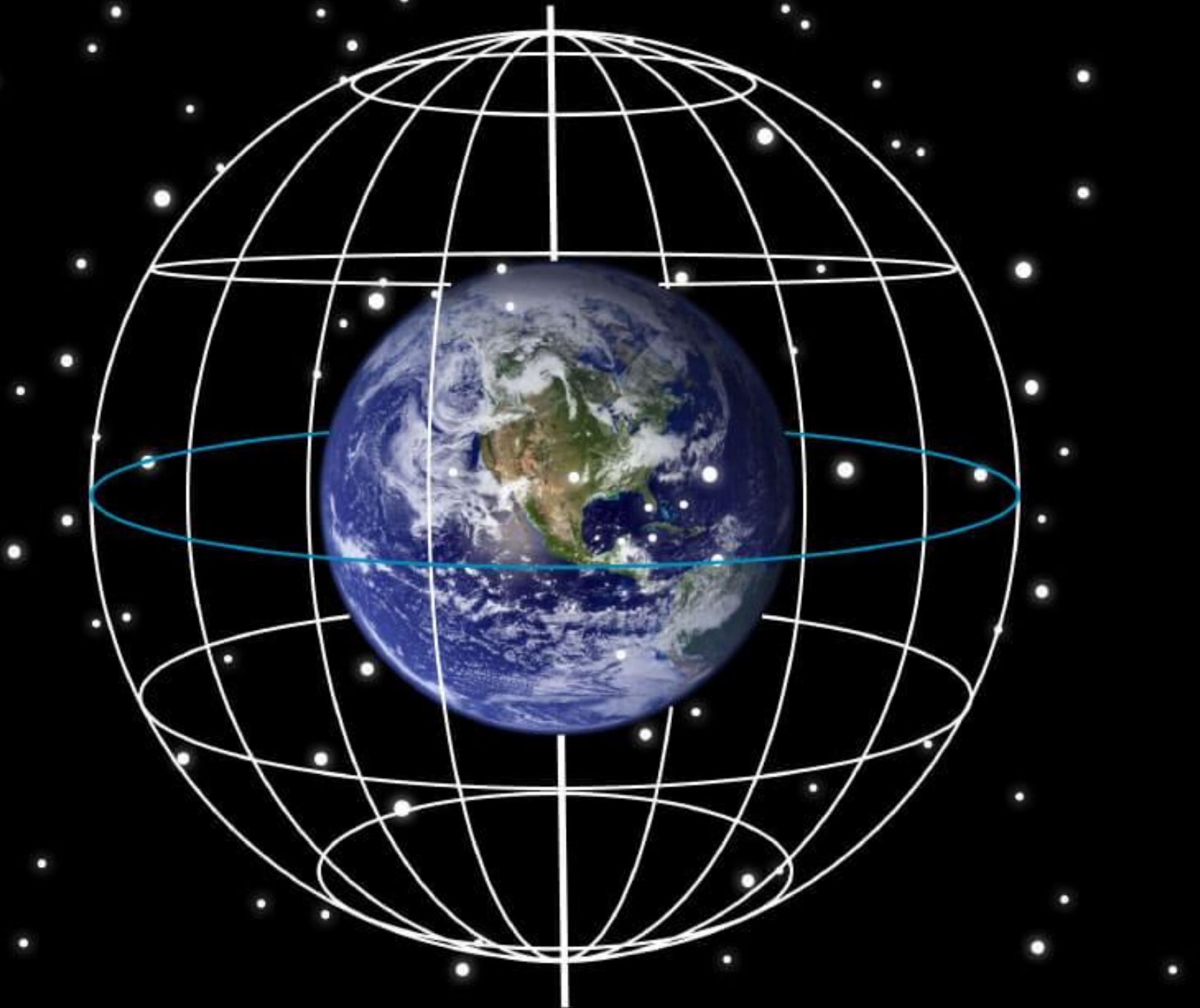
Do we see story, do we see time, do we see divine?

What most of us are taught about the sky does not match what we see.



Our Sky View

Today's view of the sky is largely informed by the cultural dominance of the celestial sphere, its constellations, and its rotation around the slowly processing poles.





Mercury



Venus



Earth



Mars



Jupiter



Saturn



Uranus



Neptune



SOLAR SYSTEM

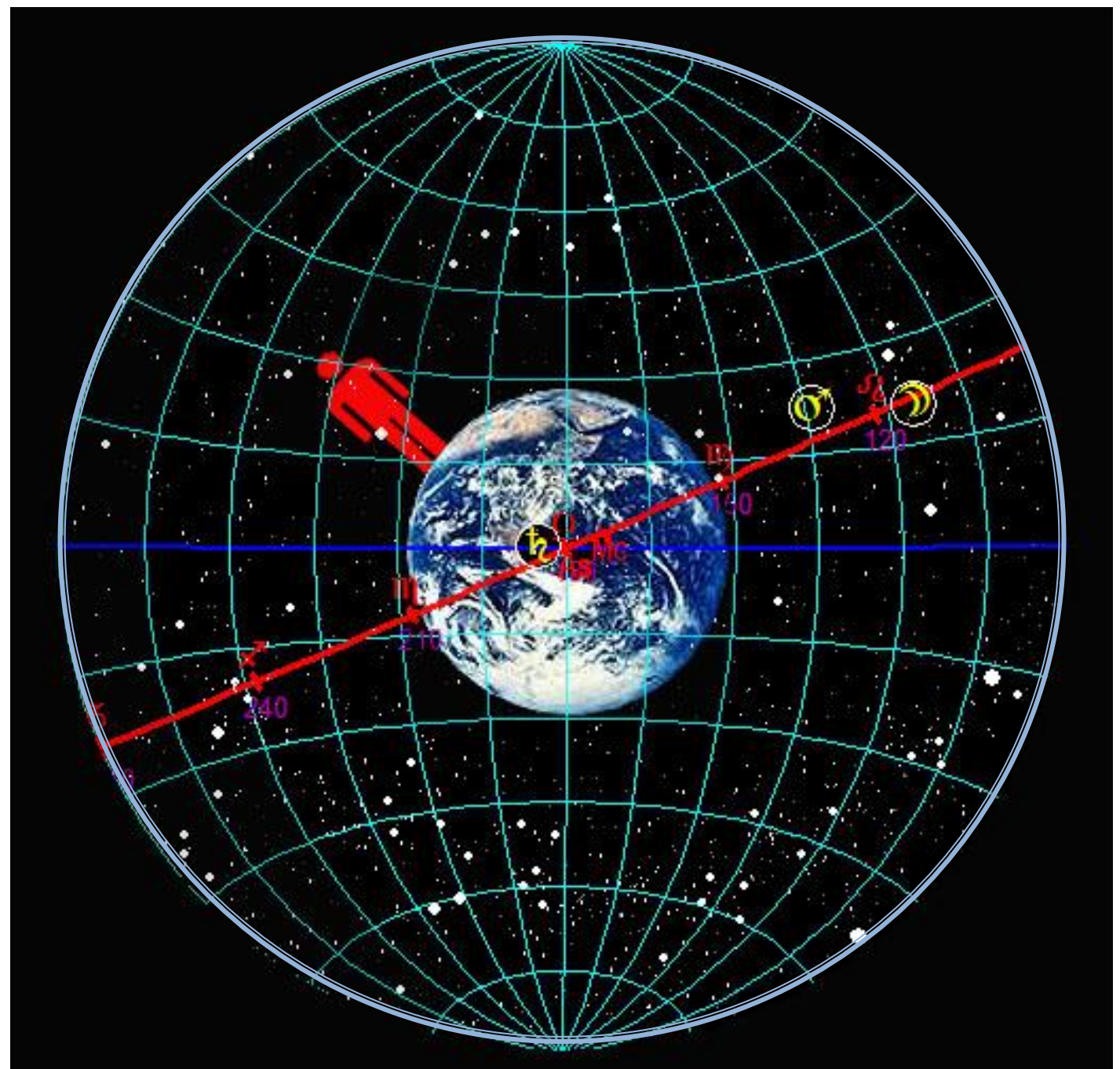




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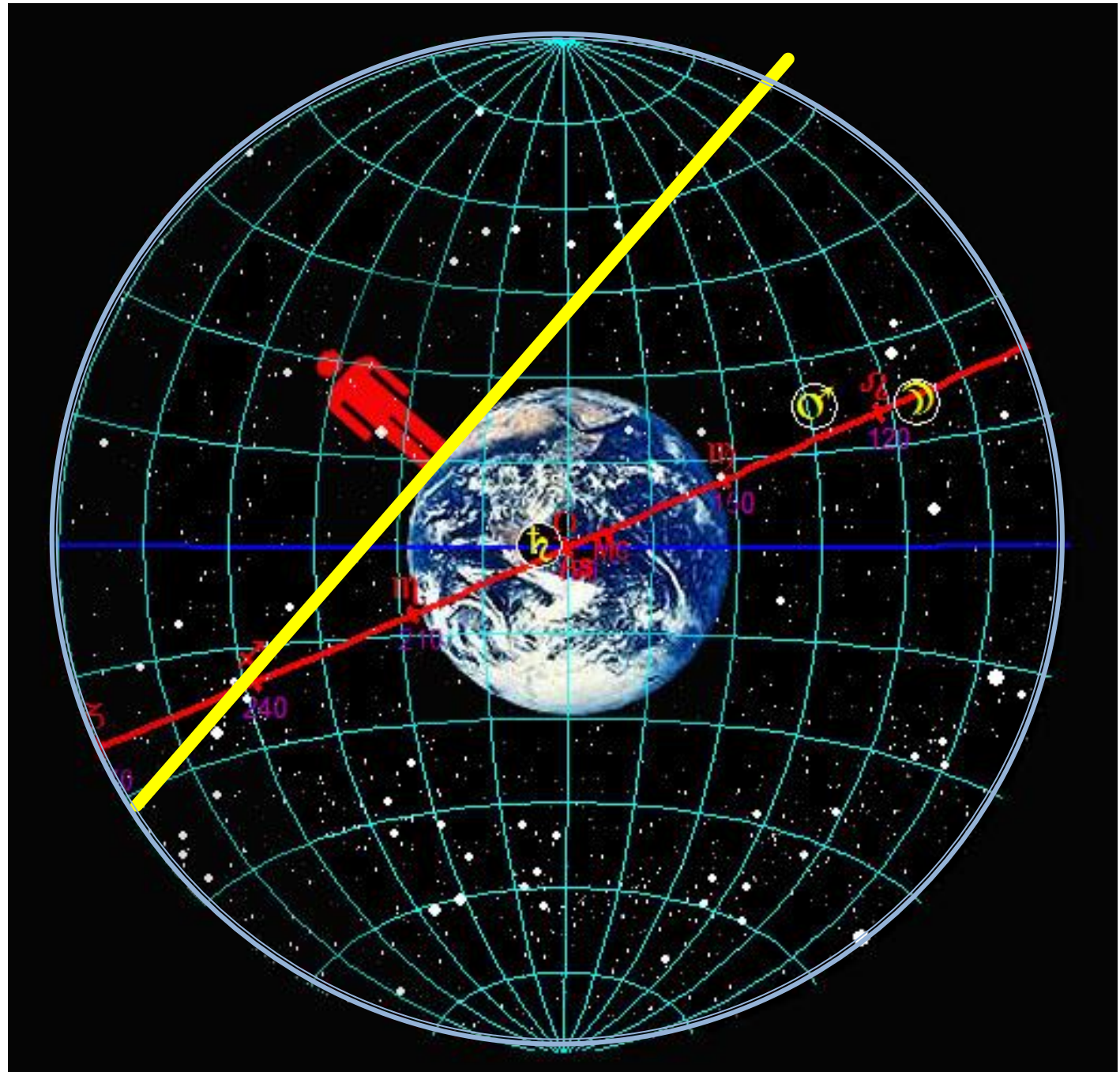
Yet this is our view of the sky – and we see it from our location.

We see the sky from our own perspective – our own location.

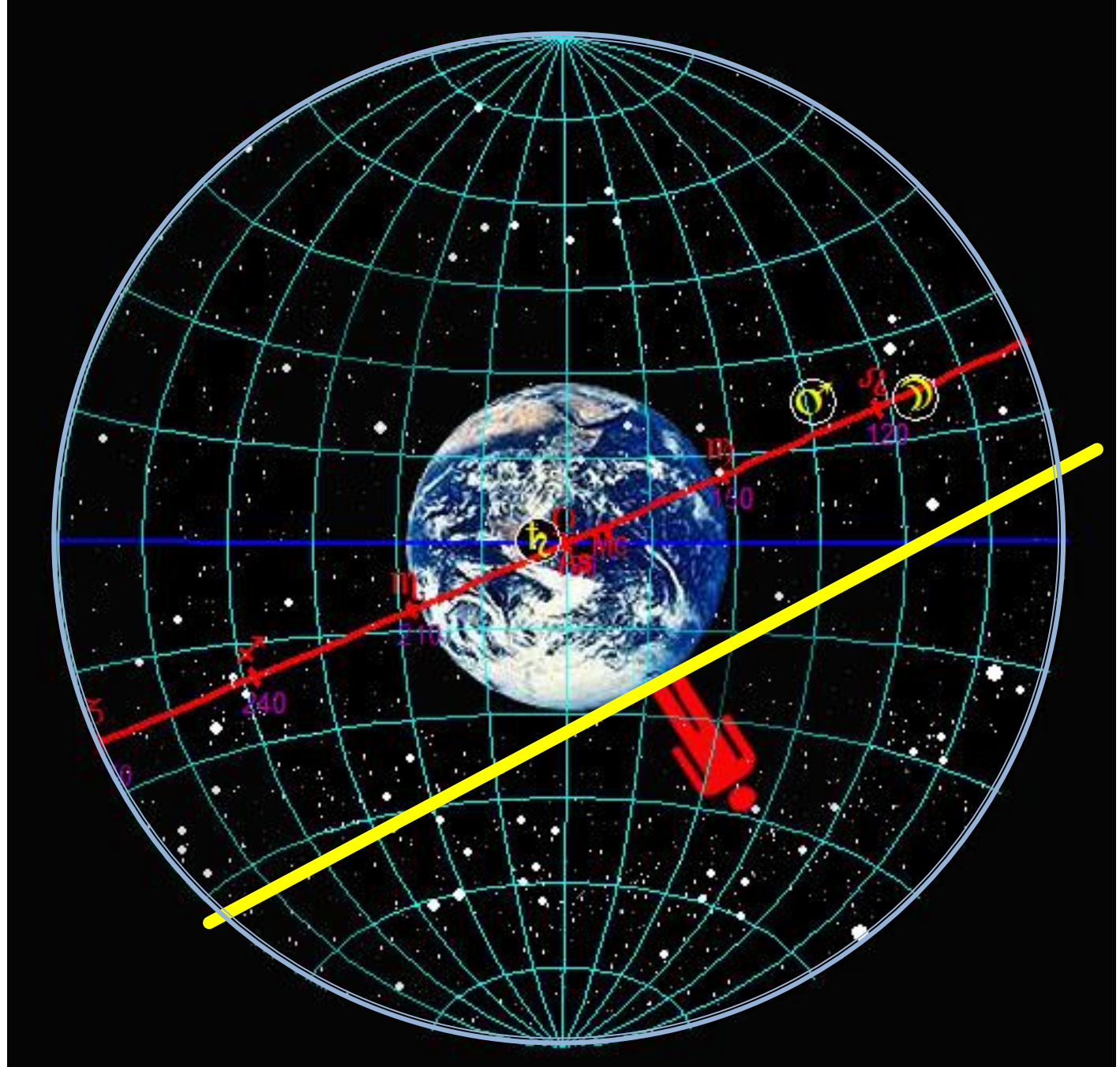


Part of our view is the horizon which is ALWAYS 90° from our upright position.

From this position we see the sky moving as it rotates around the pole.



No matter where
we are standing!

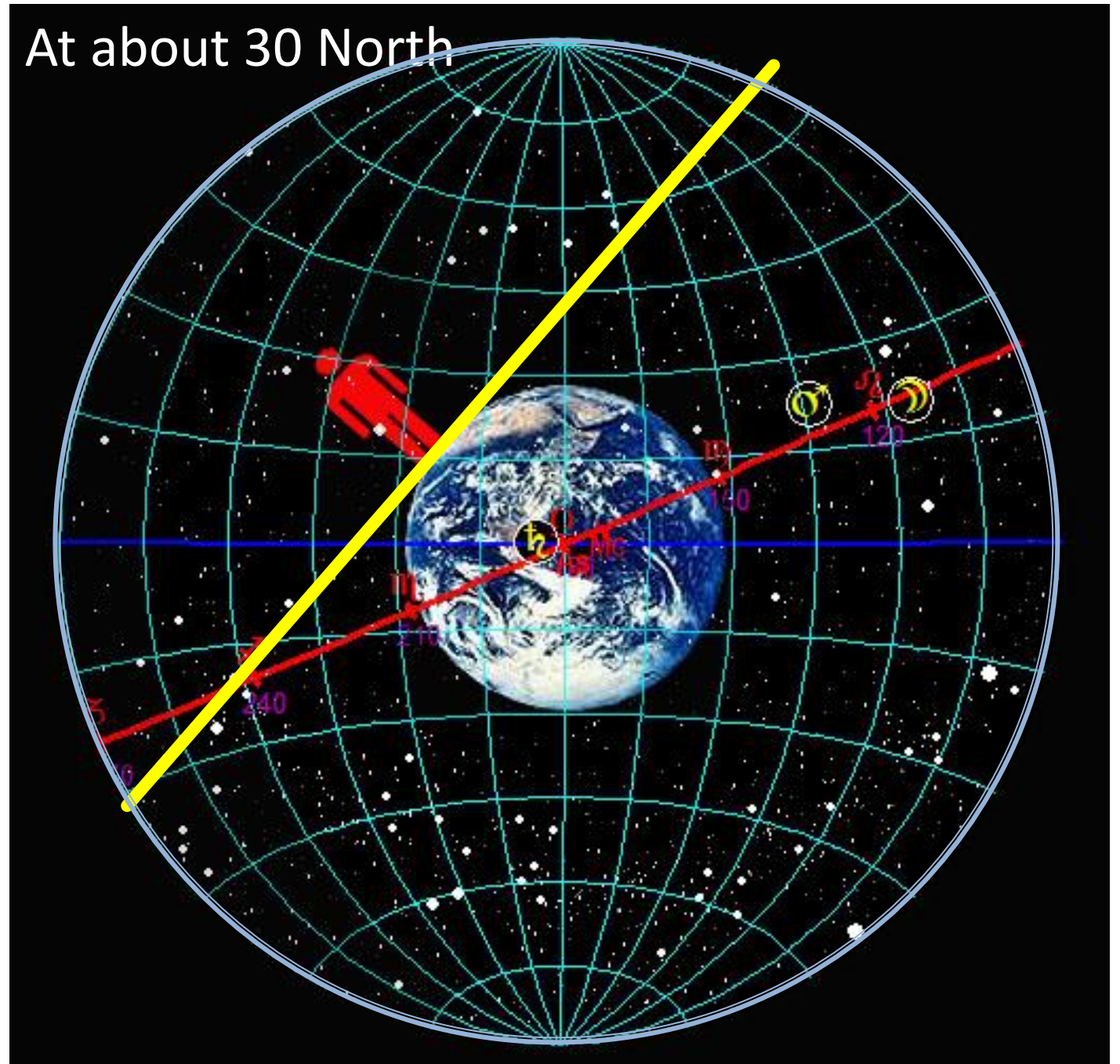


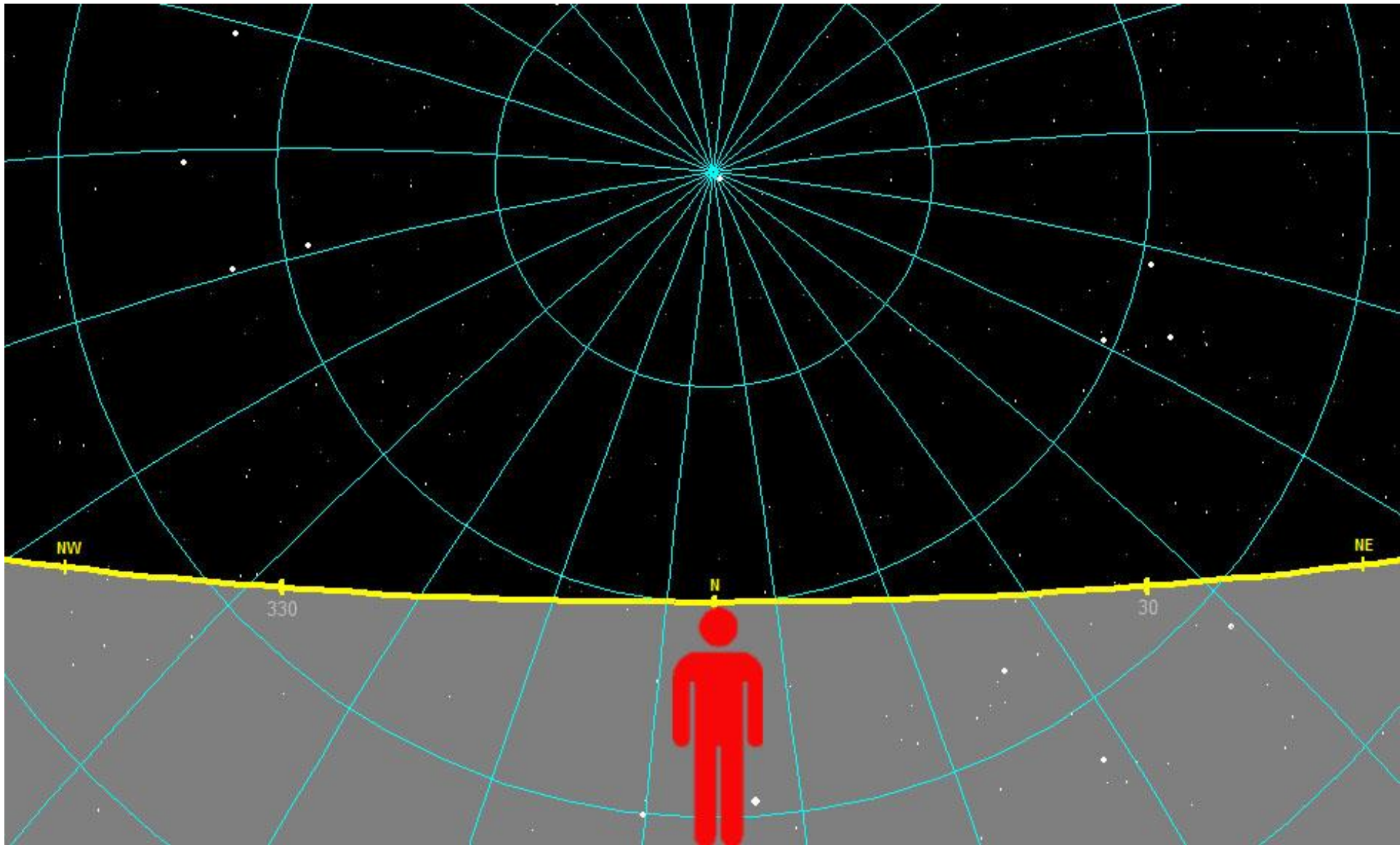
Key Point

The latitude of the observer defines the elevation of the pole for that location.

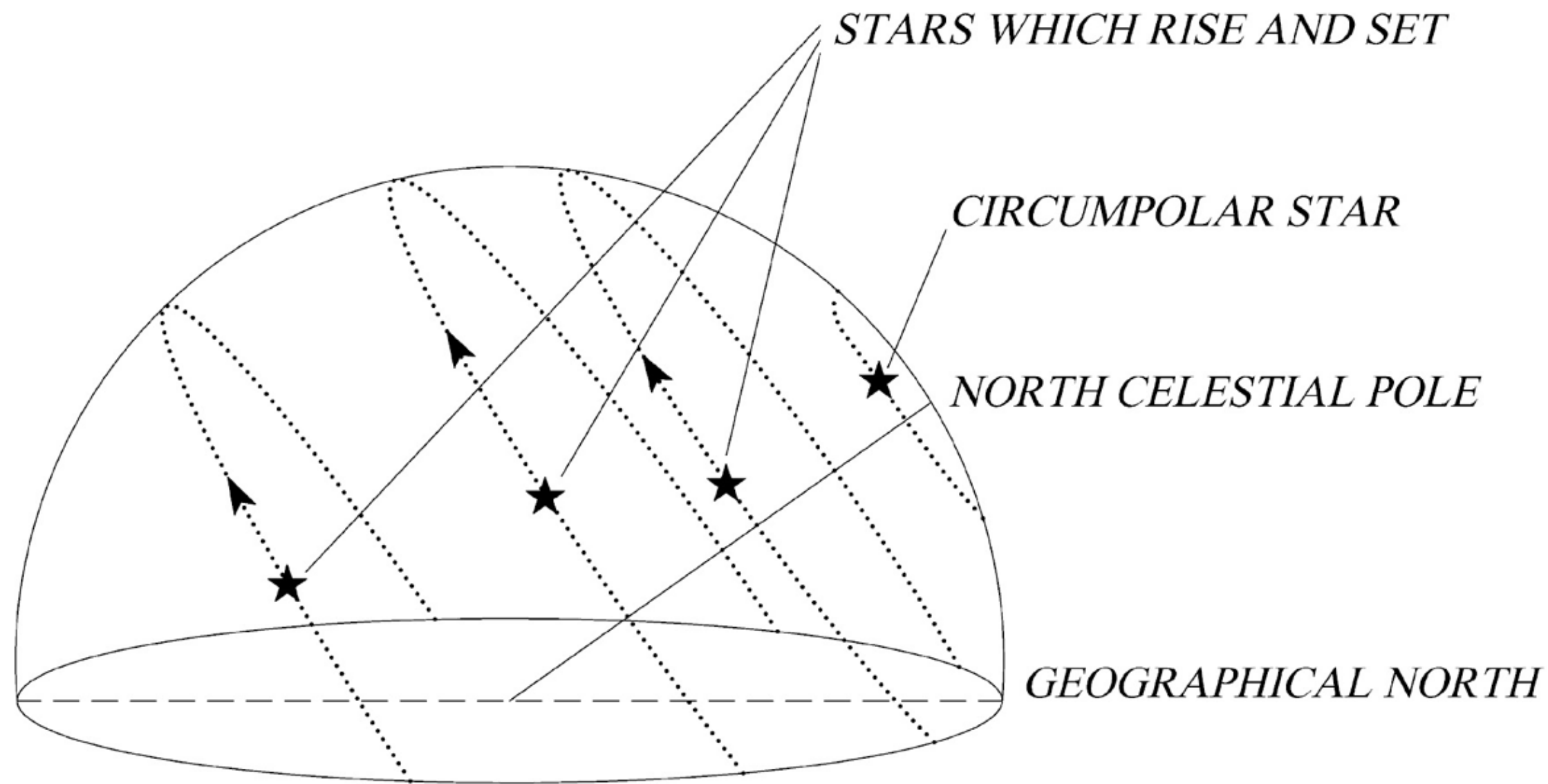
The pole for this person is elevated 30° above their horizon.

At about 30 North

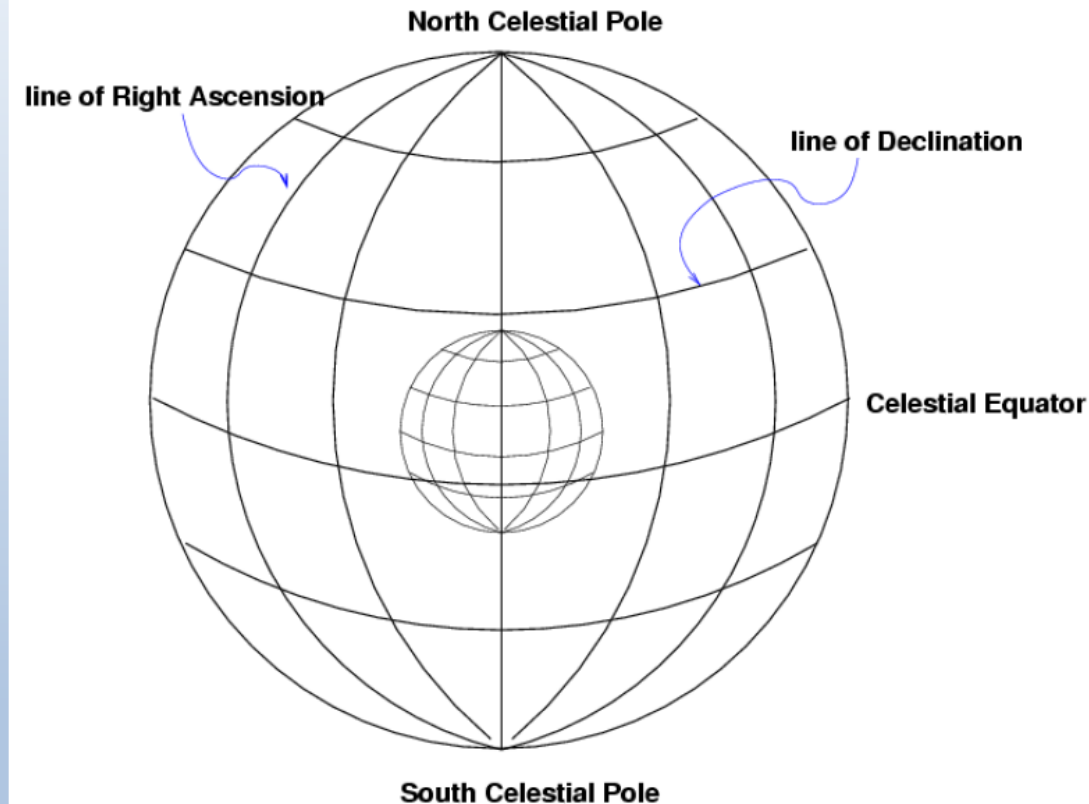




Looking at the Pole when you are at 30° North



Basic numbers you need to understand



The Fixed Address System

Just as cities have a longitude and latitude sky objects have a Right Ascension and Declination

**Declination is *like* latitude and
RA is *like* longitude (time based)**

The Fixed Address of the
star Sirius the star:

RA: 06:45:38

Dec: $-16^{\circ}44'$

Sirius will pass directly overhead once a day
if you are located at a latitude $16^{\circ}44'$ South,

Declination of bright stars for 1 January 2000

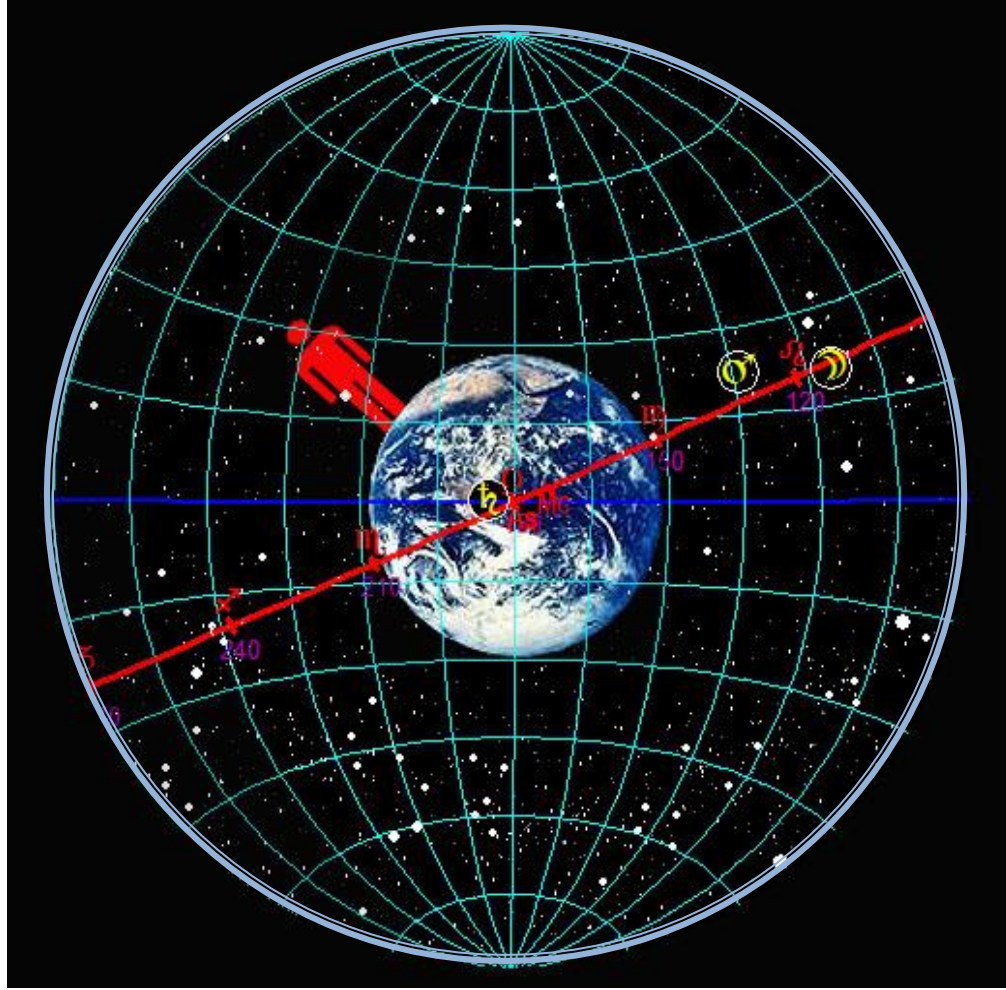
<u>Al Rescha</u>	+02°46'	<u>Scheat</u>	+28°05'	<u>Spica</u>	-11°10'
<u>Menkar</u>	+04°05'	<u>El Nath</u>	+28°36'	<u>Zuben</u>	
<u>Procyon</u>	+05°13'	<u>Alpheratz</u>	+29°05'	<u>Elgenubi</u>	-16°02'
<u>Bellatrix</u>	+06°21'	<u>Castor</u>	+31°53'	<u>Deneb</u>	
<u>Betelgeuse</u>	+07°24'	<u>Mirach</u>	+35°37'	<u>Algedi</u>	-16°08'
<u>Altair</u>	+08°52'	<u>Vega</u>	+38°47'	<u>Sirius</u>	-16°43'
<u>Vindemiatrix</u>	+10°58'	<u>Algol</u>	+40°57'	<u>Murzim</u>	-17°57'
<u>Acubens</u>	+11°51'	<u>Deneb Adige</u>	+45°17'	<u>Alkes</u>	-18°18'
<u>Regulus</u>	+11°58'	<u>Capella</u>	+46°00'	<u>Facies</u>	-23°54'
<u>Ras Alhague</u>	+12°34'	<u>Mirfak</u>	+49°52'	<u>Antares</u>	-26°26'
<u>Ras Algethi</u>	+14°23'	<u>Schedar</u>	+56°32'	<u>Fomalhaut</u>	-29°38'
<u>Denebola</u>	+14°34'	<u>Capulus</u>	+57°09'	<u>Aculeus</u>	-32°15'
<u>Markab</u>	+15°12'	<u>Dubhe</u>	+61°45'	<u>Phact</u>	-34°05'
<u>Sualocin</u>	+15°55'	<u>Alderamin</u>	+62°35'	<u>Acumen</u>	-34°49'
<u>Alhena</u>	+16°24'	<u>Thuban</u>	+64°22'	<u>Rukbat</u>	-40°37'
<u>Aldebaran</u>	+16°30'	<u>Polaris</u>	+89°16'	<u>Ankaa</u>	-42°19'
<u>Diadem</u>	+17°32'	<u>Sadalmelek</u>	-00°19'	<u>Canopus</u>	-52°42'
<u>Arcturus</u>	+19°11'	<u>Alnilam</u>	-01°12'	<u>Achernar</u>	-57°15'
<u>Zosma</u>	+20°31'	<u>Sadalsuud</u>	-05°34'	<u>Agena</u>	-60°22'
<u>Hamal</u>	+23°28'	<u>Rigel</u>	-08°12'	<u>Toliman</u>	-60°50'
<u>Alcyone</u>	+24°06'	<u>Alphard</u>	-08°40'	<u>Acrux</u>	-63°06'
<u>Alphecca</u>	+26°43'	<u>Zuben</u>			
<u>Pollux</u>	+28°01'	<u>Eschamali</u>	-09°23'		

Every star has a declination which tells you where it is on the celestial sphere

+ = North

- = South

What stars are visible for a given location

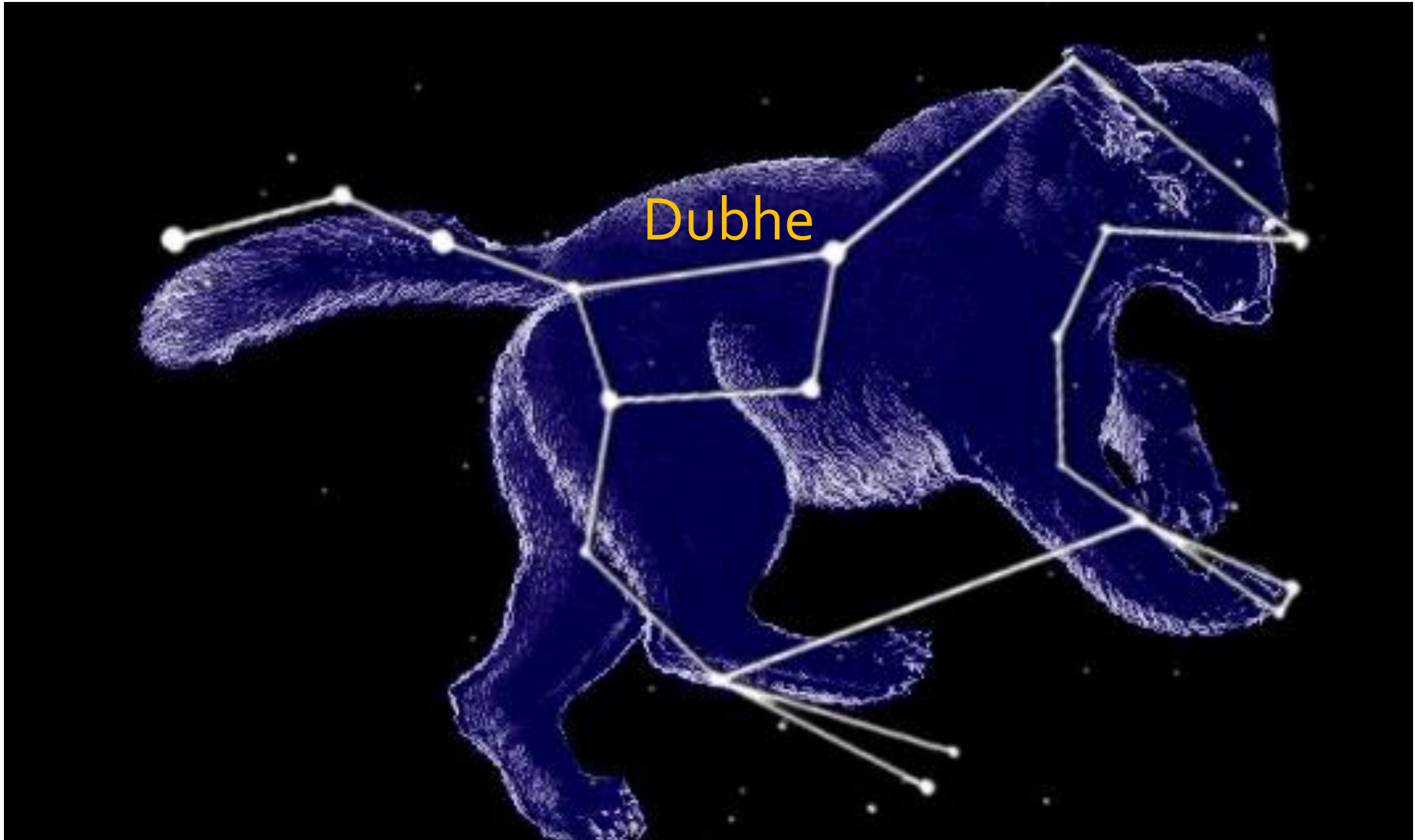


To gain a rough guide to a star's visibility for a given location subtract the observer's latitude from 90° .

The resulting answer will be the declination of a star that will either never rise or never set.

E.G. At a latitude of **51 North**. $90 - 51 = 39$.
Thus stars with a declination of **greater than 39 North** will never set while stars with a declination of **greater than 39 South** will never rise.

Who will be able to see Ursa Major?



Declination of bright stars for 1 January 2000

<u>Al Rescha</u>	+02°46'	<u>Scheat</u>	+28°05'	<u>Spica</u>	-11°10'
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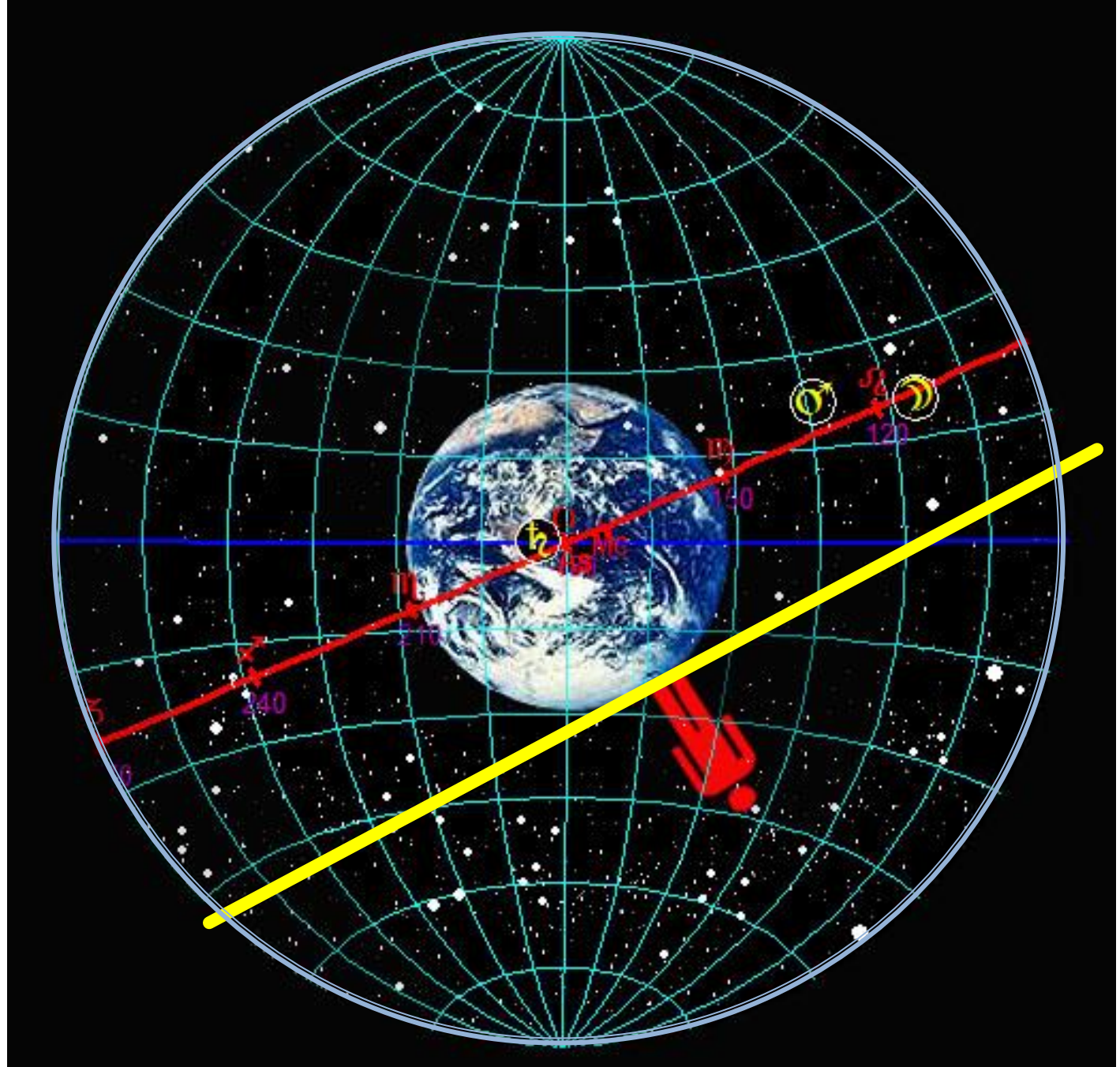
Where in the world will
Dubhe NOT be visible?

Dubhe declination +62

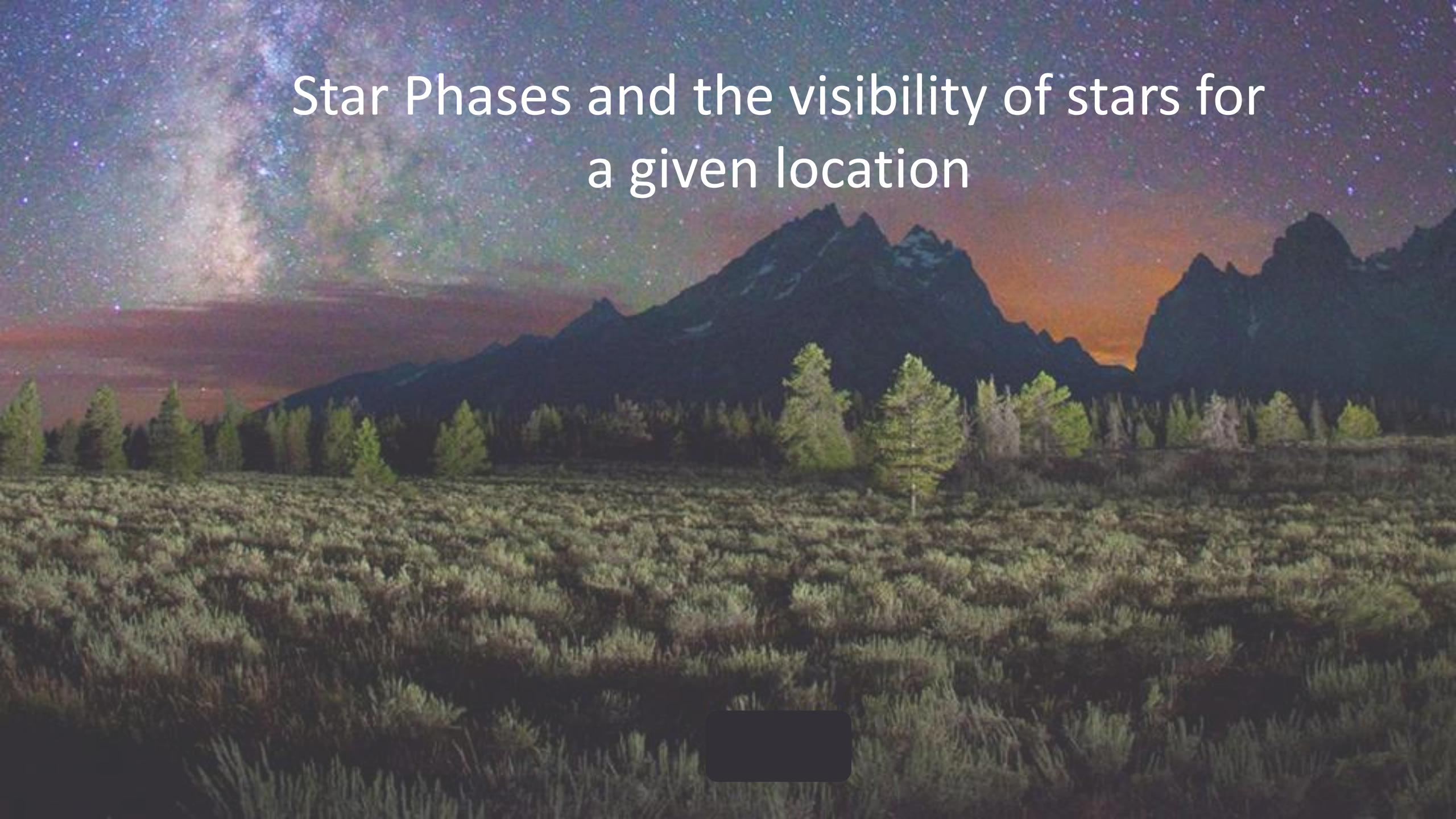
$$90^{\circ} - 62^{\circ} = 28^{\circ}$$

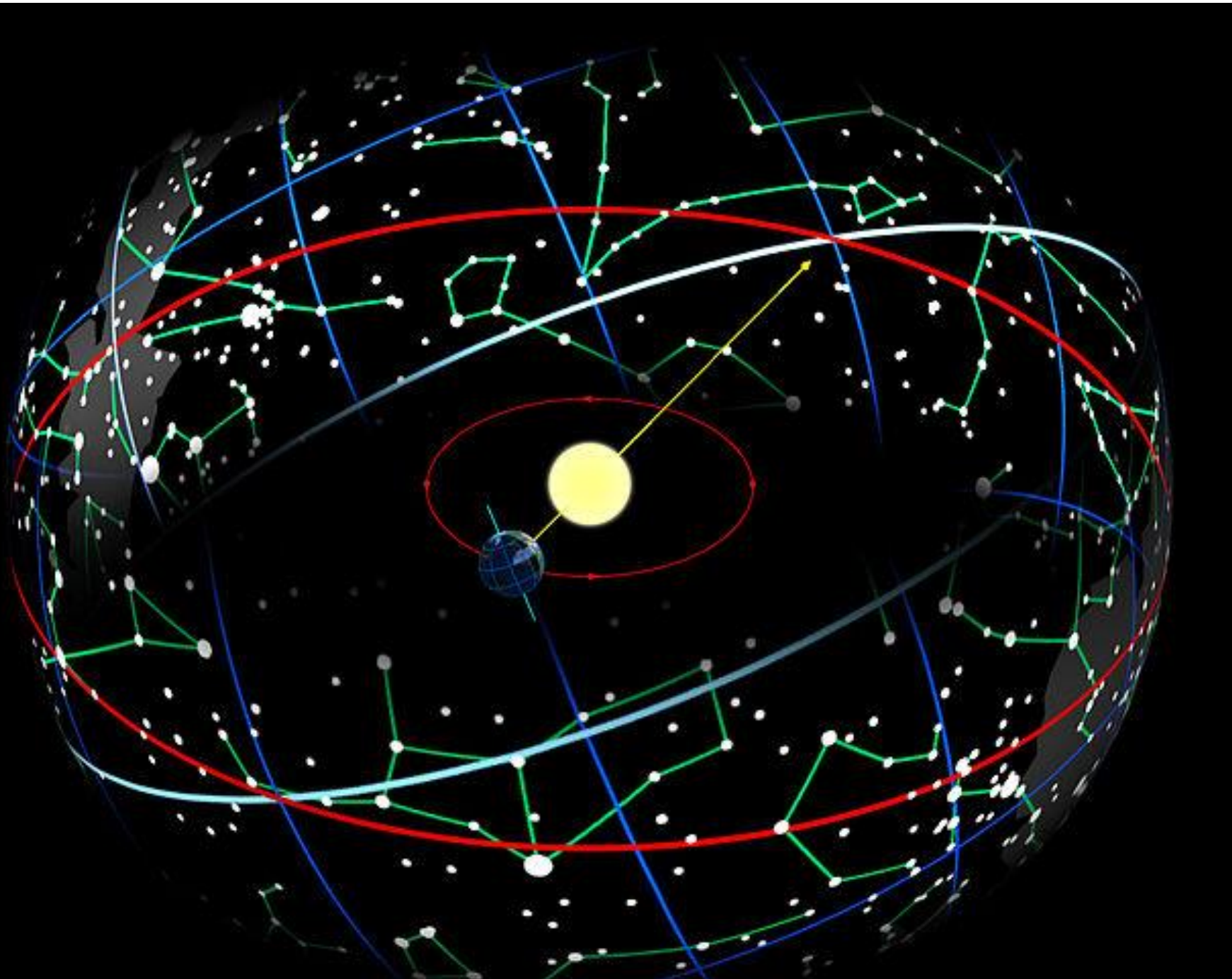
Any place located
south of Latitude 28°
south will never see
the Great Bear

This person living in
Tasmania – about
 40° South - will not
see Ursa Major.



Star Phases and the visibility of stars for a given location





A star is only visible if it is above the horizon when the sun is below the horizon.

Thus since the stars do not move it is the **movement of the sun along the ecliptic** that will cause the stars to appear or disappear from the night sky.

Thus the visibility of any star is dependant upon:

- Your location – the latitude and the declination of the star.
- Plus the position of the Sun on the ecliptic – that is the day of the year.

This combination produces what is known as **Star Phases** – a particular local rhythm of when some stars will disappear from the night sky for some weeks or months and then reappear again at the same time each year.



The Eastern Horizon

Stars will always rise in the same place on the horizon for a set point of view – based on a star's phase pattern some of these points will be where a star is 'born' and returns to visibility after being absent from the night sky.



Location where a certain star sets with the sun and begins its period of invisibility.

Location where a certain star sets after the setting sun and returns to earth.

South
P.K. Chen

West

North

The Western Horizon

Stars will always set in the same place on the horizon for a set point of view – based on a star's phase pattern some of these points will be where a star 'dies' setting just after sunset and then beginning its period of invisibility for weeks or months - being absent from the night sky.

Stars for a given location and era:

- Stars rise (or set) at the same place on the horizon.
 - Stars can thus produce calendar and navigational markers.
- Stars will have:
 - Brightness and colour.
 - A star phase will relate to a date (season) and a place on the horizon.

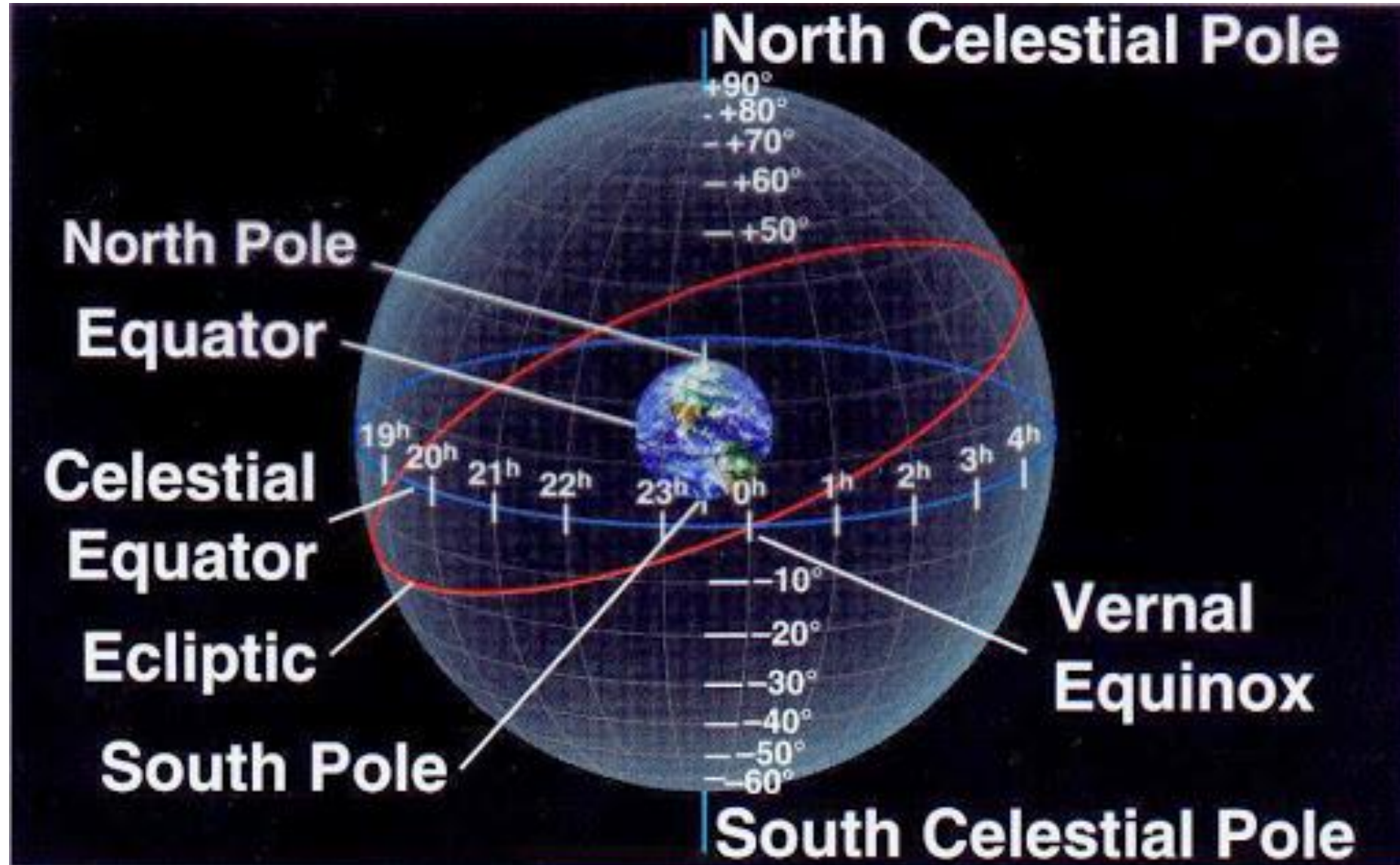


The harmony of the heavens

The patterns that show
calendar and balance.

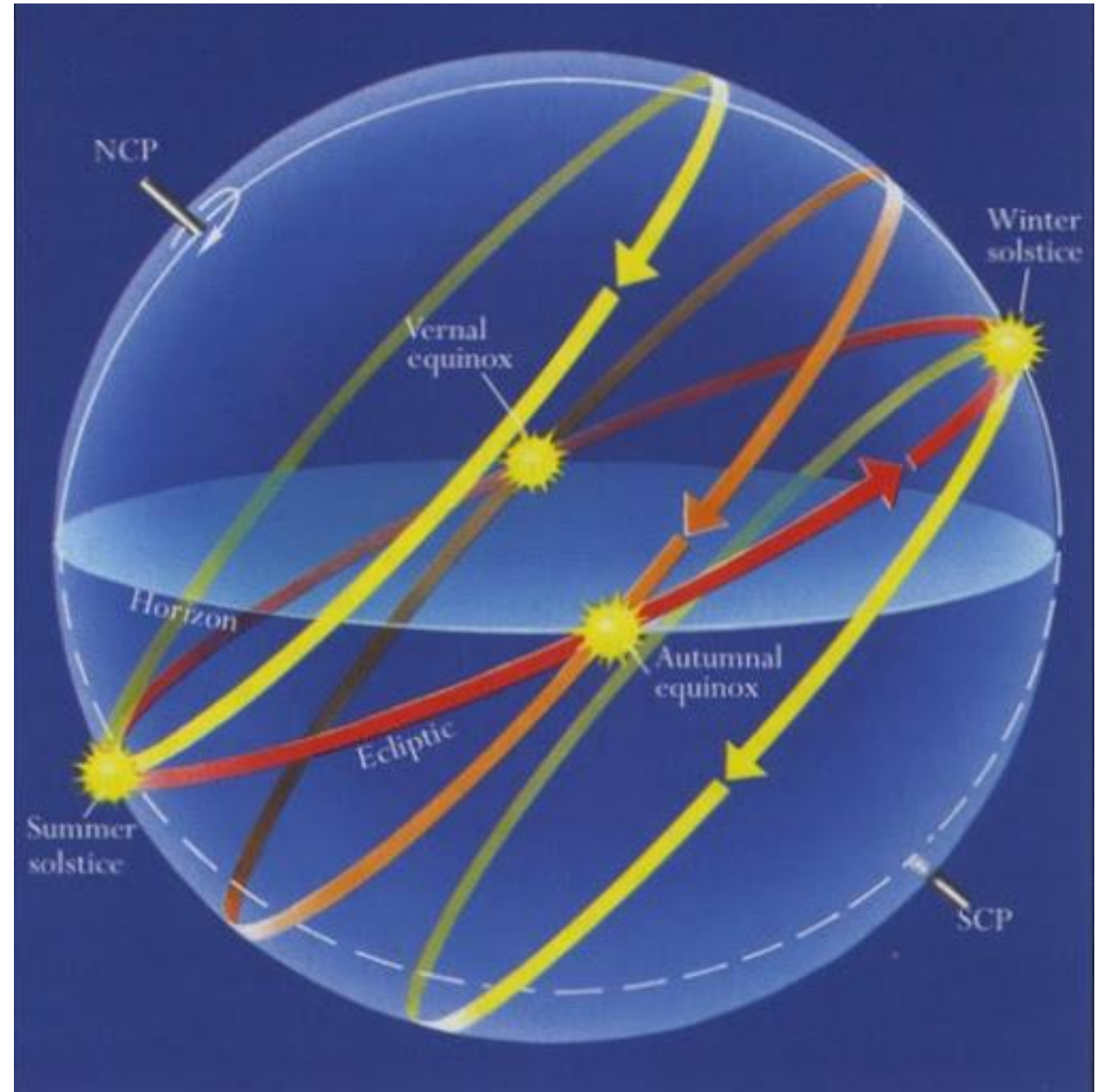


As earth orbits the sun, the sun appears to move along the ecliptic.

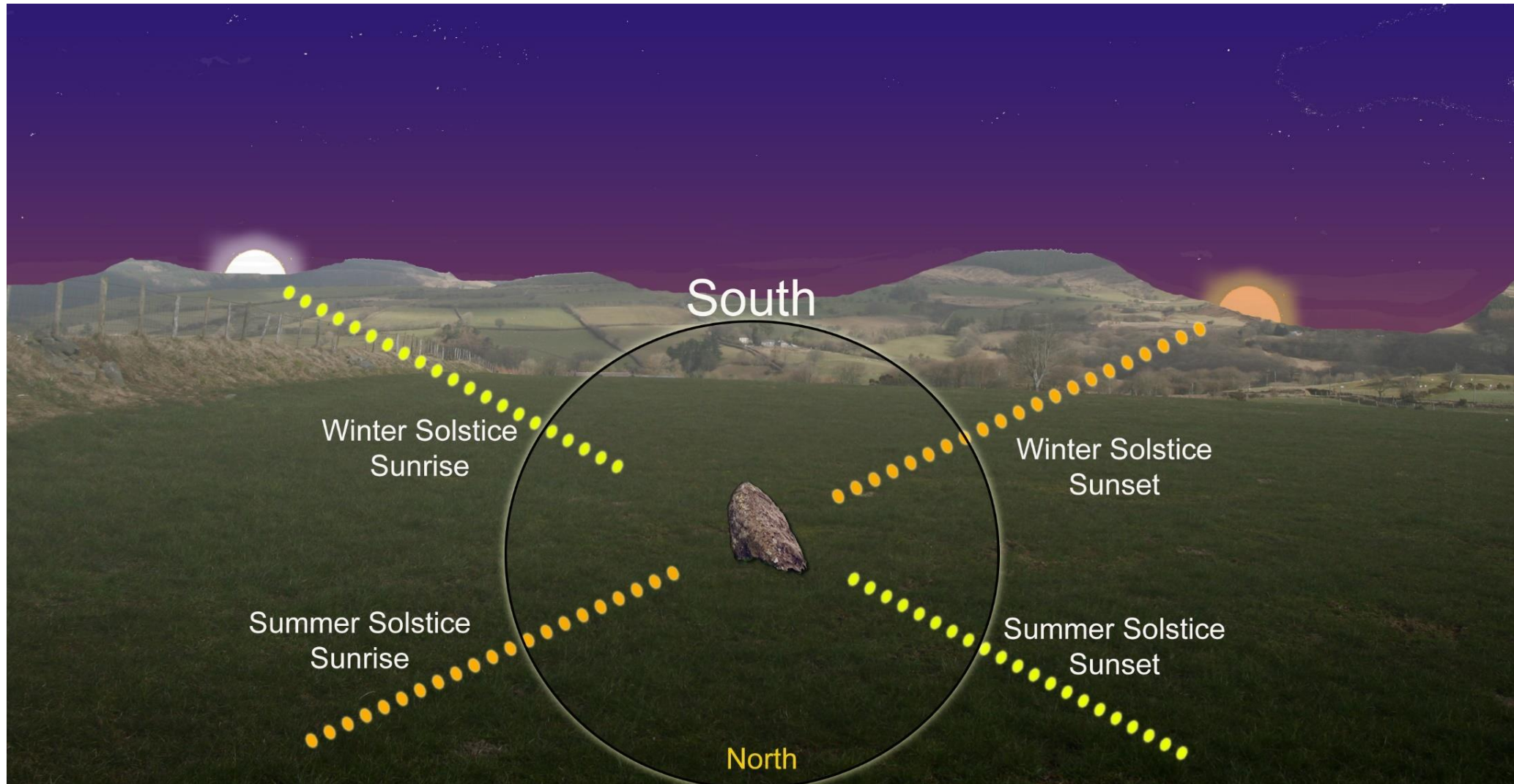


When the sun moves into the places where the ecliptic has its greatest declination – north or south - that is a solstice.

When it crossed the equator – has a declination of 0° then it is an equinox.



The landscape and the sun



This arc between sunrise (or sunset) for the two solstices is a reflection of your latitude.

North East

East

South East

Dec = +23.5

+0

-23.5

Summer Solstice
Sunrise

Spring and Autumn

Winter Solstice
Sunrise

Winter Solstice
Full Moon Rise

Spring and Autumn

Summer Solstice
Full Moon Rise

Landscape harmony
between the sun and
the moon.

Location of sunsets
and full moon sets on
a horizon.

March through to
August.



Equinox (March)
Full Moon Set Sunset



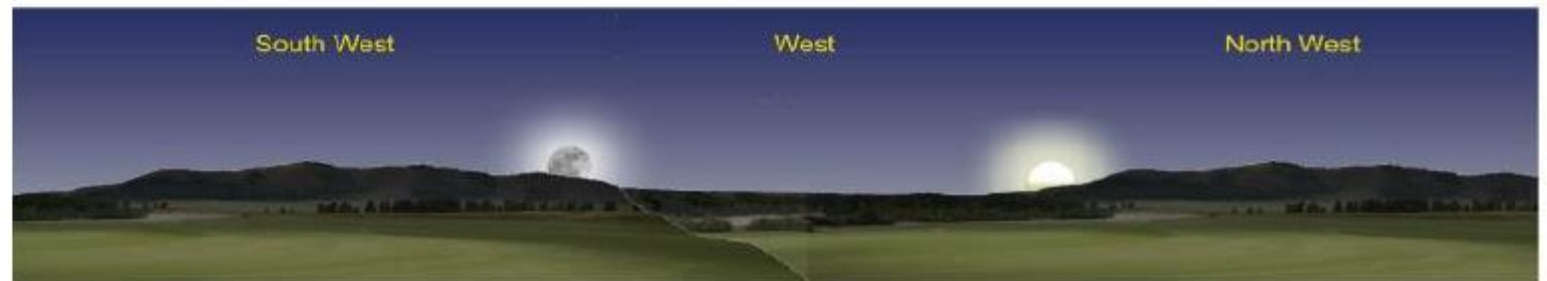
Cross Quarter (May)
Full Moon Set

Cross Quarter (May)
Sunset



Summer Solstice
Full Moon Set

Summer Solstice (June)
Sunset

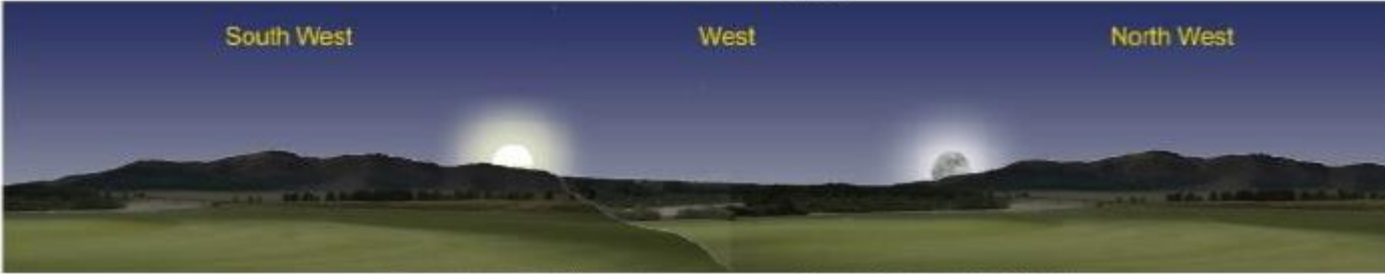


Cross Quarter
Full Moon Set

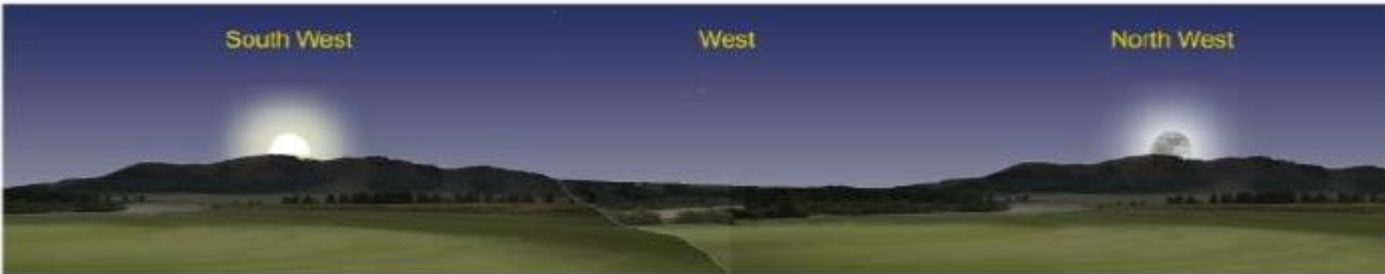
Cross Quarter (August)
Sunset



Equinox (September)
Full Moon Set Sunset



Cross Quarter (Oct/Nov)
Sunset Full Moon Set



Winter Solstice
Sunset Full Moon Set

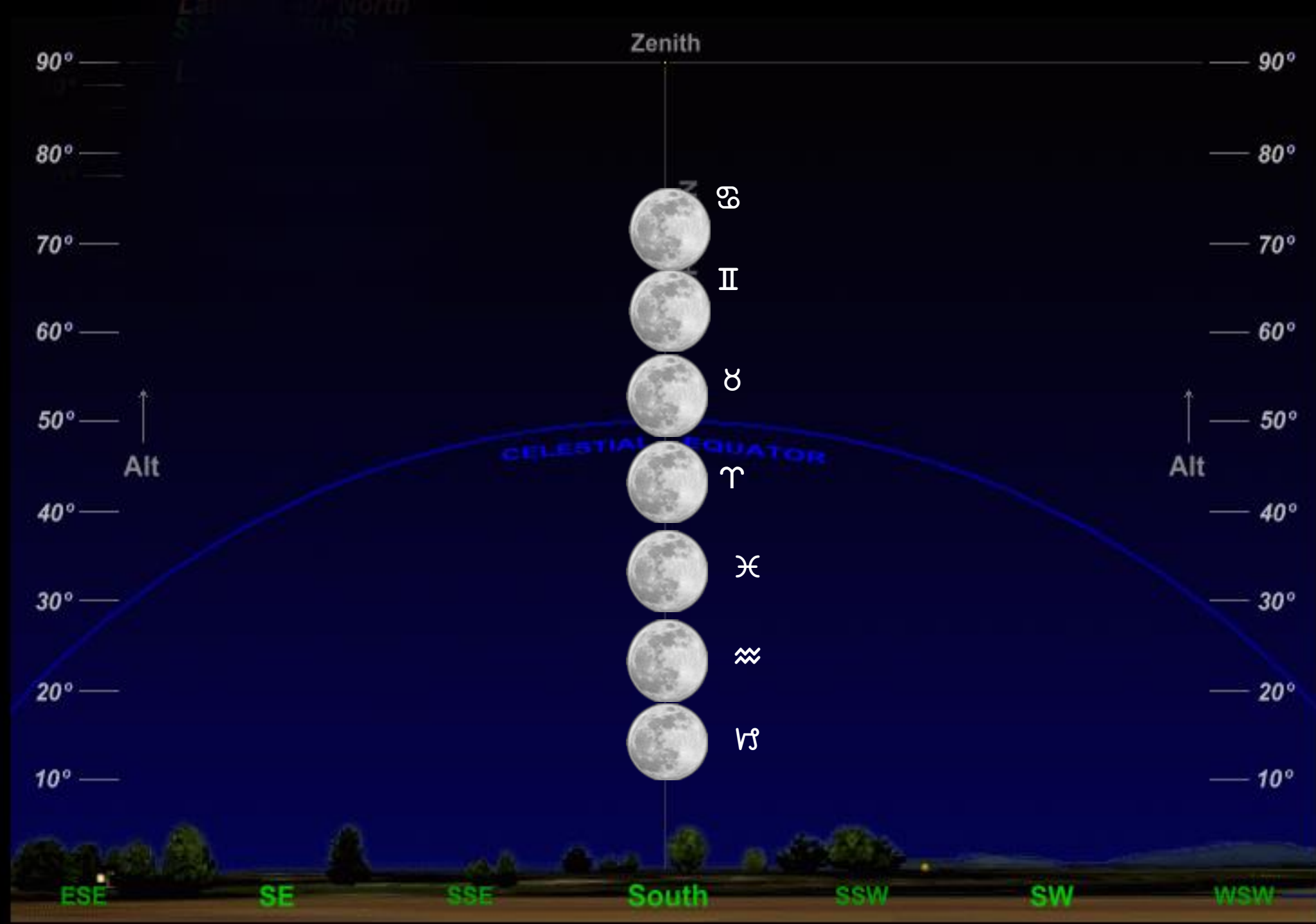


Cross Quarter (February)
Sunset Full Moon Set

Landscape harmony
between the sun and
the moon.

Location of sunsets
and full moon sets on
a horizon.

September through to
February.



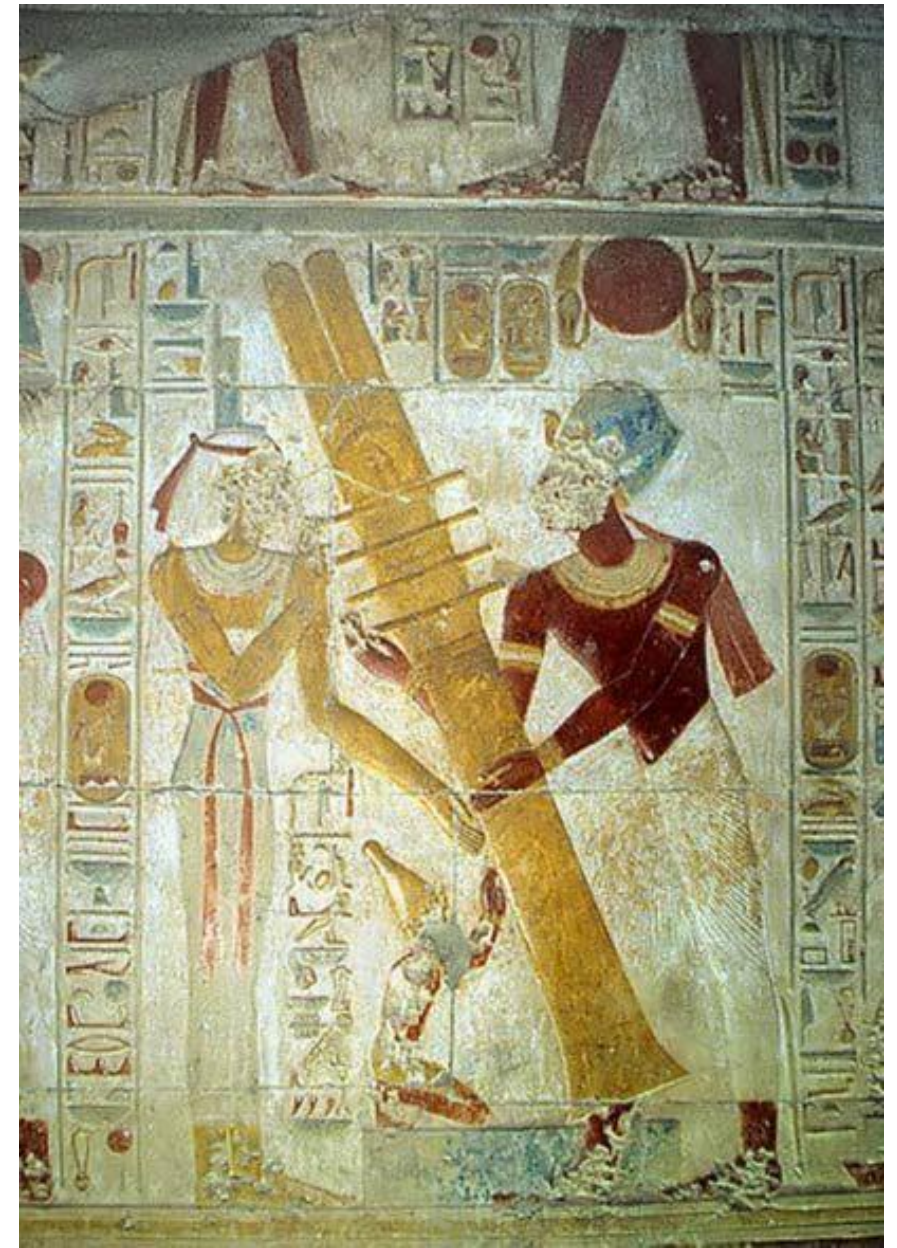
The sky is regular in motion and thus provides the concept of time. - expand on this in Week 4 lunar calendar

- The time of the year (seasons) – Calendars
 - sun, moon and stars.
- The number of years (marked by planetary movement) - Chronologies.
 - Planetary cycles against the stars.
- The time of the day (or night) – ‘Clocks’
 - Diurnal movement of sun, moon or stars.

Returning to Plato: Sky as Eternal

Plato *Timaeus* 37c-39e

Wherefore he resolved to have a moving image of eternity, and when he set in order the heaven, he made this image eternal but moving according to number, while eternity itself rests in unity; and this image we call time. ... They (the heavens) are all parts of time, and the past and future are created species of time.



The Djed Pillar – Seti I, 19 Dynasty

Conclusion

From the perspective of the watcher the sky produces:

- A fixity of star movement – to each other as well as to the landscape.
- This fixity gave a view of consistency which morphs into a view of the eternal.
- A regular and unchanging pattern of sunrise and sunsets which mark the agricultural year.
- There is a rhythm between the sun and the moon.

Reading

- Ruggles, Clive, “Basic Concepts of Positional Astronomy.” In Ruggles, Clive (ed), *Handbook of Archaeoastronomy and Ethnoastronomy*, New York: Springer, pp. 459-472.

This is available through the library and you can access it directly through the Lagento [Reading List](#) at the top of this Moodle page.

- Brady, Bernadette "Star Phases: the naked-eye astronomy of the Old Kingdom Pyramid Texts". . In Silva, Fabio and Nick Campion (eds), *Skyscapes: The Role and Importance of the Sky in Archaeology*, Oxford: Oxbow Books, 2015, pp. 76-86.

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- Brady, Bernadette, ‘Stars-Paths, Stones and Horizon Astronomy.