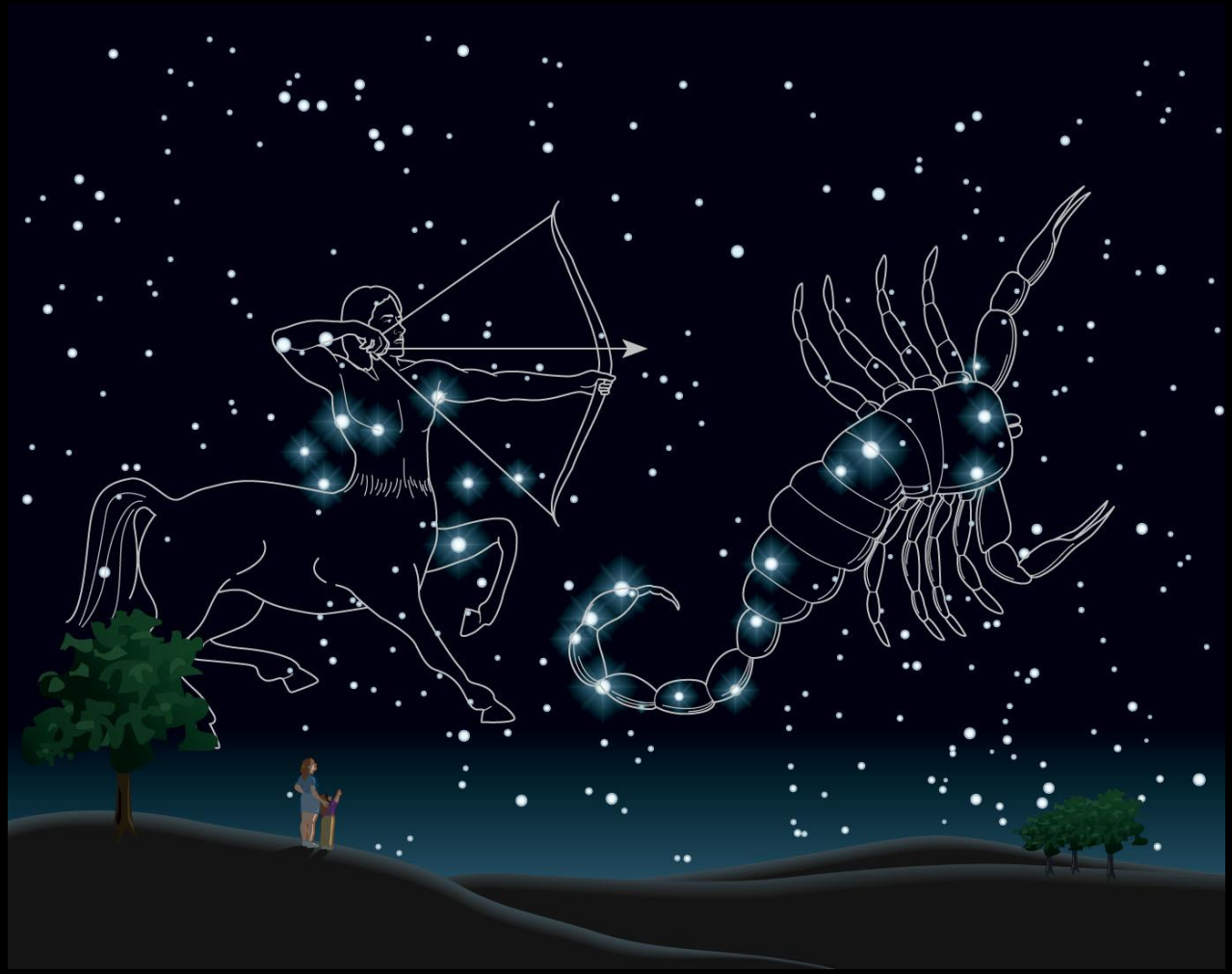
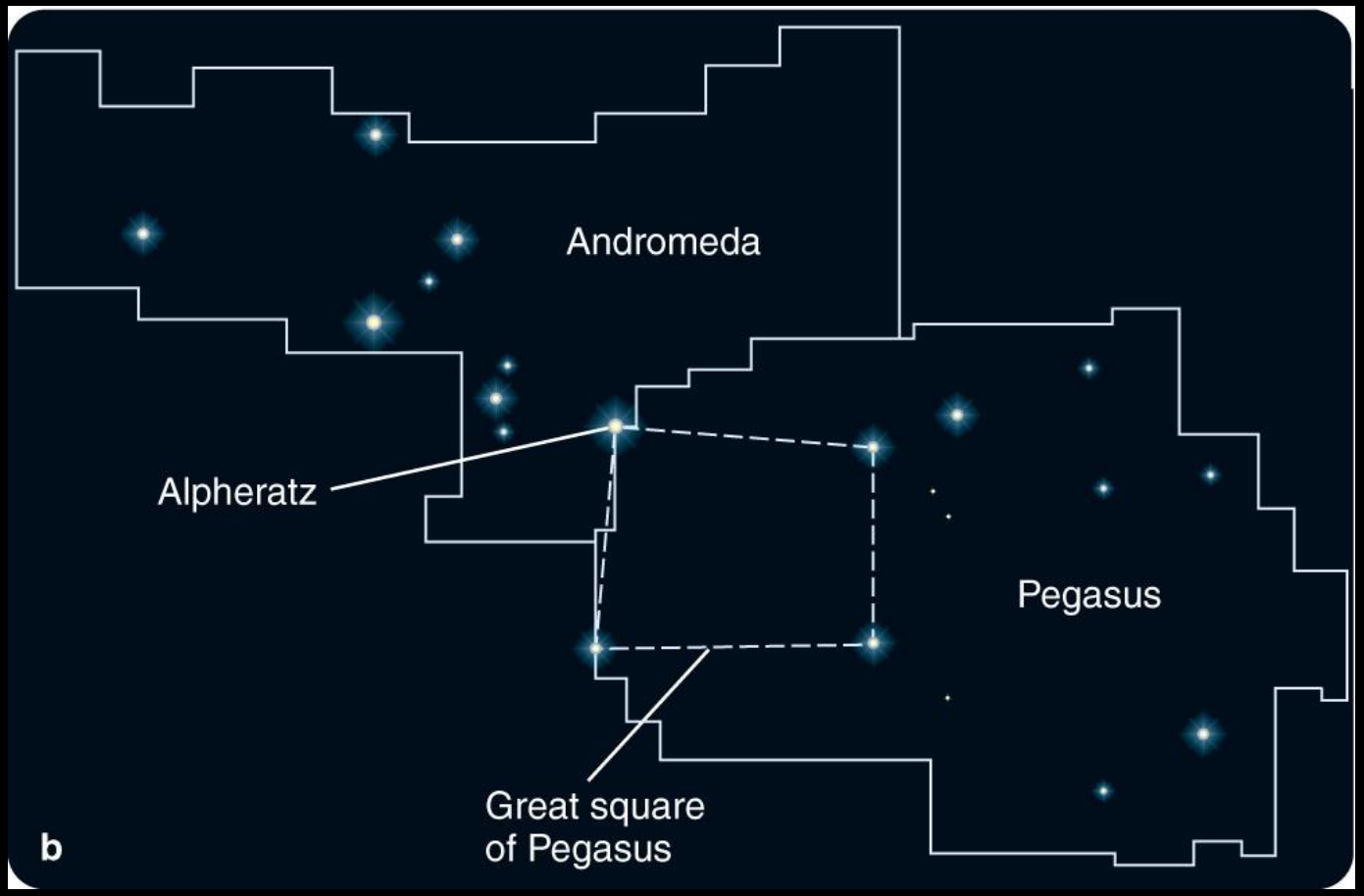
The Sky: Constellations

Constellations



In ancient times, constellations only referred to the brightest stars that appeared to form groups.

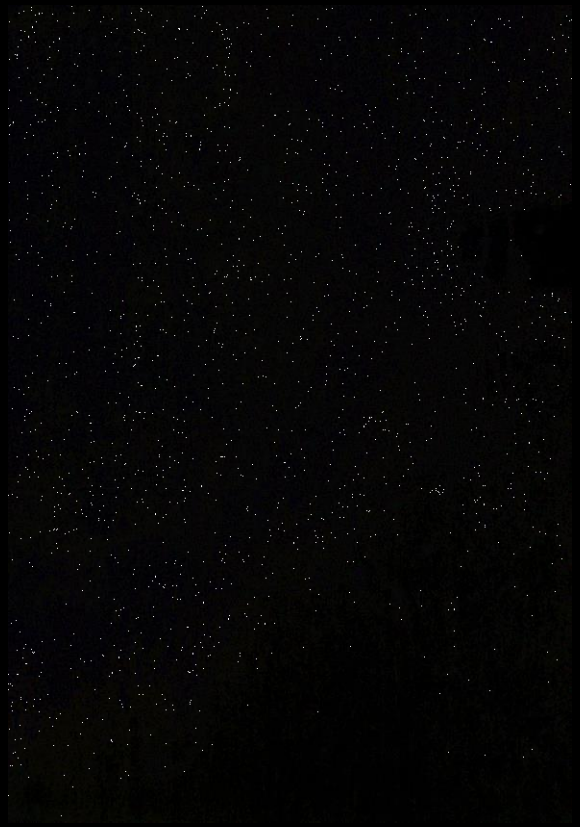
Constellations



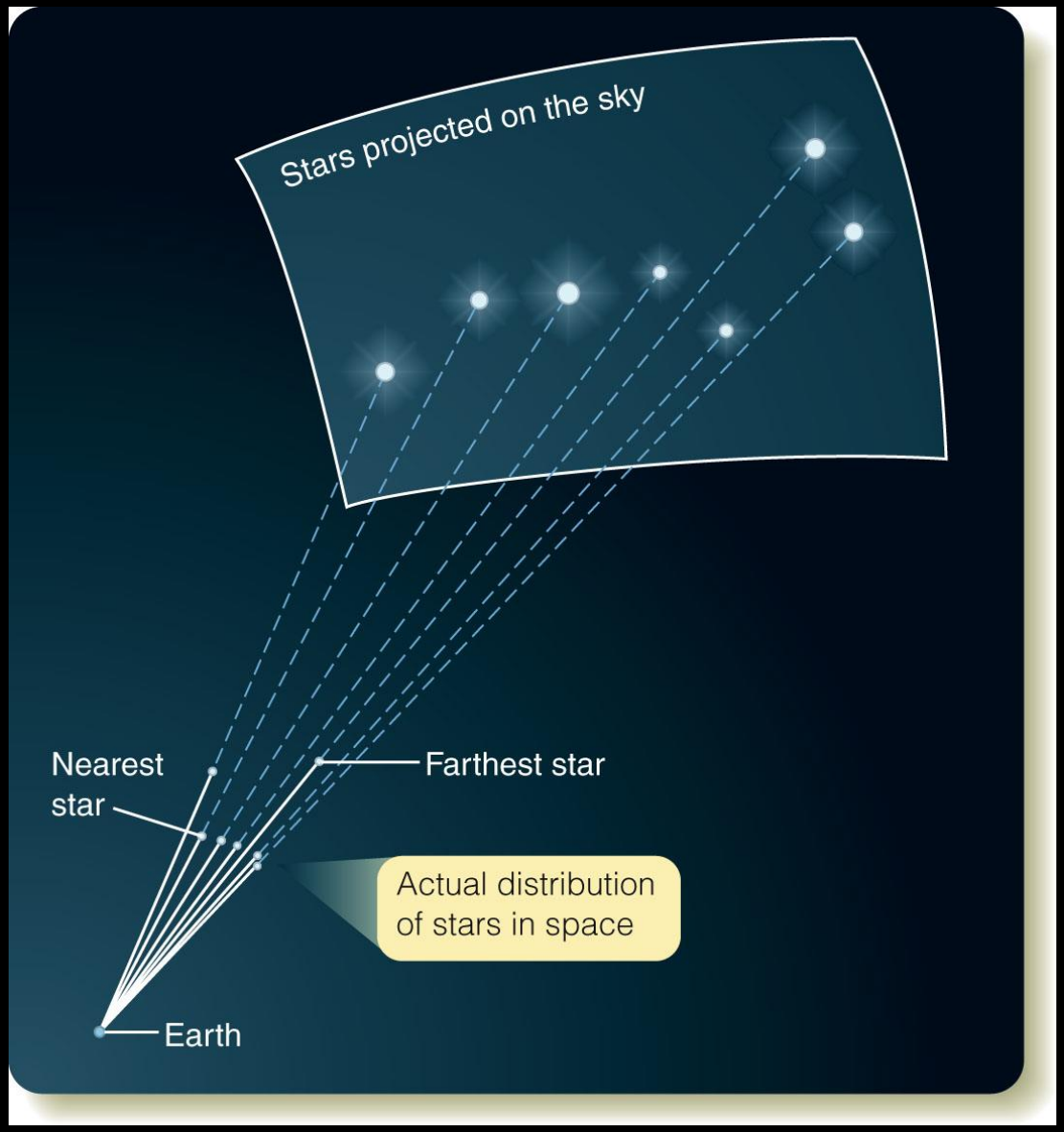
Today, constellations are well-defined regions on the sky, irrespective of the presence or absence of bright stars in those regions.

Constellations

Apparent groupings of stars – relatively fixed positions



Constellations

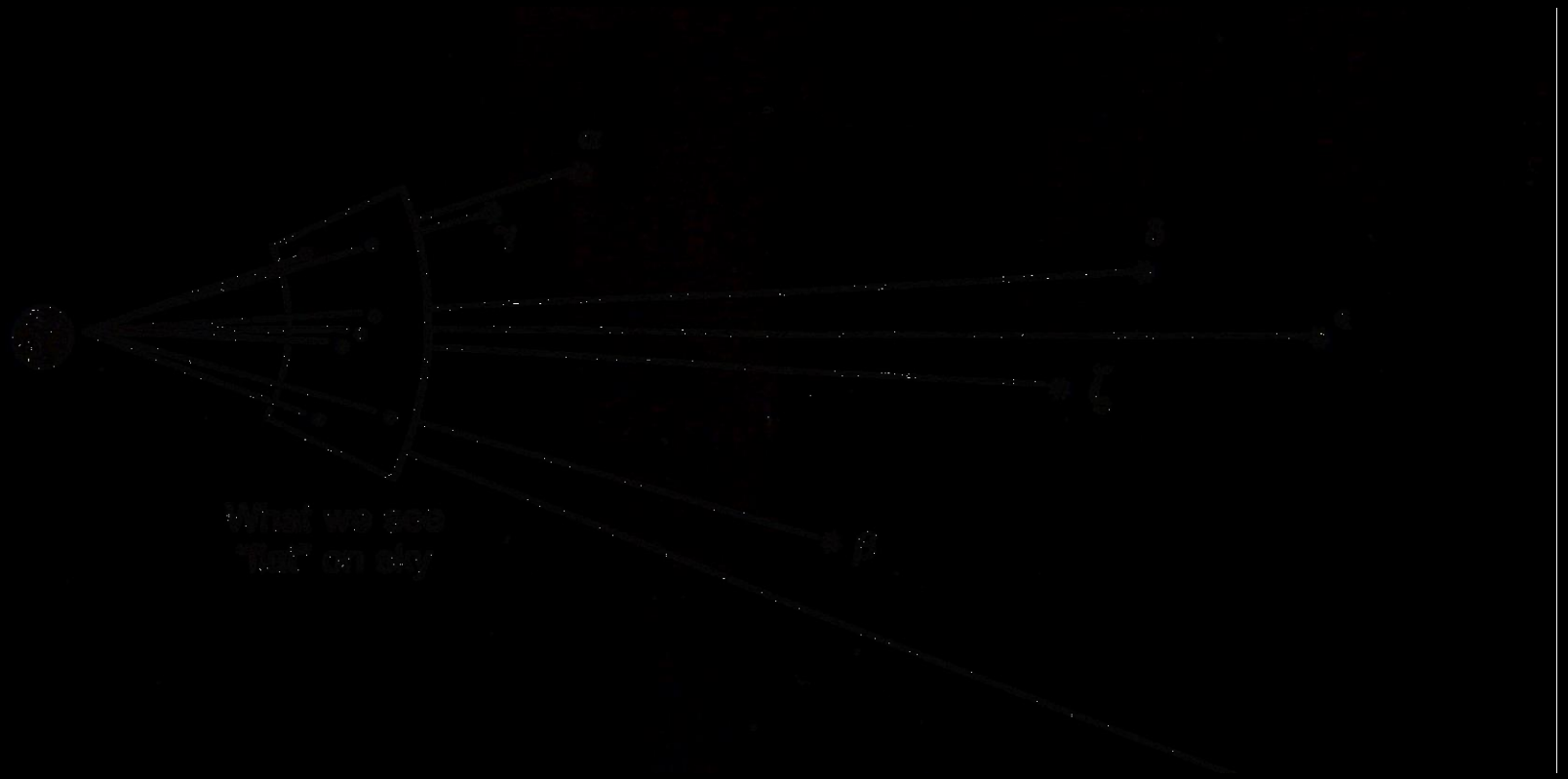


The stars of a constellation only appear to be close to one another.

Usually, this is only a *projection effect*:

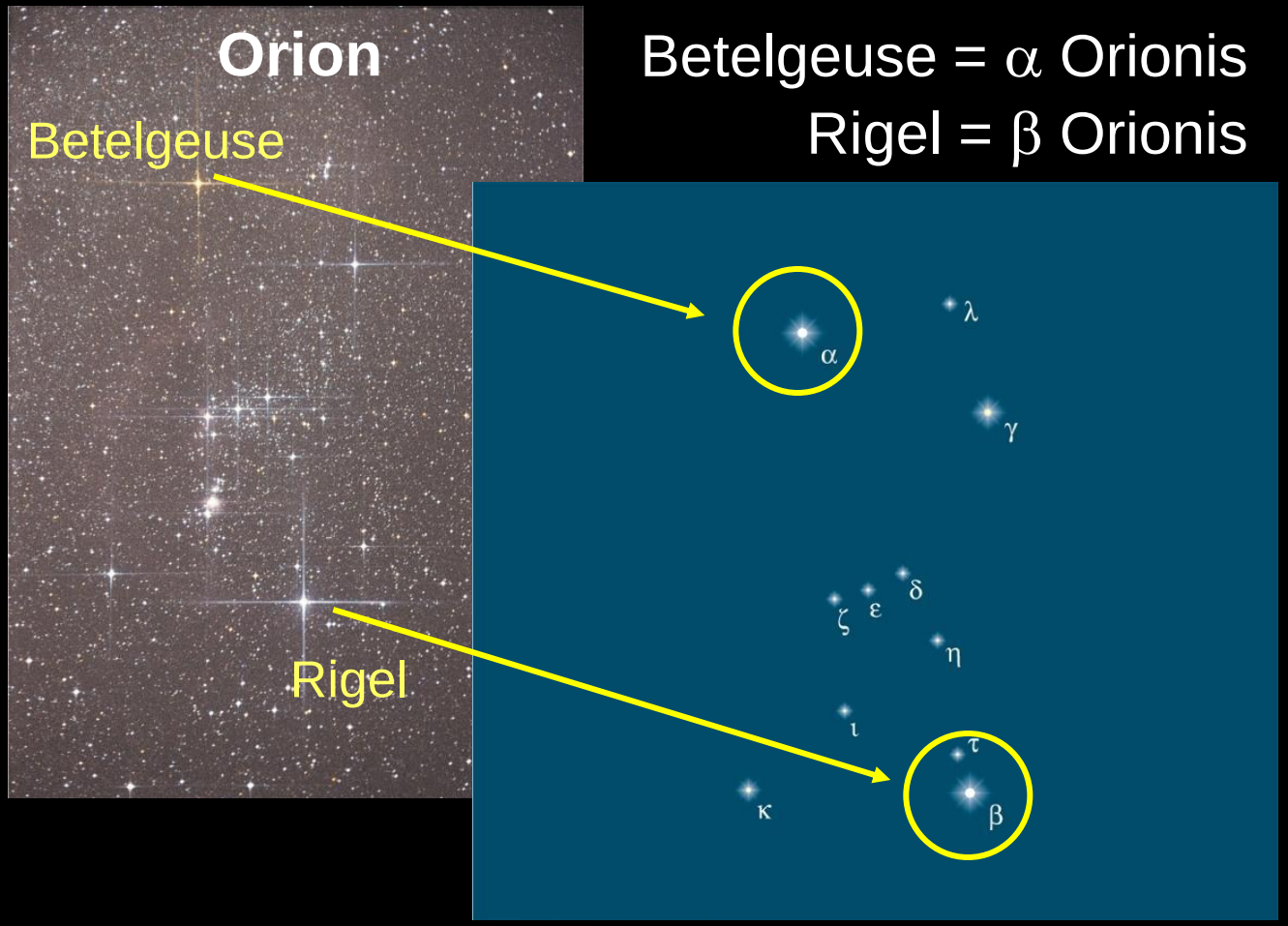
Constellations

Locating constellations on the celestial sphere is just a convenience – we know that the stars are distributed three-dimensionally in space.



Constellations

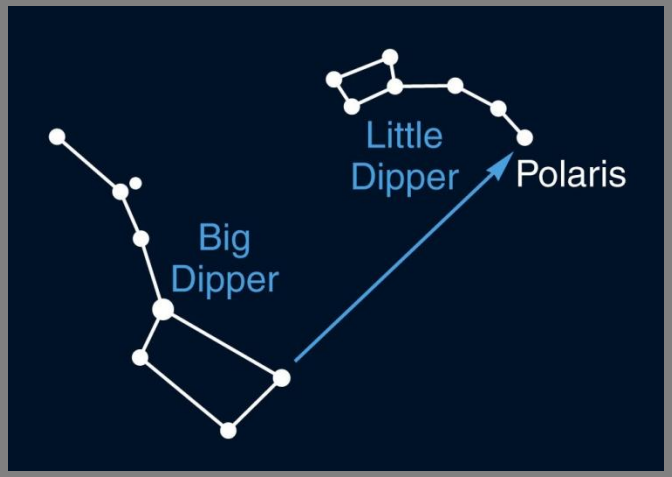
Stars are named by a Greek letter (α, β, γ)

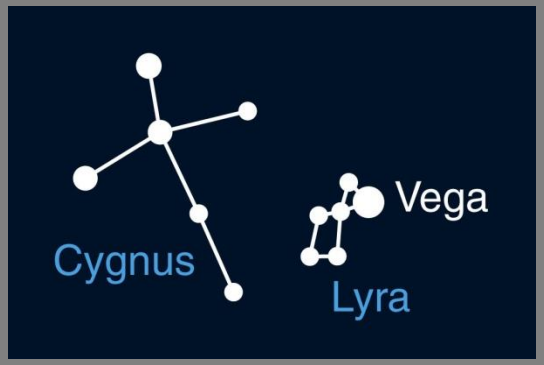


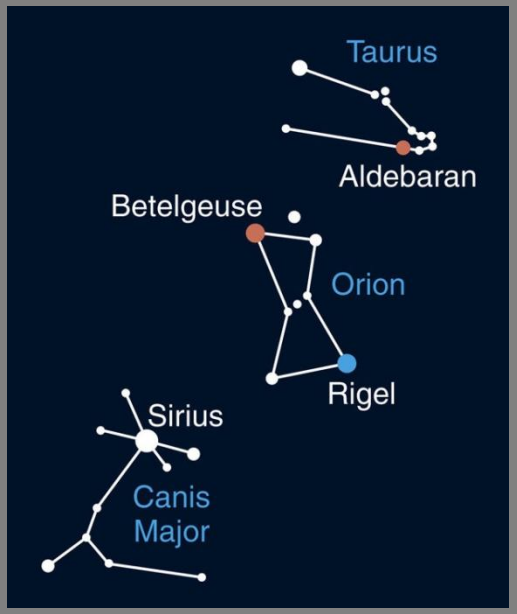
Betelgeuse = α Orionis

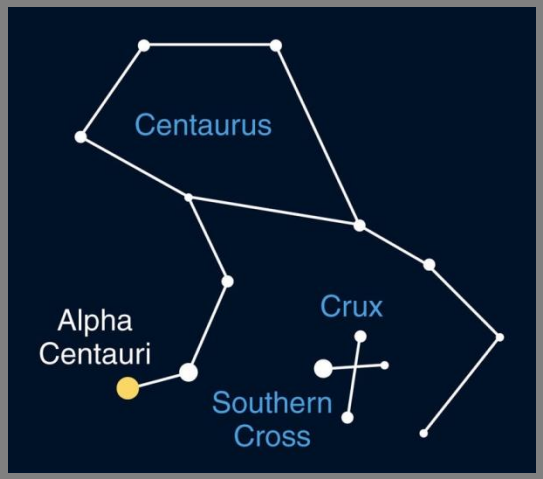
Rigel = β Orionis

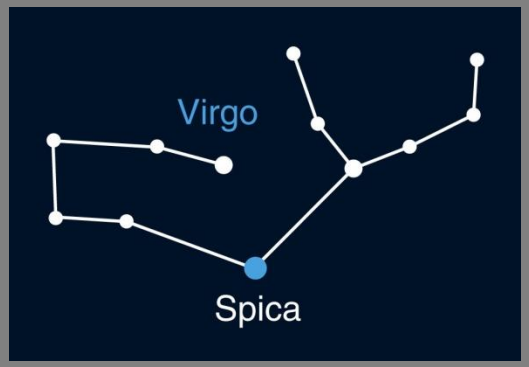
Constellations











Some examples of easily recognizable constellations and their brightest stars

The Magnitude Scale

First introduced by Hipparchus (160 - 127 B.C.):

- Brightest stars: ~1st magnitude
- Faintest stars (unaided eye): 6th magnitude

More quantitative:

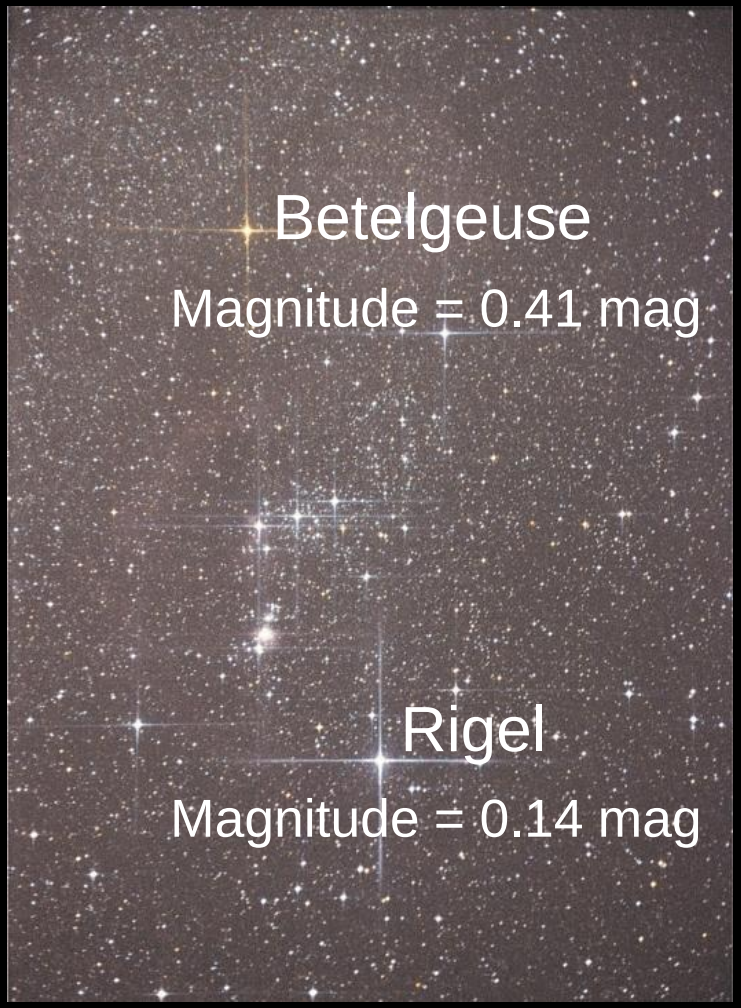
- 1st mag. stars appear 100 times brighter than 6th mag. stars
- 1 mag. difference gives a factor of 2.512 in apparent brightness (larger magnitude => fainter object!)

Table 2-1 | Magnitude and Intensity

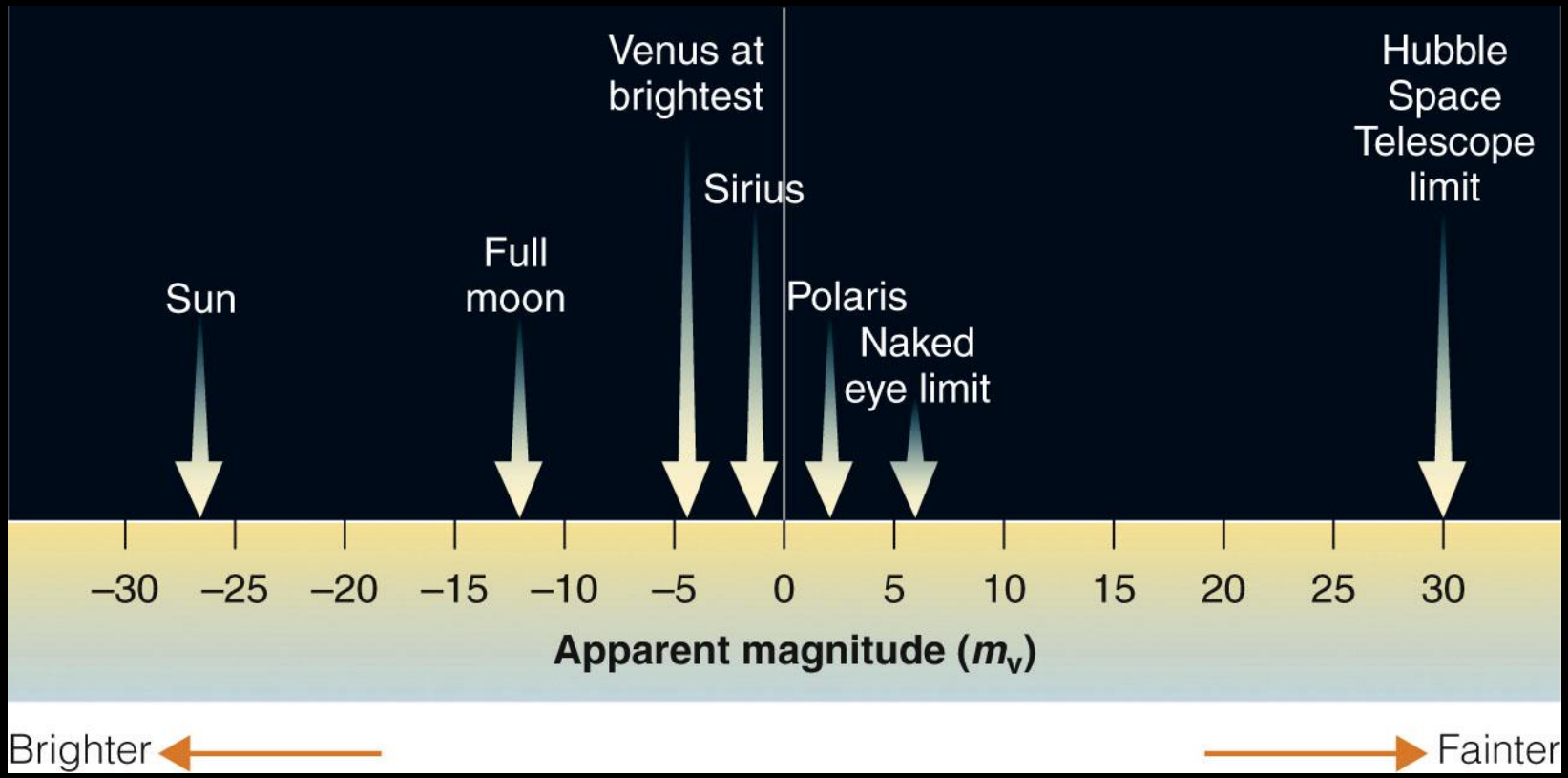
Magnitude Difference	Approximate Intensity Ratio
0	1
1	2.5
2	6.3
3	16
4	40
5	100
6	250
7	630
8	1600
9	4000
10	10,000
⋮	⋮
15	1,000,000
20	100,000,000
25	10,000,000,000
⋮	⋮

For a magnitude difference of 0.41 – 0.14 = 0.27, we find an intensity ratio of $(2.512)^{0.27} = 1.28$.

In other words, Rigel is 1.28 times brighter than Betelgeuse.



The Magnitude Scale

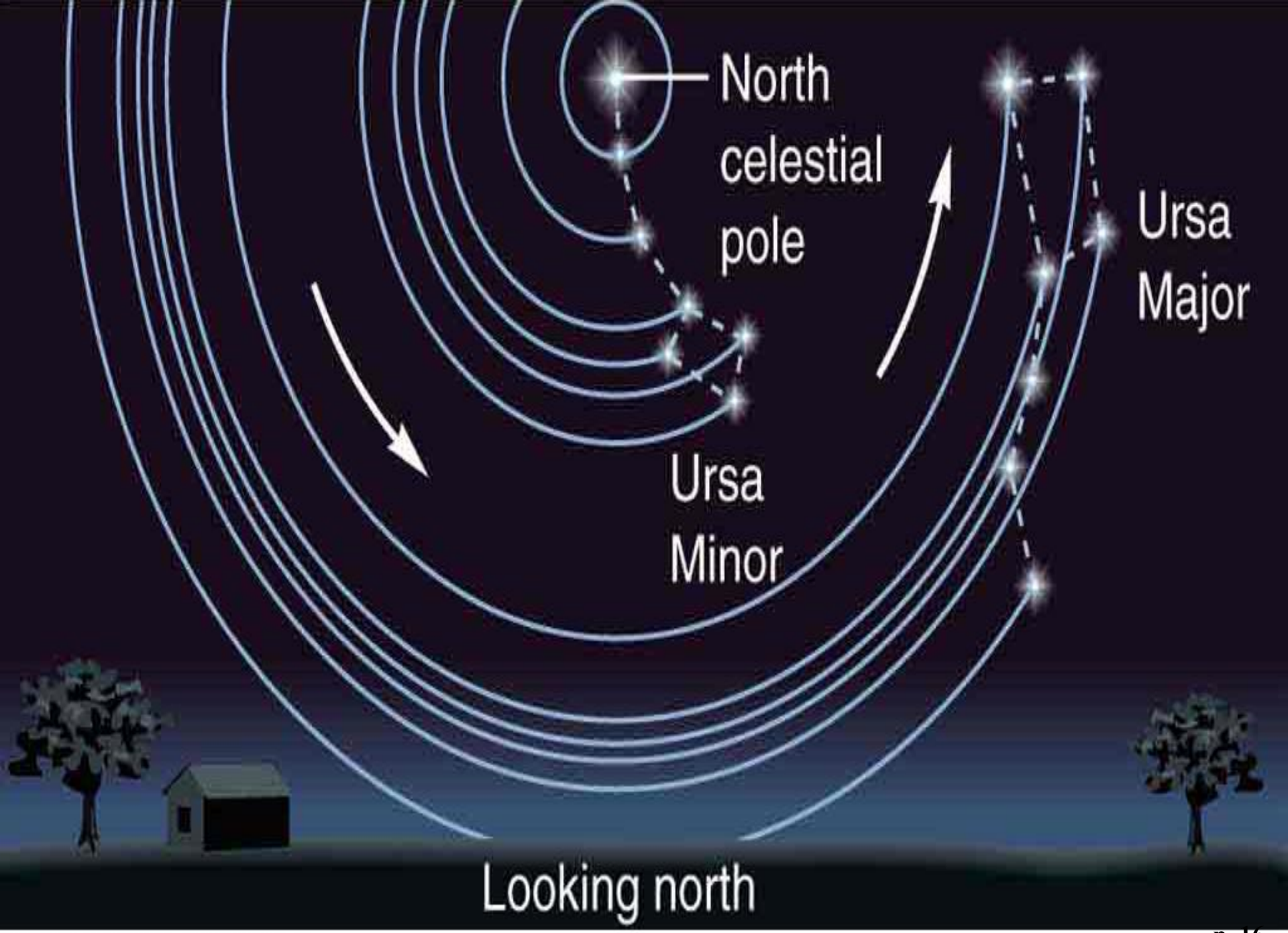


Sirius (brightest star in the night sky): $m_v = -1.42$

Full moon: $m_v = -12.5$

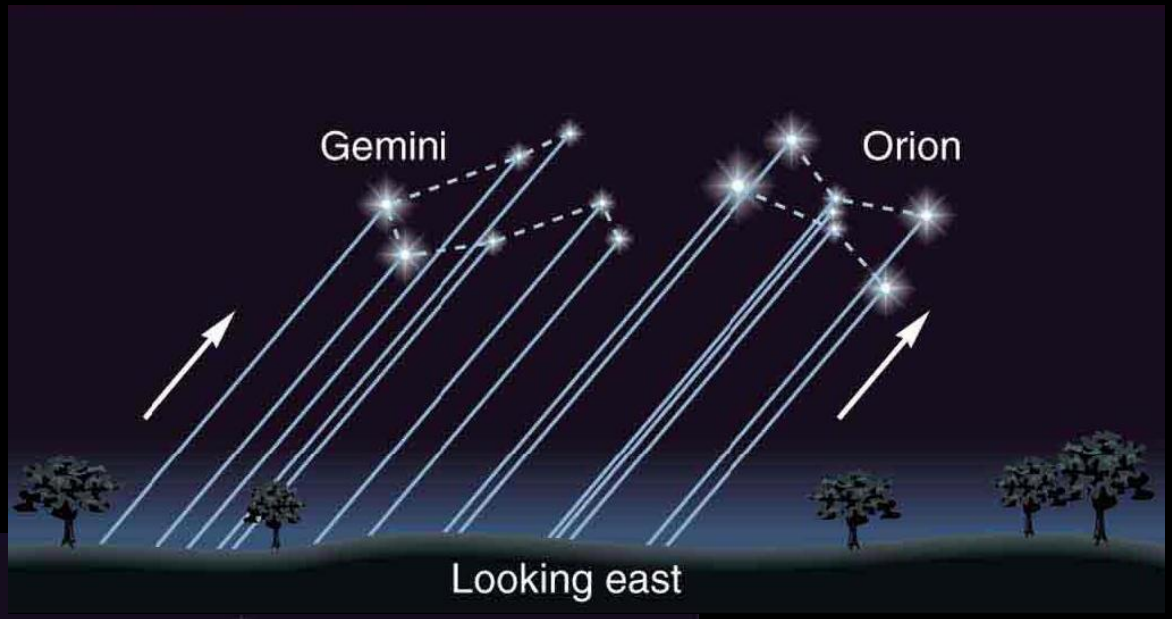
Sun: $m_v = -26.5$

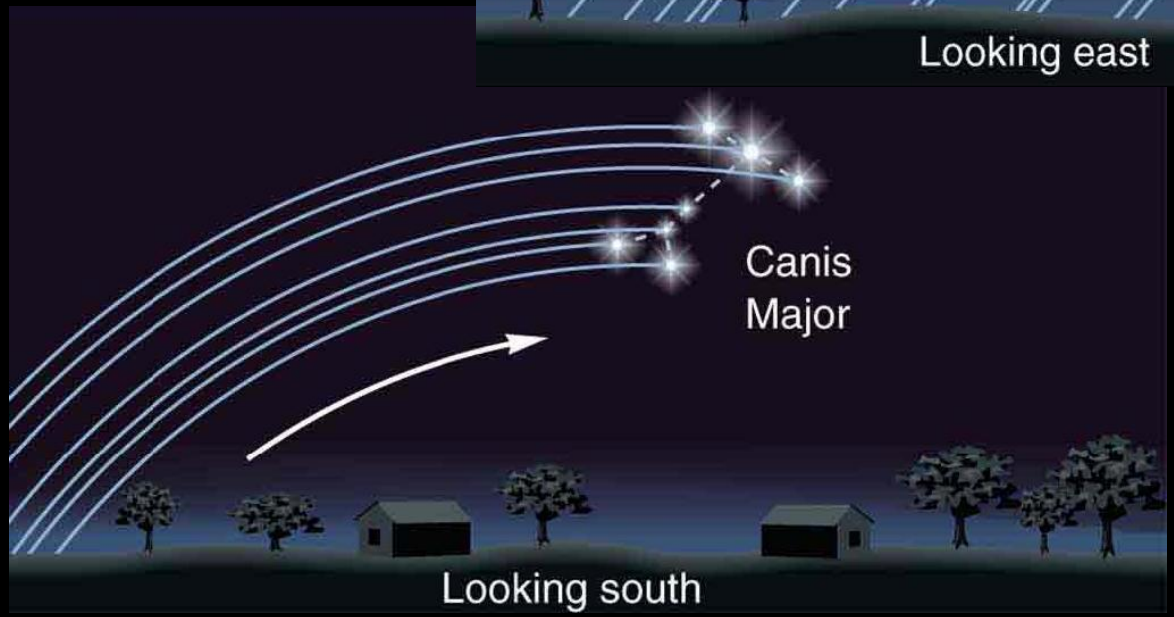
Star trails



Apparent Motion of The Celestial Sphere

Looking east, you see stars rising and moving to the upper right (south)





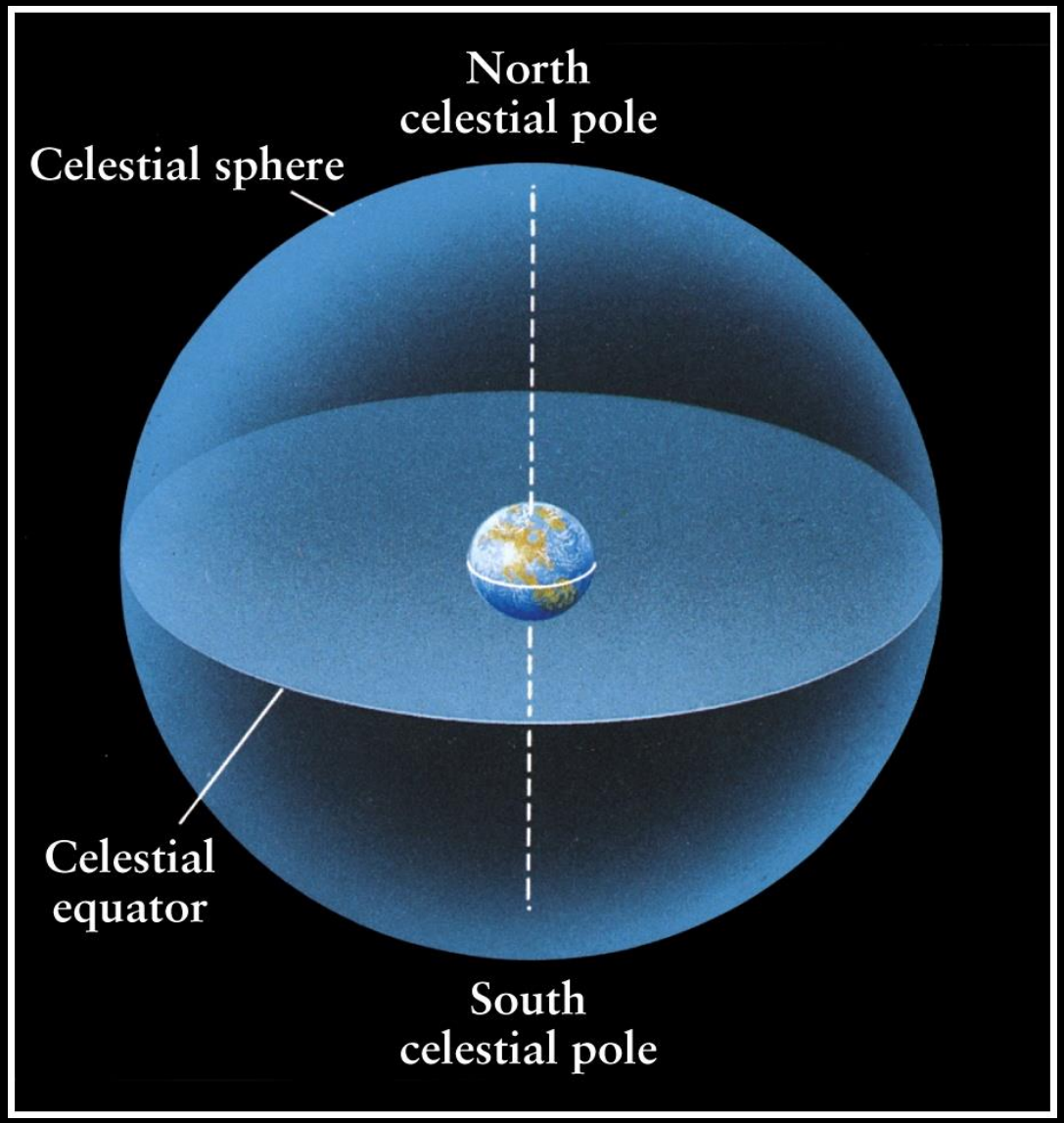
Looking south, you see stars moving to the right (west)

Celestial Sphere: Extension of the Earth's Coordinates

celestial sphere

- N/S celestial poles
- celestial equator

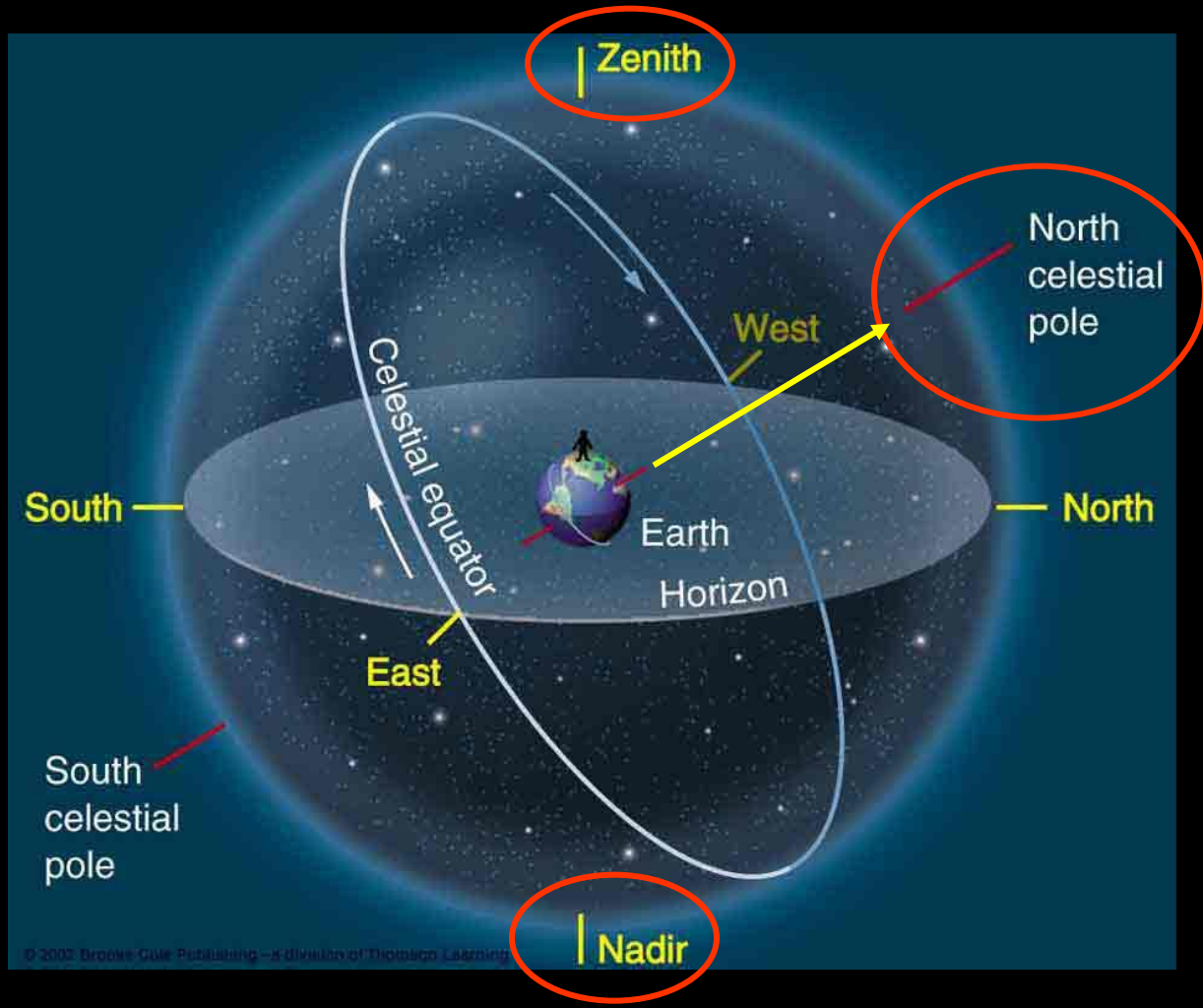
Like a salad bowl over your head!



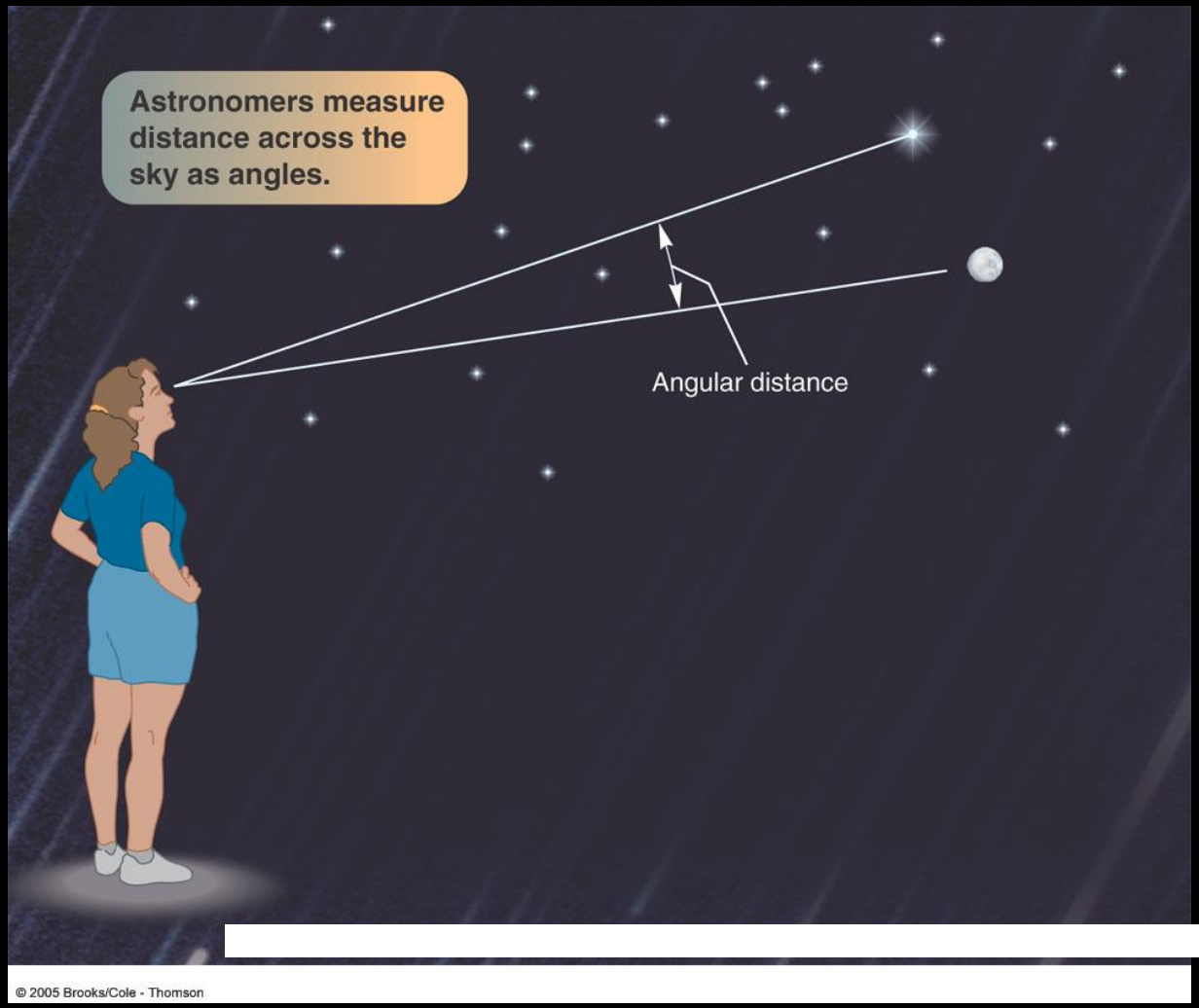
The Celestial Sphere

Zenith = Point on the celestial sphere directly overhead

Nadir = Point on the c.s. directly underneath (not visible!)



Distances on the Celestial Sphere



degrees (^{o}):

Full circle = 360^o

arc minutes (‘):

$1^o = 60'$

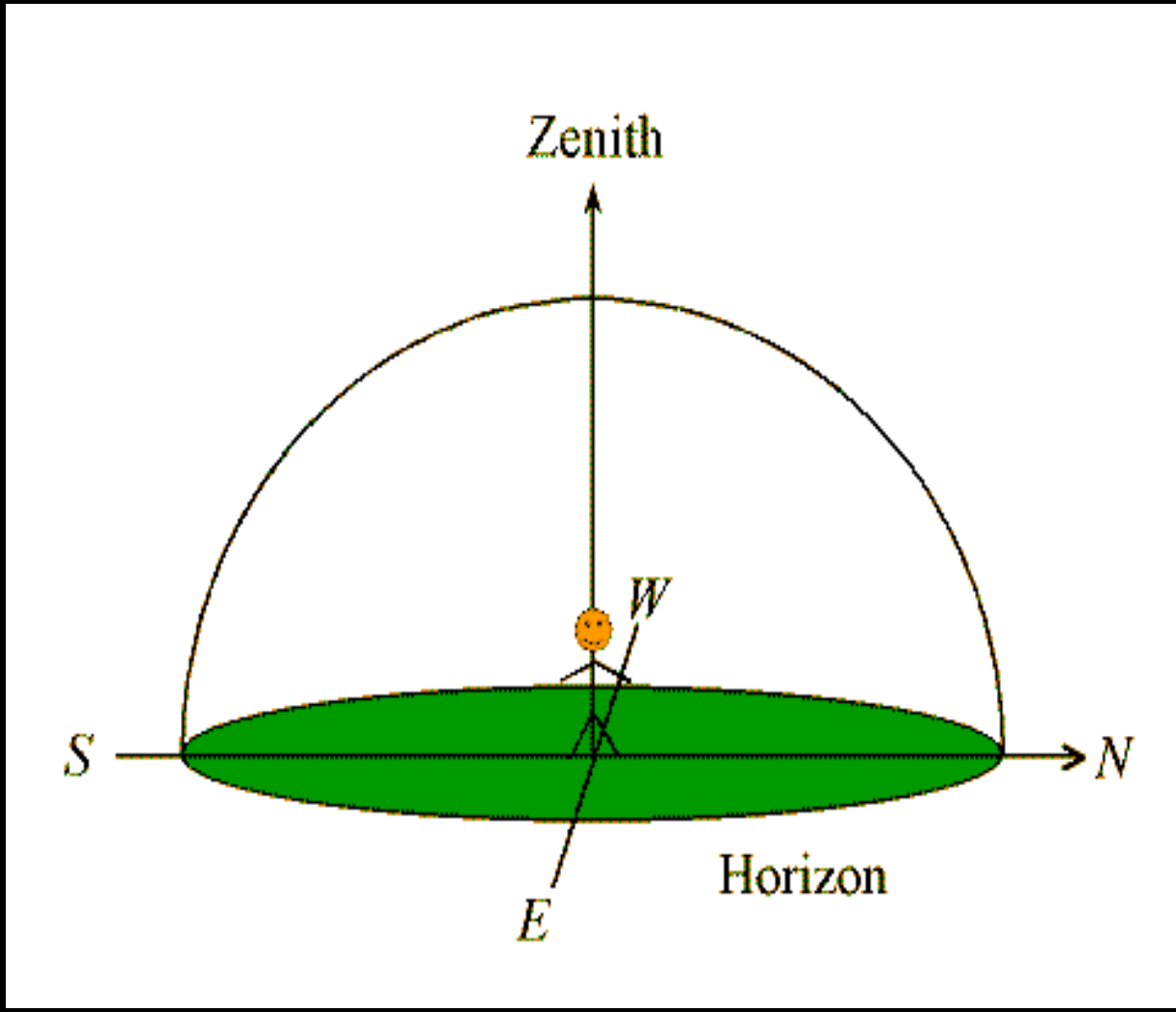
arc seconds (“):

$1' = 60''$

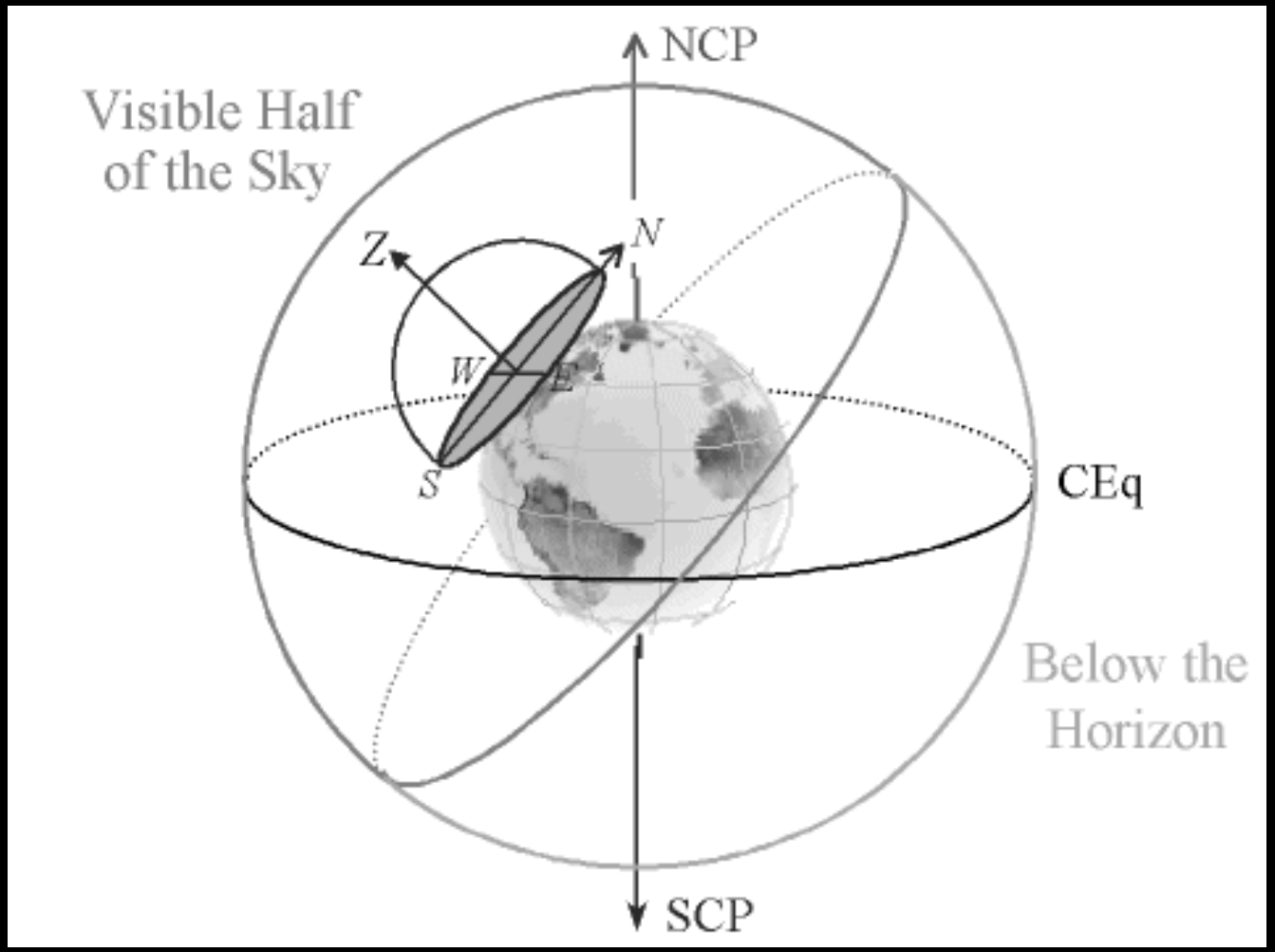
What's up for you?

Observer Coordinates

- **Horizon** – the plane you stand on
- **Zenith** – the point right above you
- **Meridian** – the line from North to Zenith to south



…depends where you are!



- Your **<u>local sky</u>** –
  your view depends on your location on earth