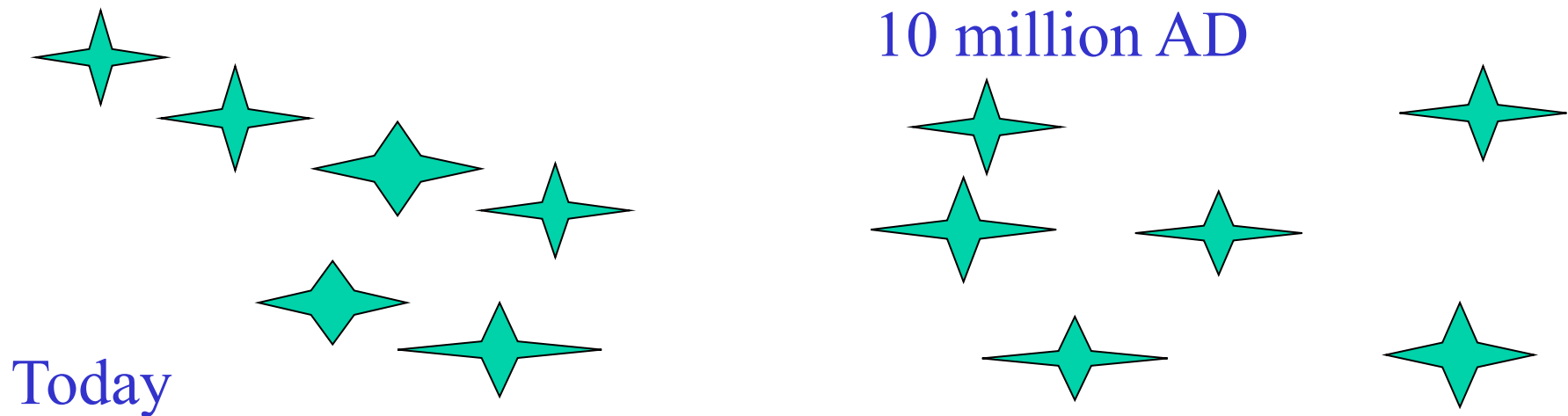


# Stars and Planets

- Stars are “fixed” relative to each other. They produce their own light which is independent of Sun’s location (thus indicating they are very far away - the Greeks understood this)
- Planets have complicated (but predictable) orbits when viewed from the Earth. Wanderers. Brightness does depend on Sun. Small numbers of such objects (5 planets visible to unaided eye)

# Constellations

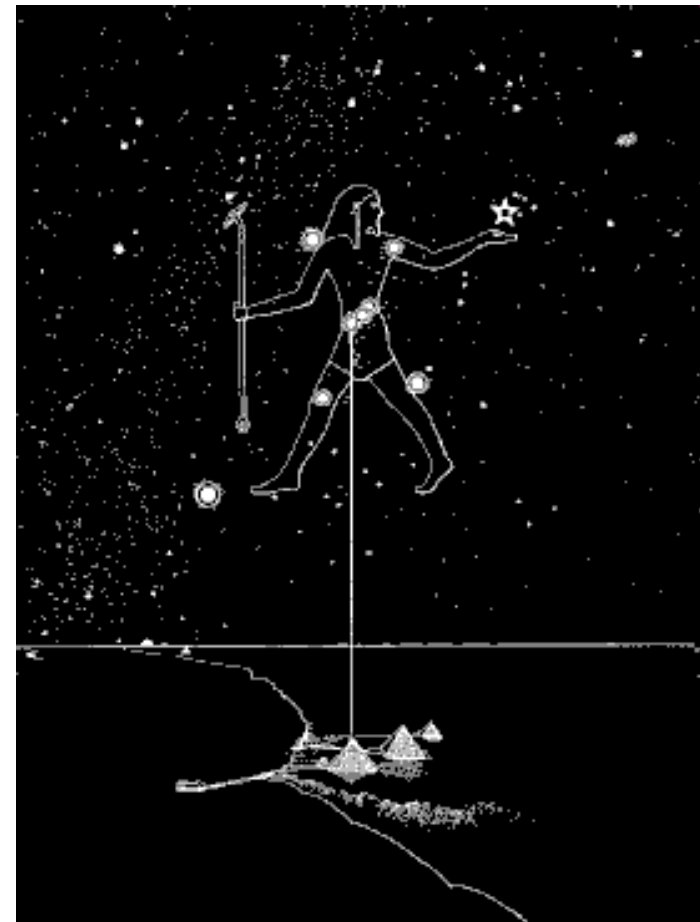
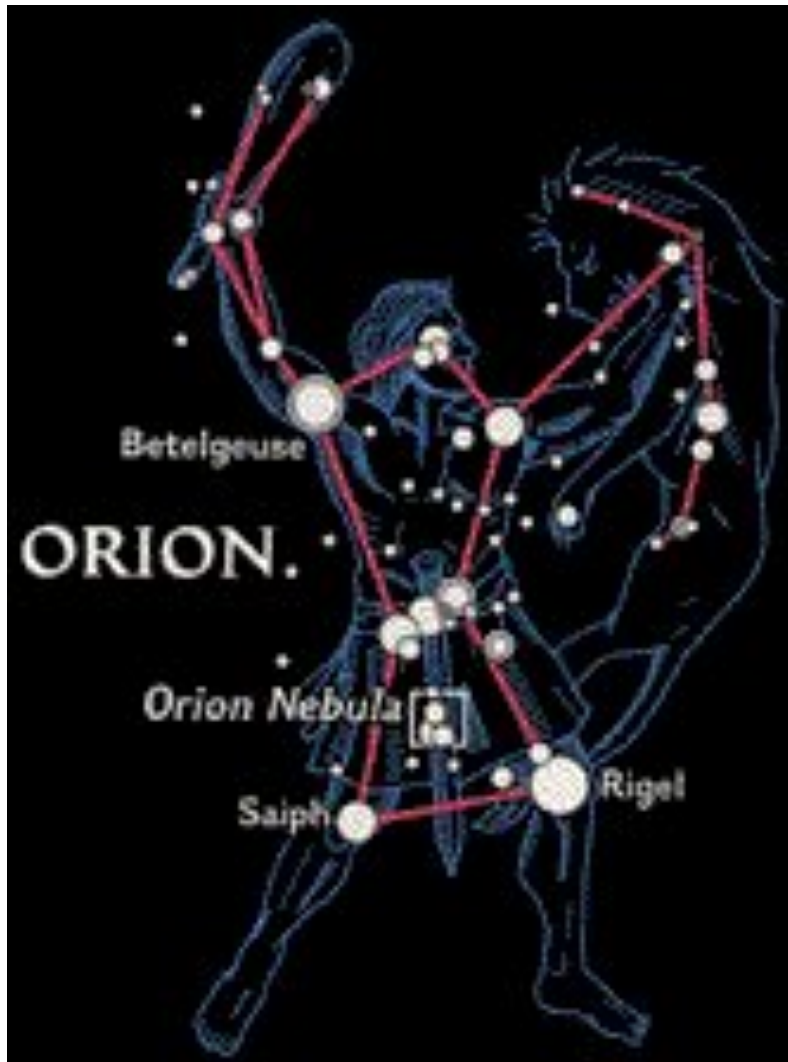
- Stars which are “close” to each other (in angle) form patterns called constellations
- Unchanging in 10,000 year timescales but position in sky varies with season
- Geological timescales → stars move



# Constellations - Orion

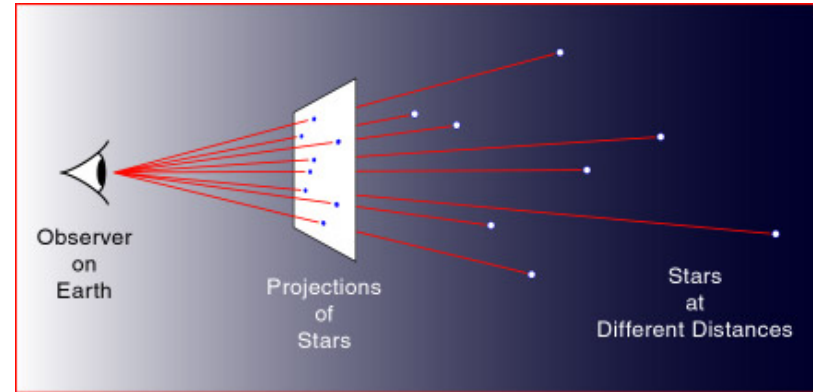
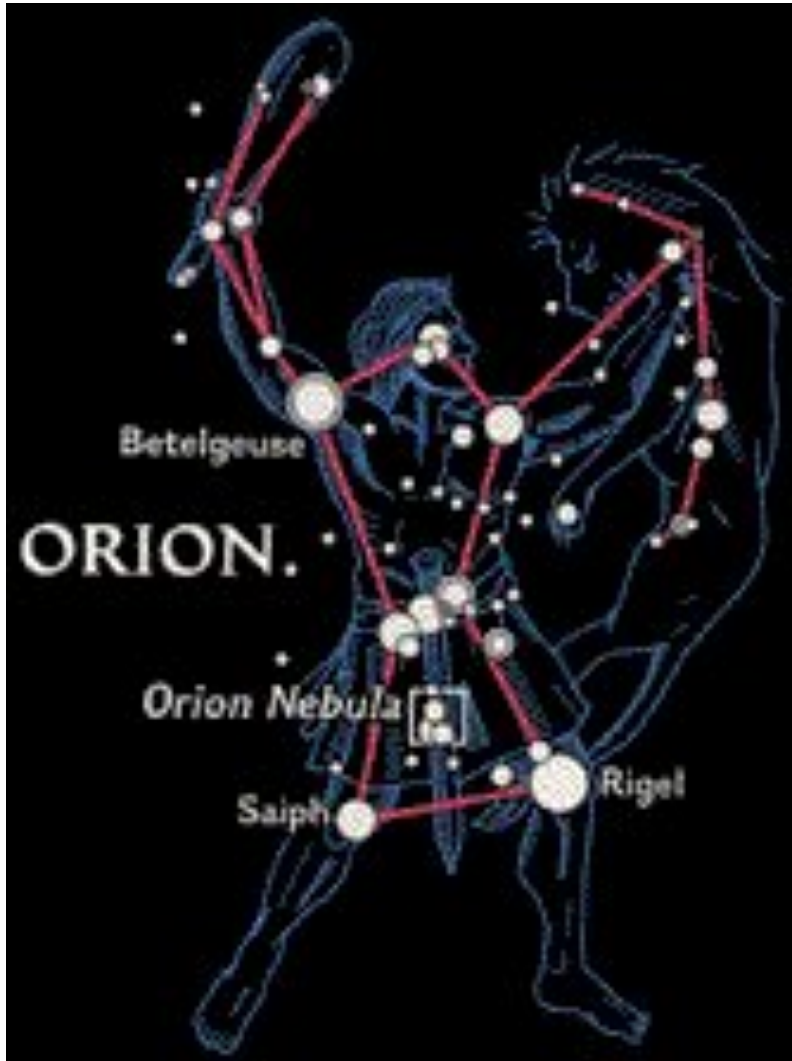


# Orion (Greek) or Osiris (Egypt)



pyramids: in same pattern?

# Orion – Star Distances



Stars are at different distances

Rigel 773 Light Years(LY)

Betelgeuse 427 LY

Nebula 1300 LY

Saiph 720 LY

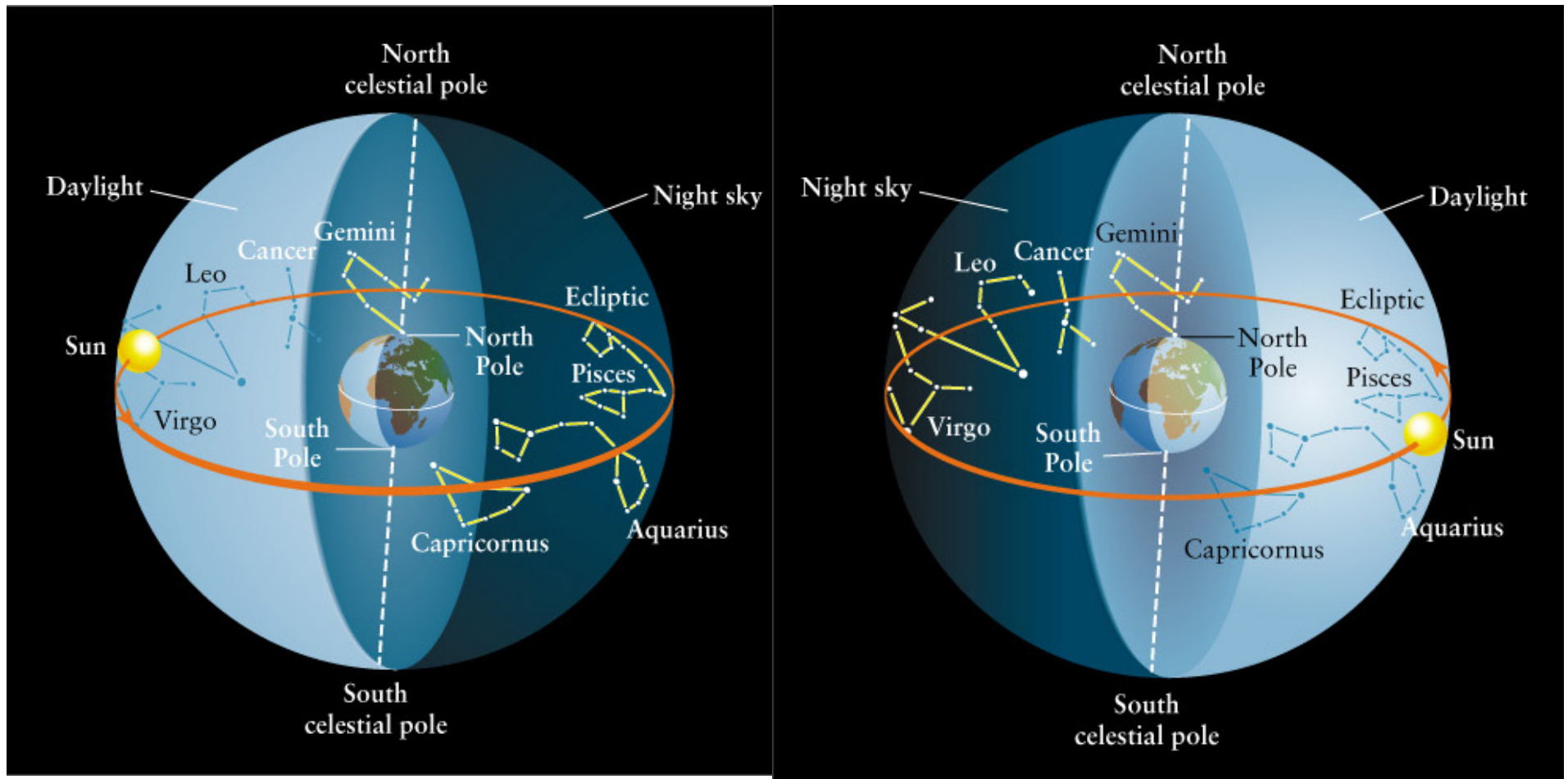
Ballatrix (rt shoulder) 243 LY

# Different seasons, different constellations

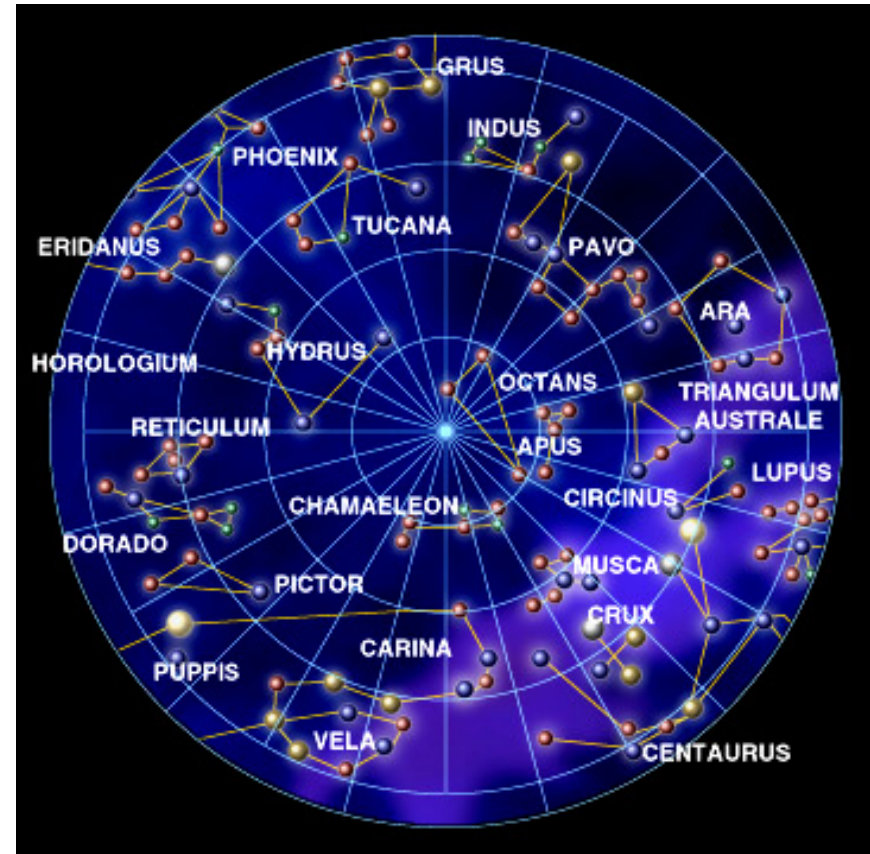
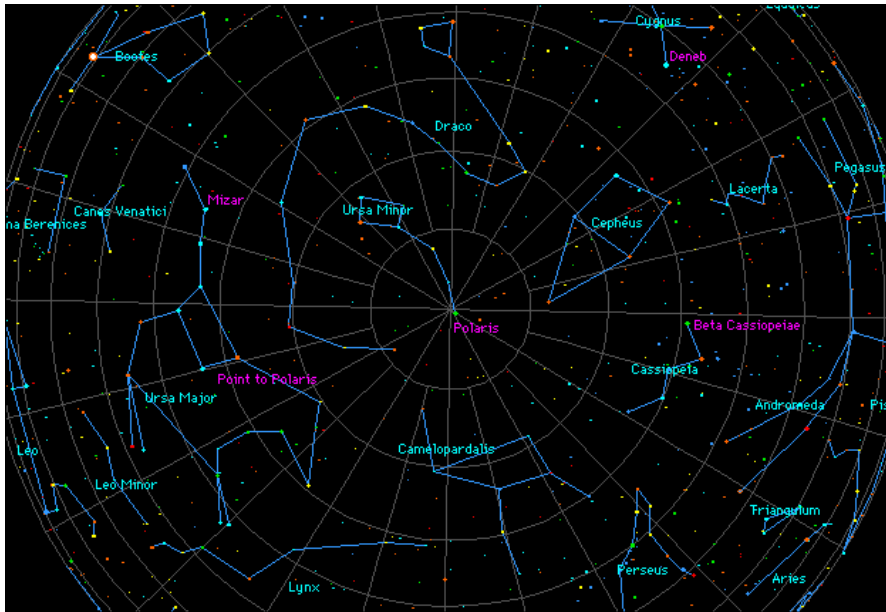




# Different seasons, different constellations



# Different hemispheres, different constellations



Sky seen at North pole (up) and South pole (right)



# Polaris - The North Star

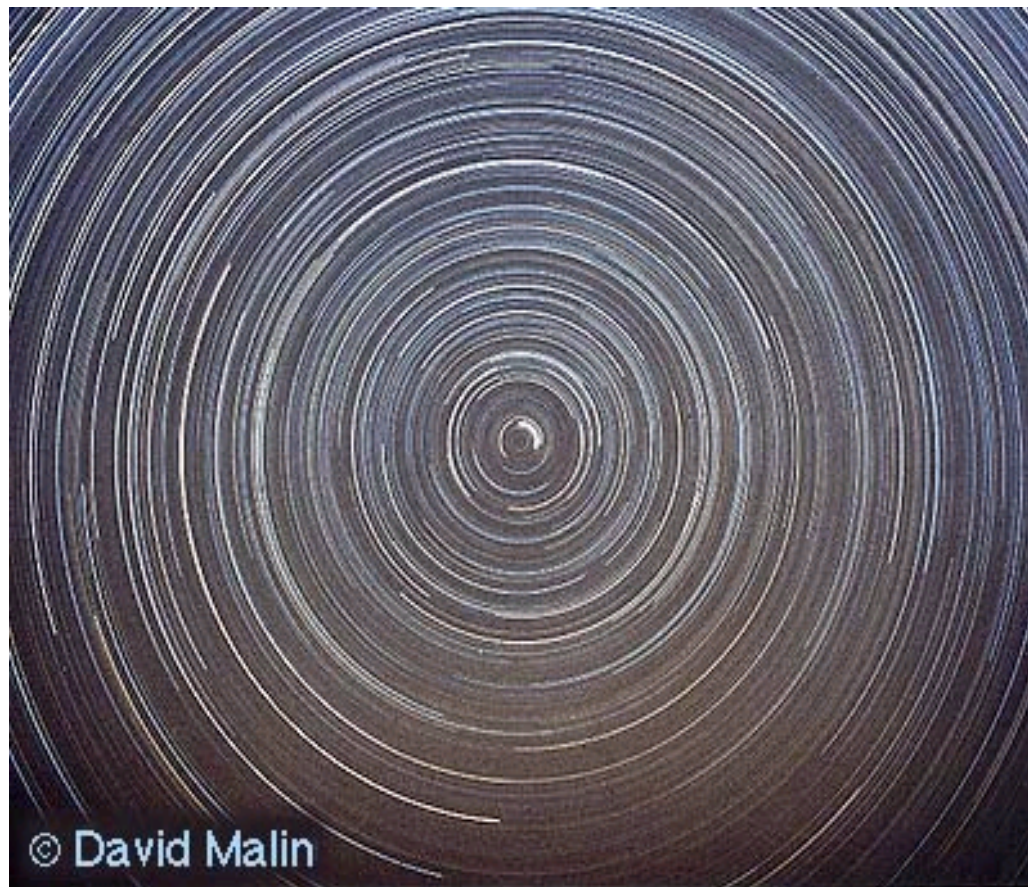
- Polaris is almost directly overhead at the North Pole.
- Polaris is about halfway up from the north horizon in DeKalb.
- Polaris is at the north horizon at the Equator.
- Polaris is not visible south of the Equator.
- Polaris doesn't "move" due to the Earth's rotation.
- No equivalent "South Star"

# Rising and Setting Stars

- Other stars “move” in circles about Polaris.
- It takes 1 day to complete the circle.
- The rising and setting time of a star changes with the seasons.
- Stars are directly overhead (*zenith*) 2 hours earlier each month.

# Star trails in the northern sky

- As the earth spins on its axis, the sky seems to rotate around us. This motion produces the concentric trails traced by the stars in this time exposure of the night sky. The north celestial pole (NCP) is at the center.



# Star trails in the northern sky

- The very short bright trail near the NCP was made by Polaris, commonly known as the North Star.
- So this is proof that Polaris is not *exactly* due north.





# Star trails in the southern sky

- While the bright star Polaris lies conveniently close to the North Celestial Pole, no bright star similarly marks the pole in the South.
- Still, the South Celestial Pole is easily identified in the picture as the point in the sky at the center of all the star trail arcs.





# Star trails at mid-latitudes

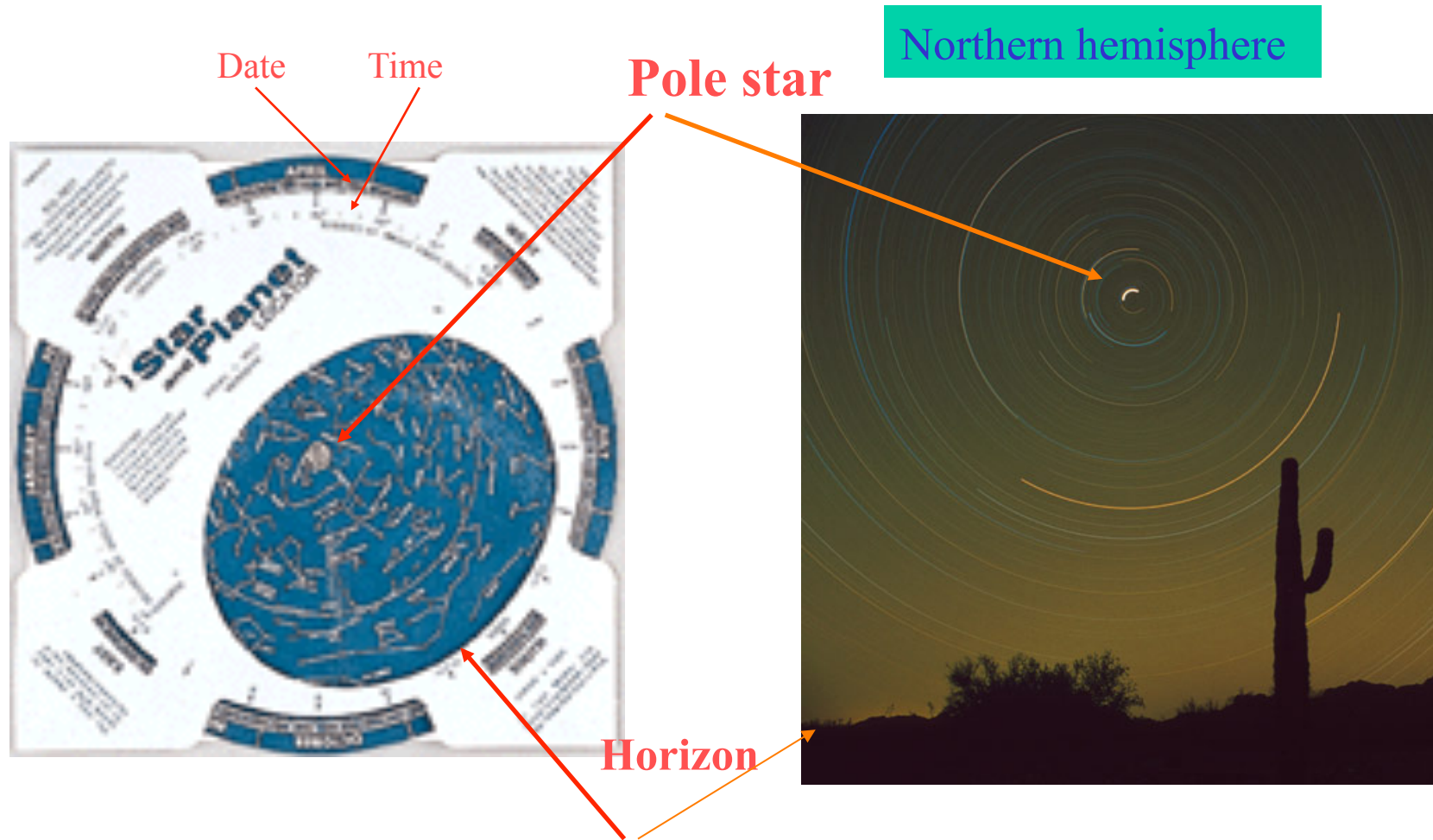
- Star trails from a lower latitude (trails set beneath the horizon)



# Compare rising and setting at high and low latitudes



# Star and Planet Locator (aka Planisphere or Star Wheel)

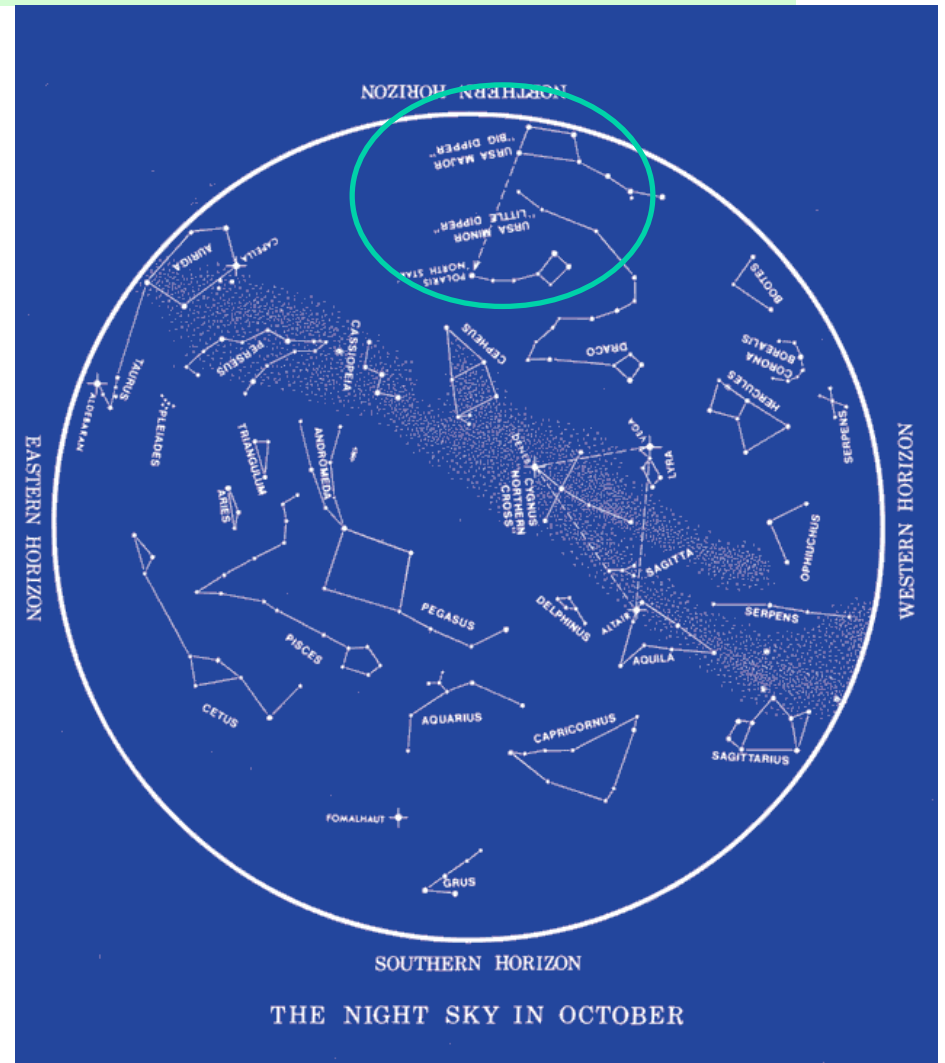
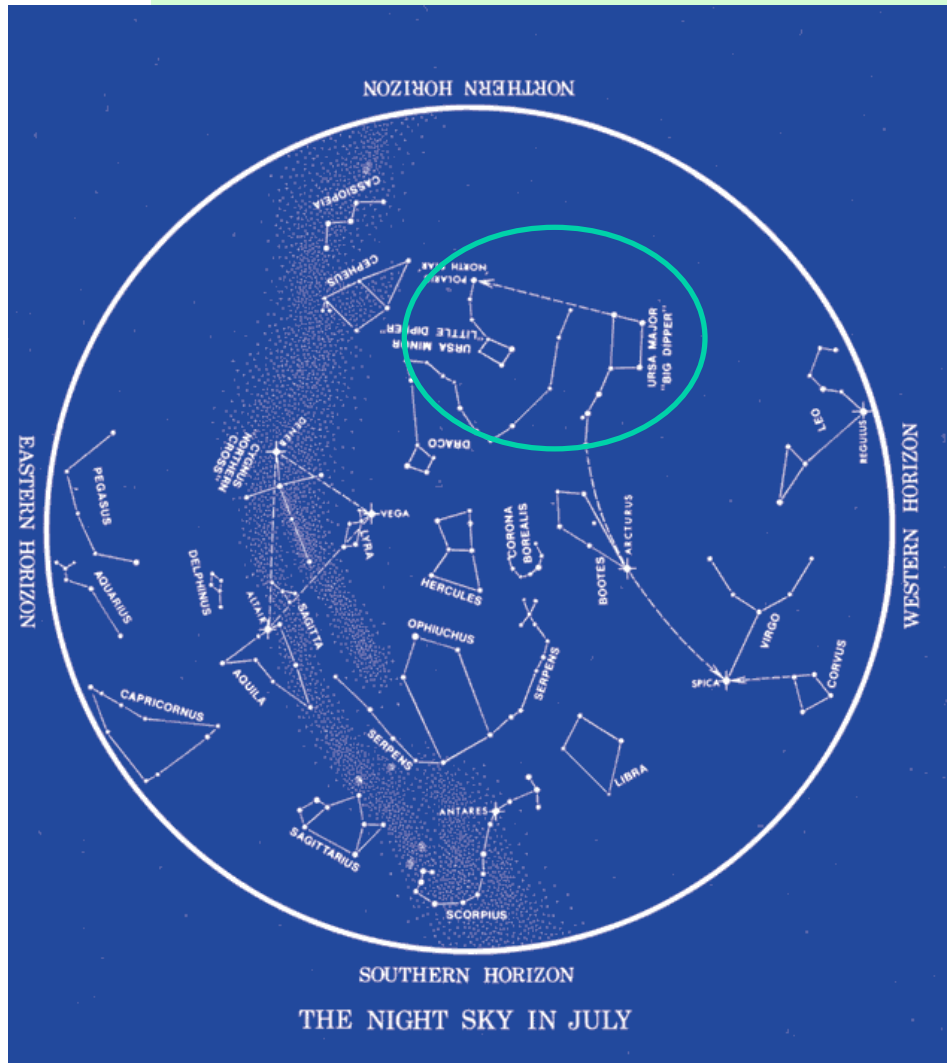


# Star Wheel

- Stars “move” East to West over the course of one Night (in circle about the North Star)
- Stars “move” East to West by 2 hours per month and “return” to the same position after one Year
- It’s just caused by Earth’s daily spin and yearly orbit about the Sun

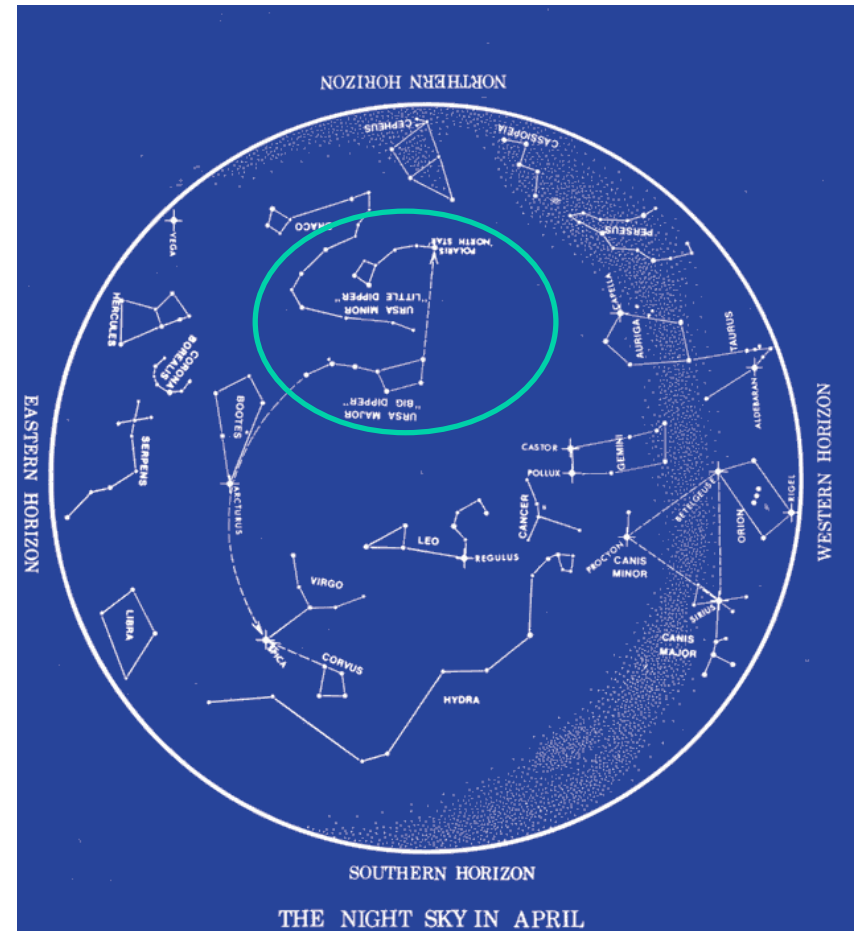
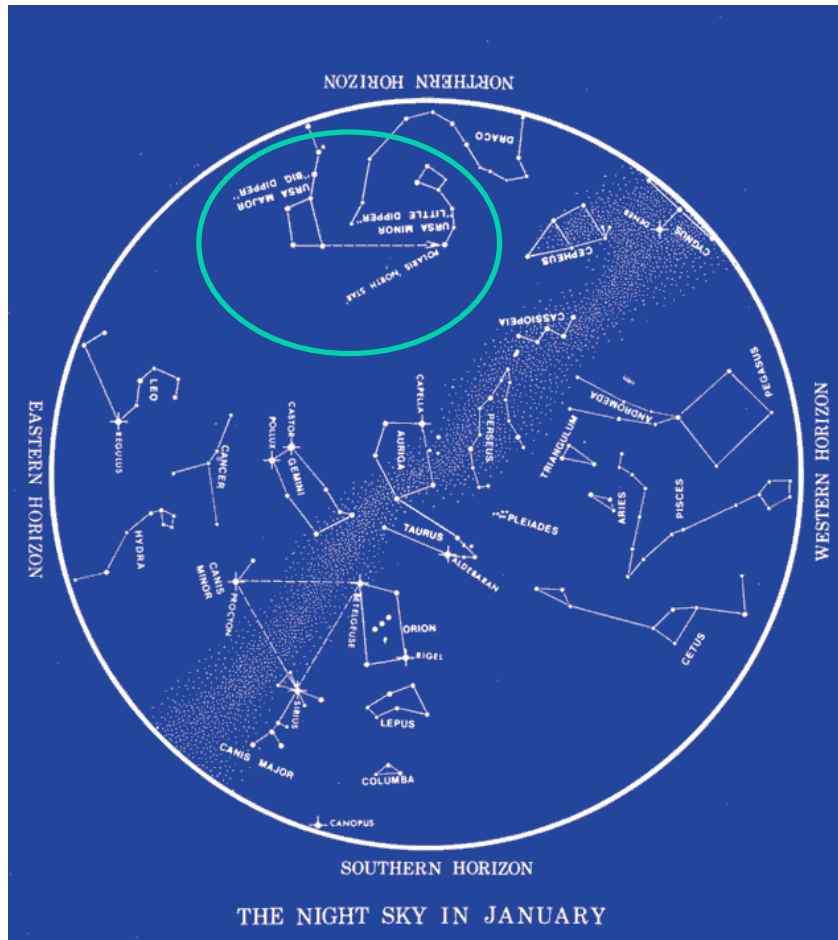


# July and October – near Sunset





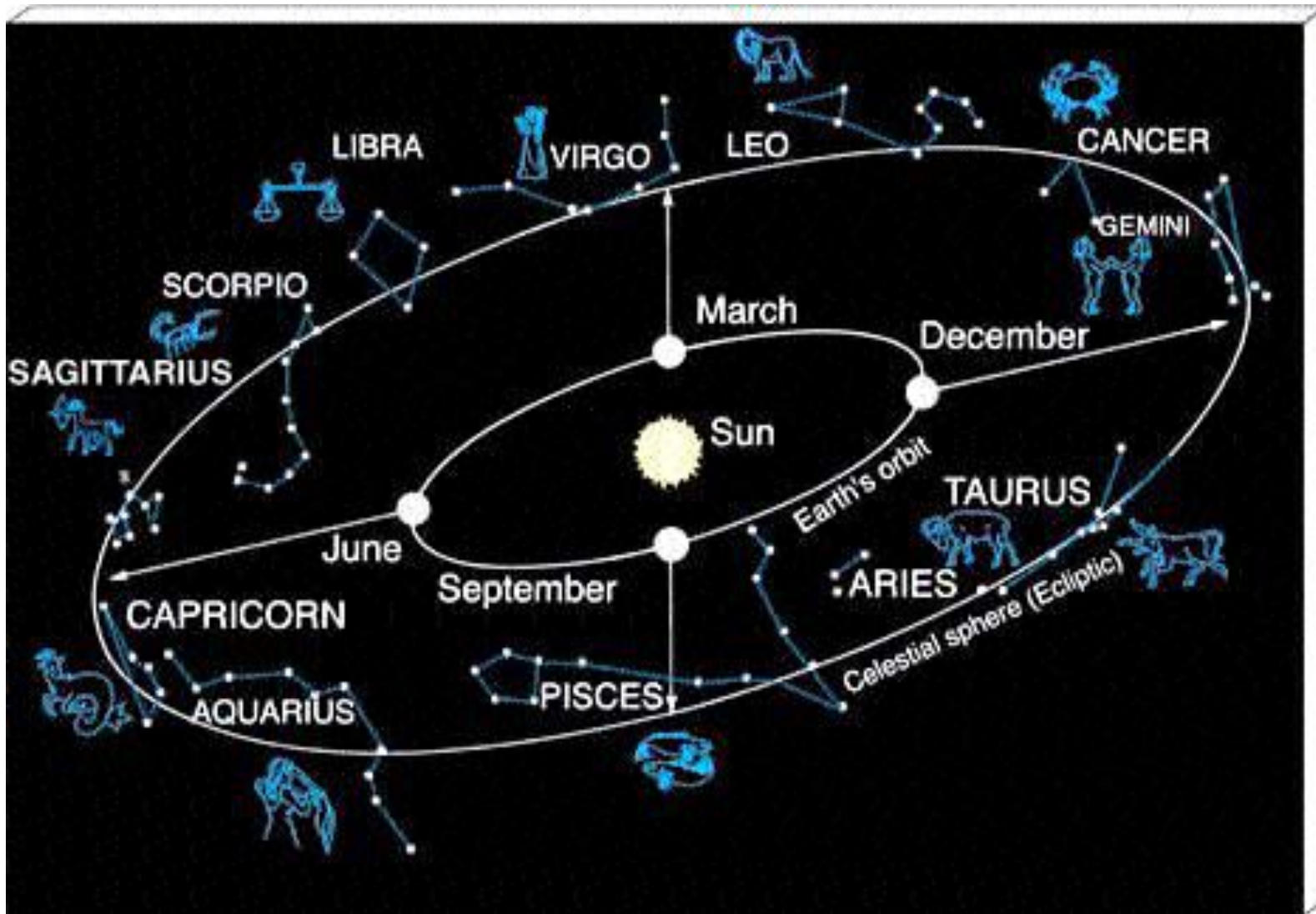
# January and April – near Sunset



# Zodiac Constellations (not on tests)

- a line between the Earth and the Sun traces out a “circle” in the sky
- called the ecliptic
- the 12-13 constellations along the circle are the “signs” of the Zodiac
- changes with the seasons

# Zodiac Constellations (not on tests)



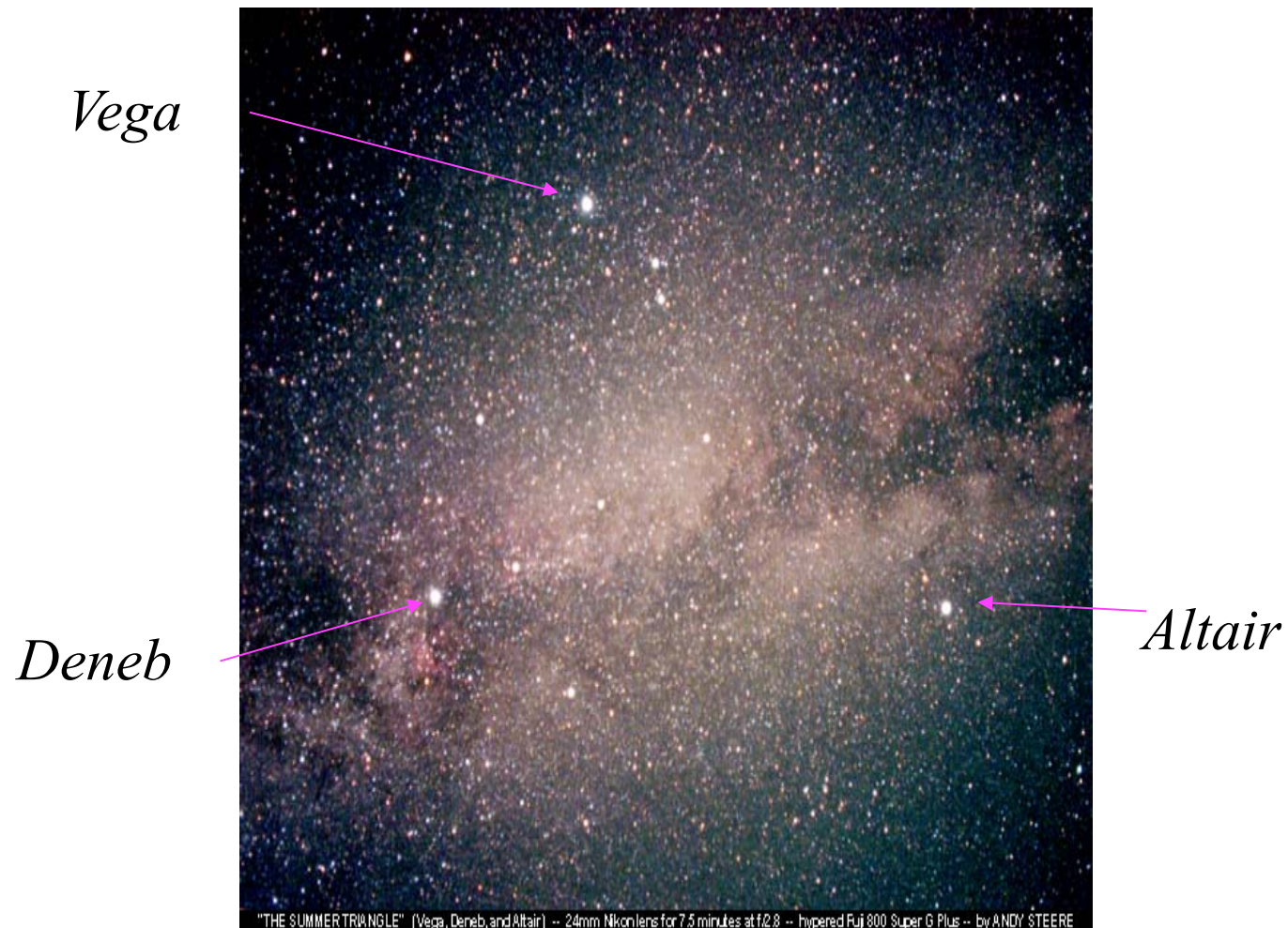


## Zodiac Constellations

“modern” may add  
Ophiuchus between  
Sagittarius and  
Scorpius

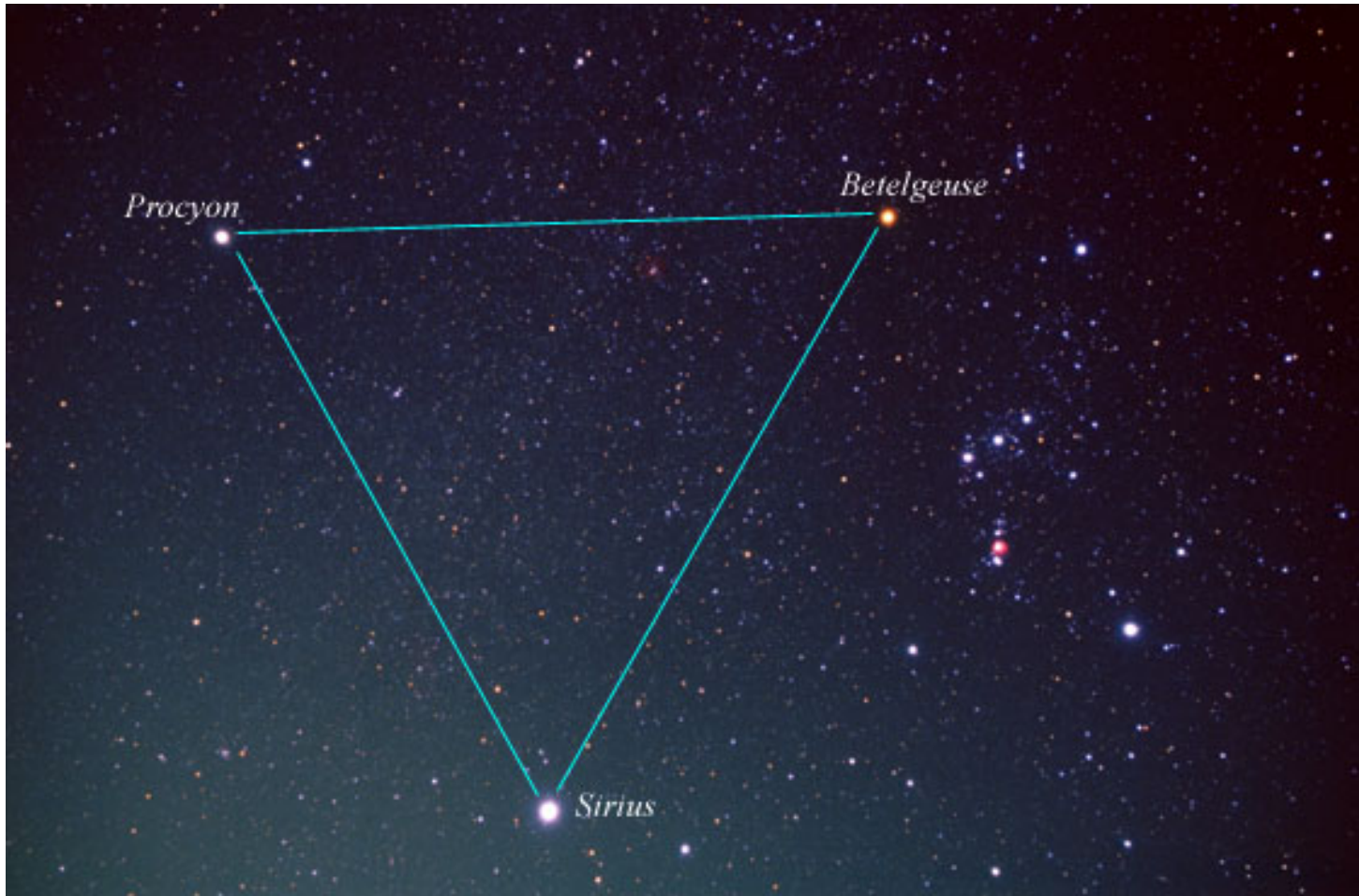


# Summer triangle

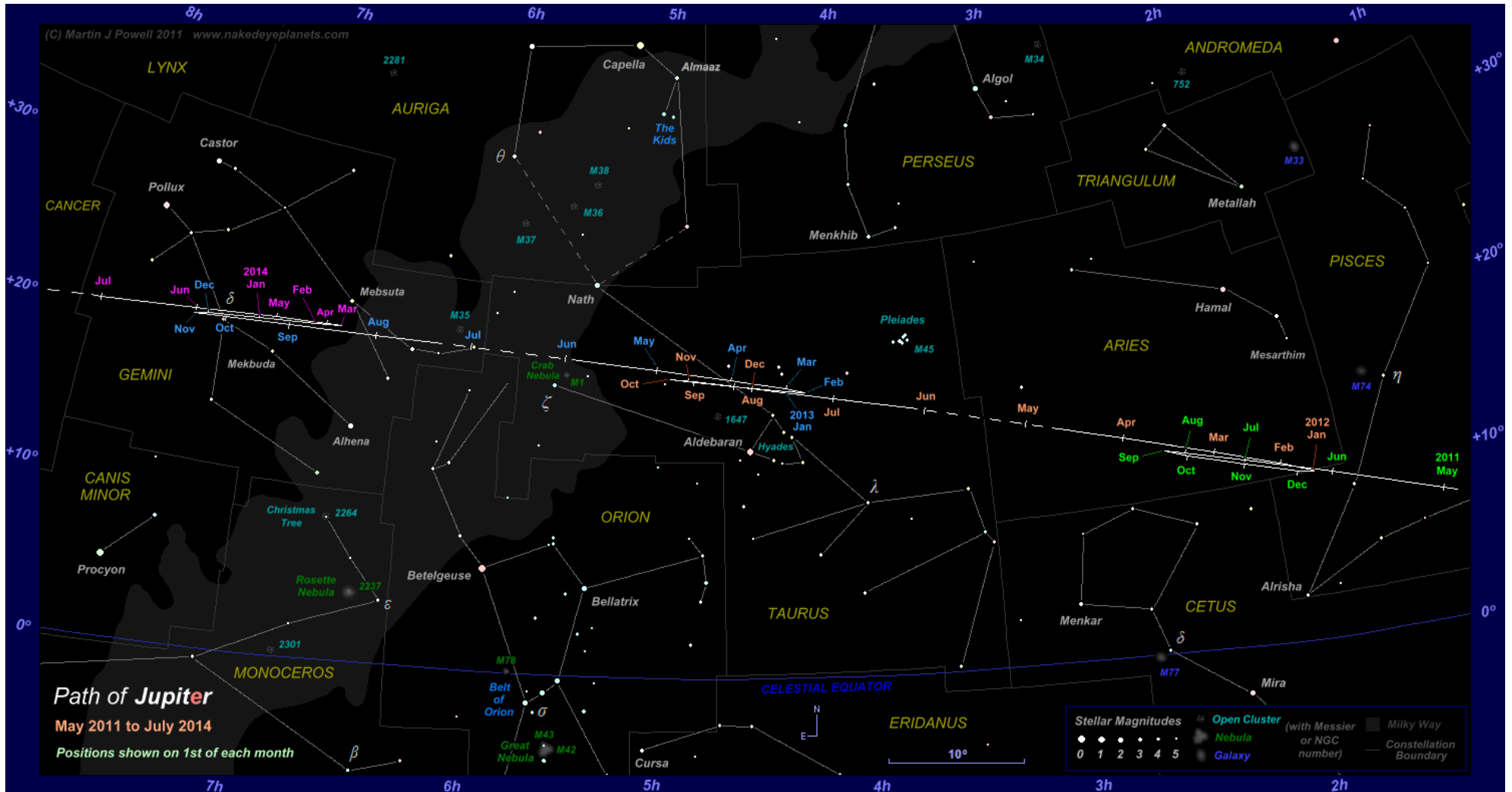




# Winter triangle



# Planets – Example Jupiter – 2011-2014



# What to Remember – North/South

- Polaris (the North Star) doesn't “move” due to the Earth's rotation.
- The angle of Polaris to the north horizon gives the observer's latitude

<u>Polaris Location</u>	<u>Latitude</u>
directly overhead	$90^{\circ}$ N (NP)
about halfway up	$42^{\circ}$ N (DK)
on horizon	$0^{\circ}$ (Equator)
below horizon	Southern hemisphere

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- Other stars “move” in circles about Polaris. 1 day to complete circle. Angle between star and Polaris gives declination (N-S location)

# What to Remember – East/West

- What time during the day a star rises, is overhead, and sets changes with the seasons
- look up on Star Chart (right ascension is the East-West location)
- Changes 2 hours/month
- Only on the Equator can all stars be viewed from a single location → Hawaii or northern Chile a good place for telescopes (all of northern or southern hemisphere plus a little bit of the other)



# Right Ascension and Declination

