

Galaxy Song!!!

From Monty Python's "Meaning of Life"

<http://www.youtube.com/watch?v=vly76M-4txo>

(PG-13) <https://>

www.youtube.com/watch?v=buqtdpuZxvk

Where are we?

[http://www.youtube.com/watch?
v=17jymDn0W6U](http://www.youtube.com/watch?v=17jymDn0W6U)



The Night Sky from Earth – Daily Motion

Lecture 1 Review (Where are we?)

Universe

approx. size: 10^{21} km

Local Supercluster

approx. size: 3×10^{18} km

Local Group

approx. size: 10^{18} km

Milky Way Galaxy

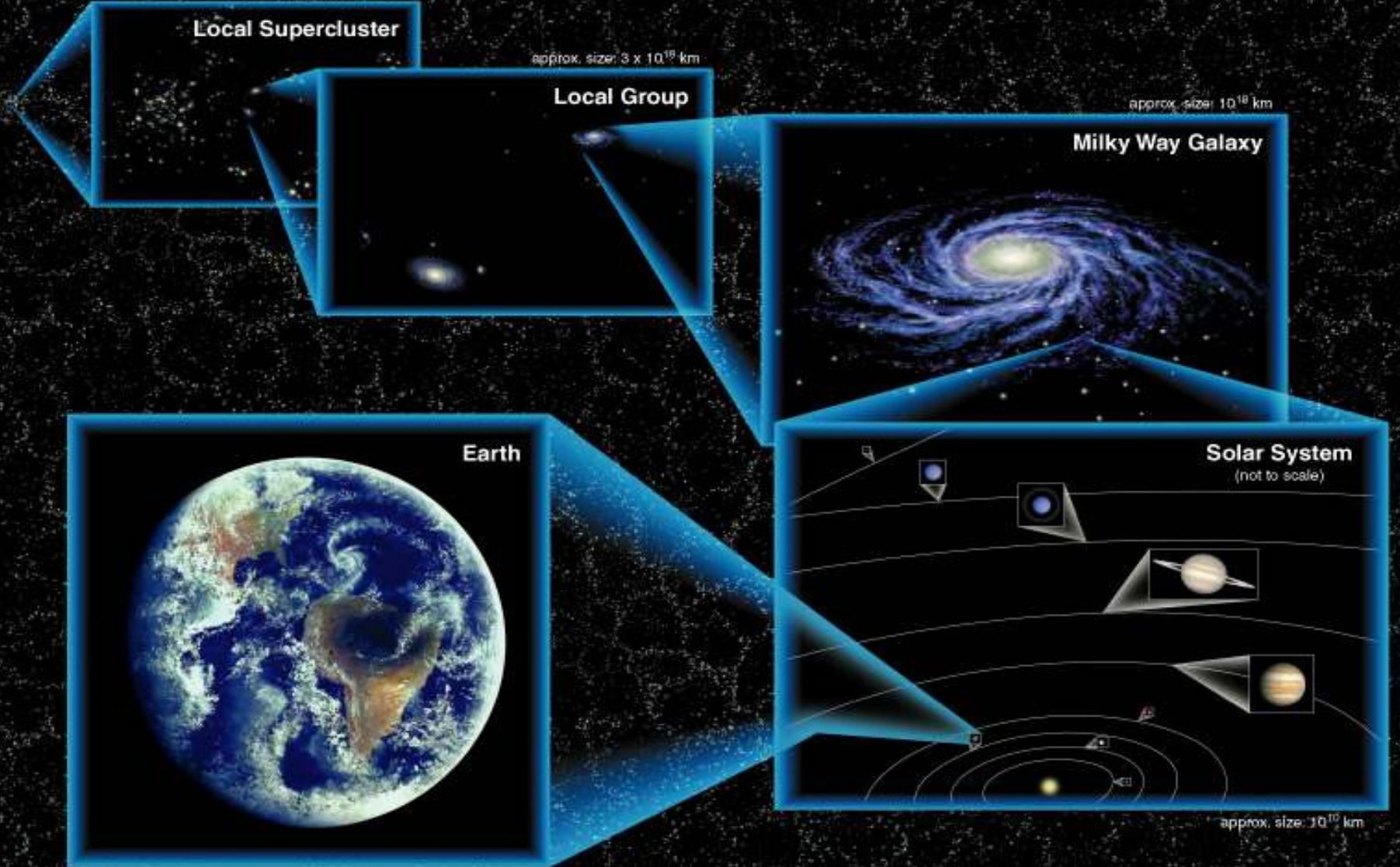
Earth

Solar System

(not to scale)

approx. size: 10^{10} km

approx. size: 10^4 km



The Night Sky

Goals for Today:

- 1) What does the Universe look like from Earth?
- 2) What are constellations and asterisms?
- 3) What is the Celestial Sphere?
- 4) How do stars move (daily)?

Words to know: Asterism, celestial north and south poles, horizon, zenith, altitude, circumpolar

What does the Universe look like from Earth?

With the naked eye, we can see more than 2,000 stars. We can also see the Milky Way, most of the planets, many comets, a whole bunch of satellites, and some galaxies.



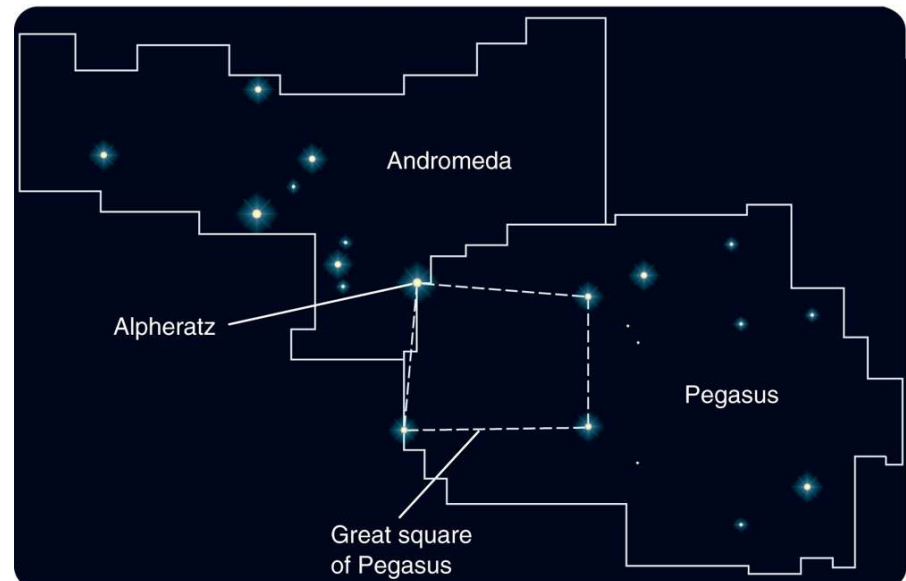
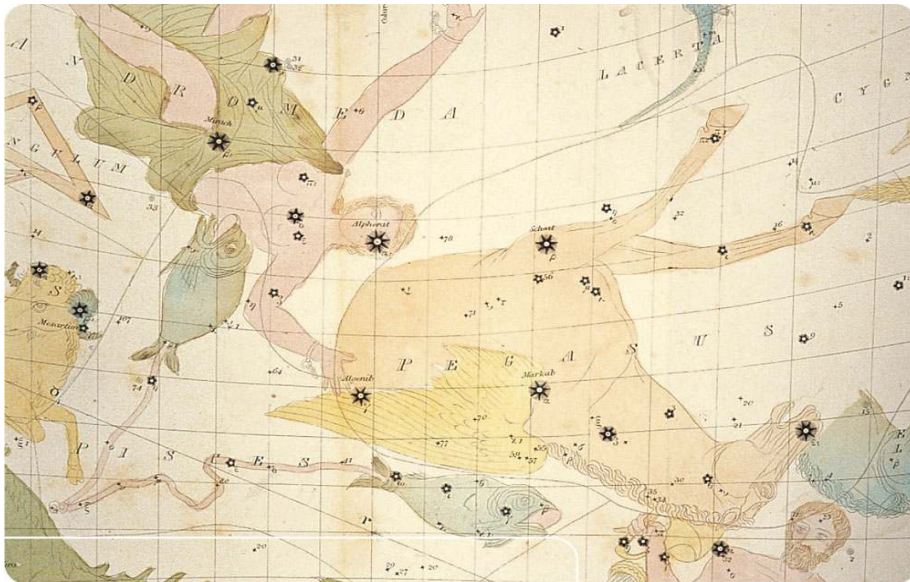
Constellations - Modern Definition

A **constellation** is a loose grouping of stars that appear close together in the night sky

In ancient times, they included only bright stars.

Today, there are an agreed-upon set of 88 constellations that together divide the entire sky

- Like a country boundary, “the star's address”



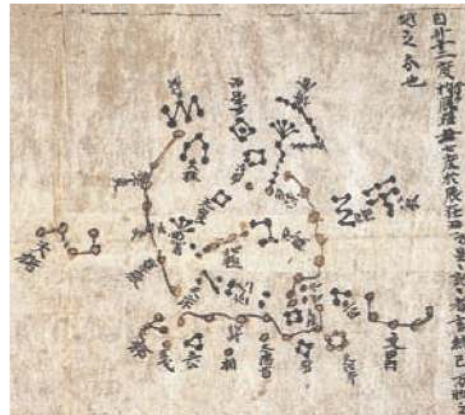
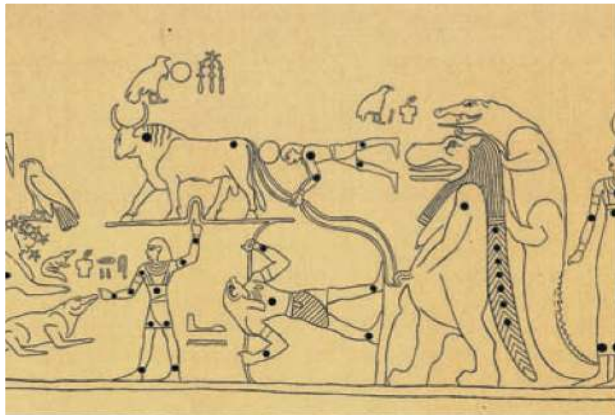
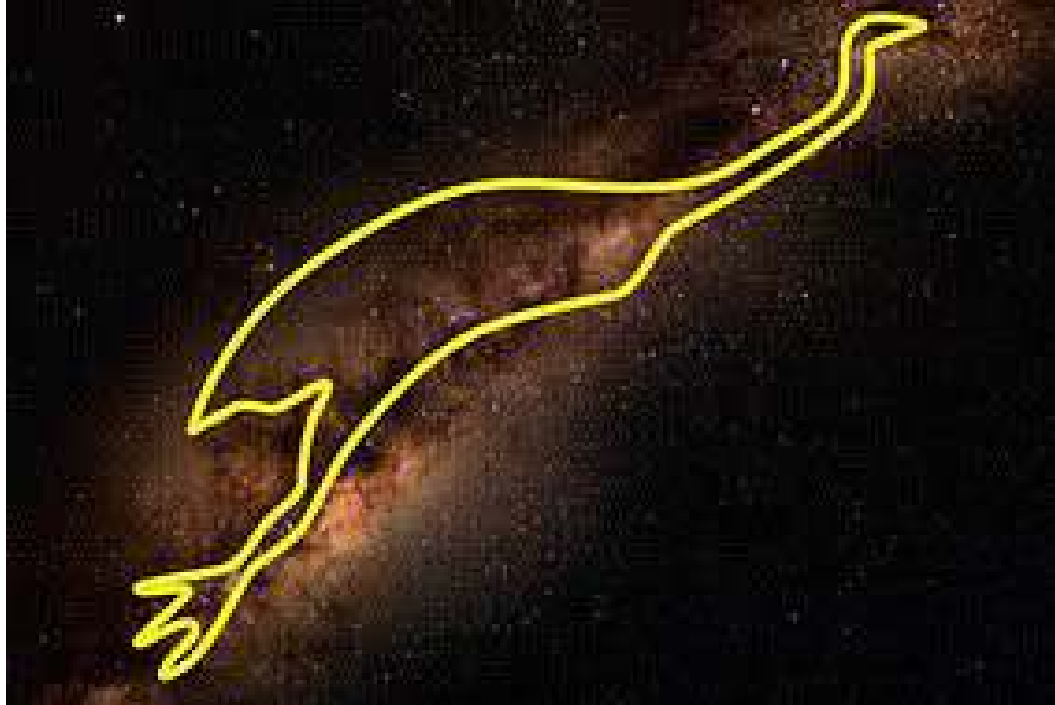
Constellations Culturally Defined

Constellations have been defined by many different cultures

Orion



Ancient Constellations



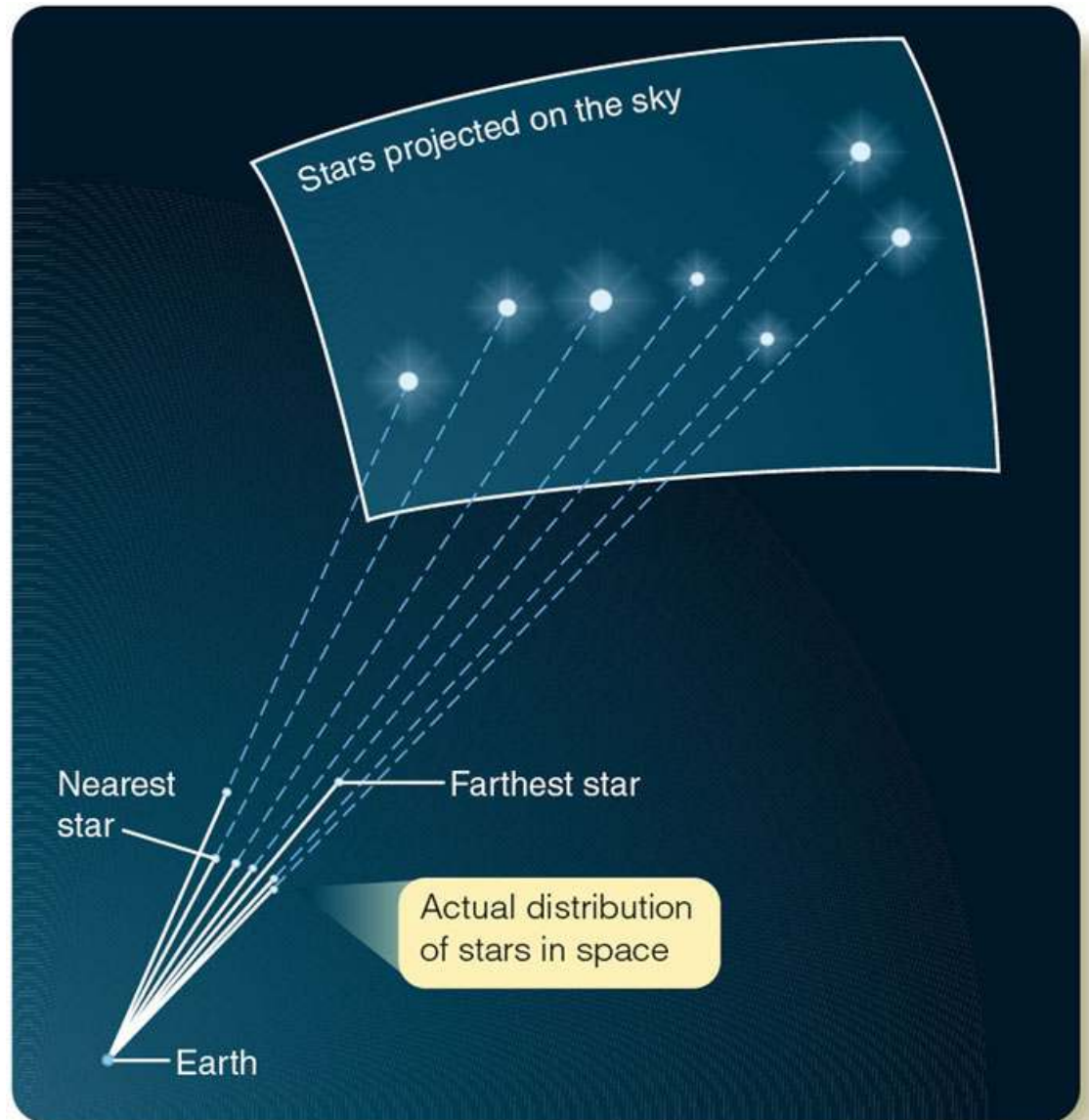
Asterisms

An **asterism** is a less formally defined grouping of stars, that may be a part of one or more constellations; for example, the Big Dipper in Ursa Major



Constellations Are Not Real Groups

The stars in constellations and asterisms are not necessarily physically close to each other.



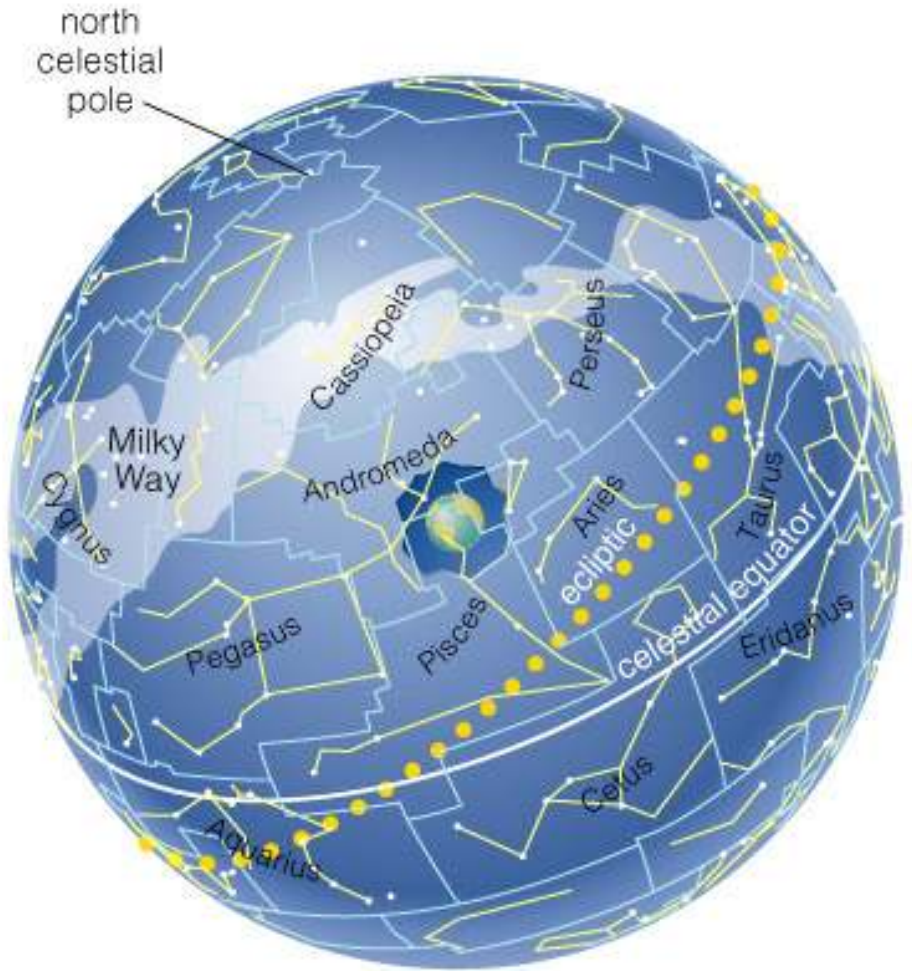
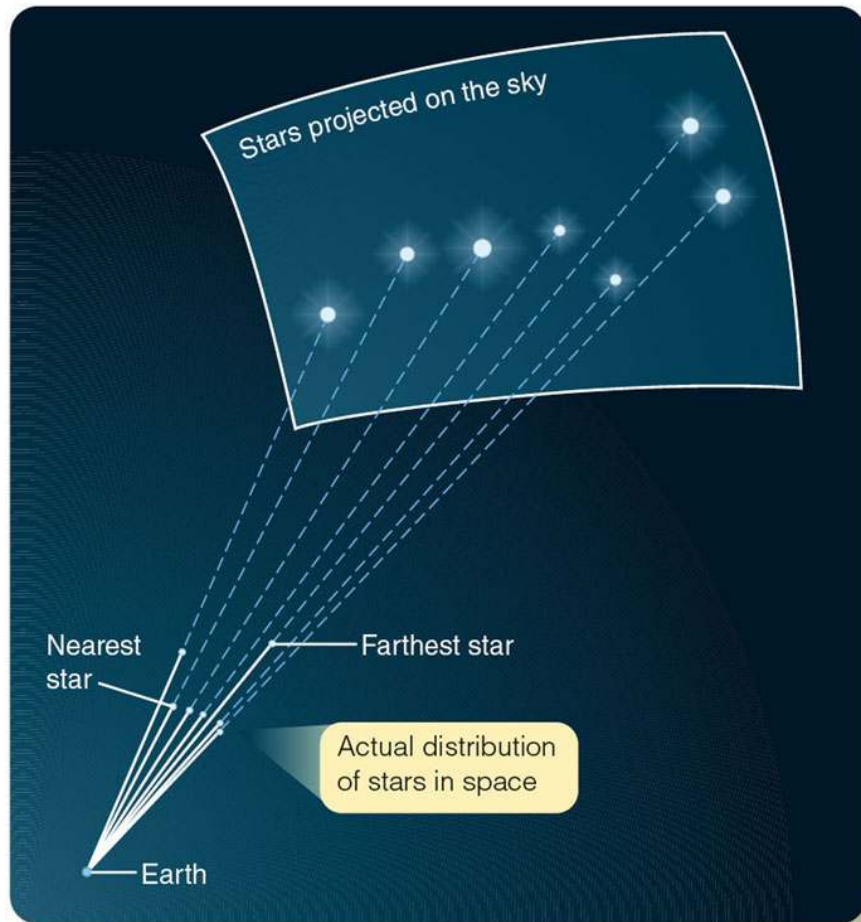
The Celestial Sphere



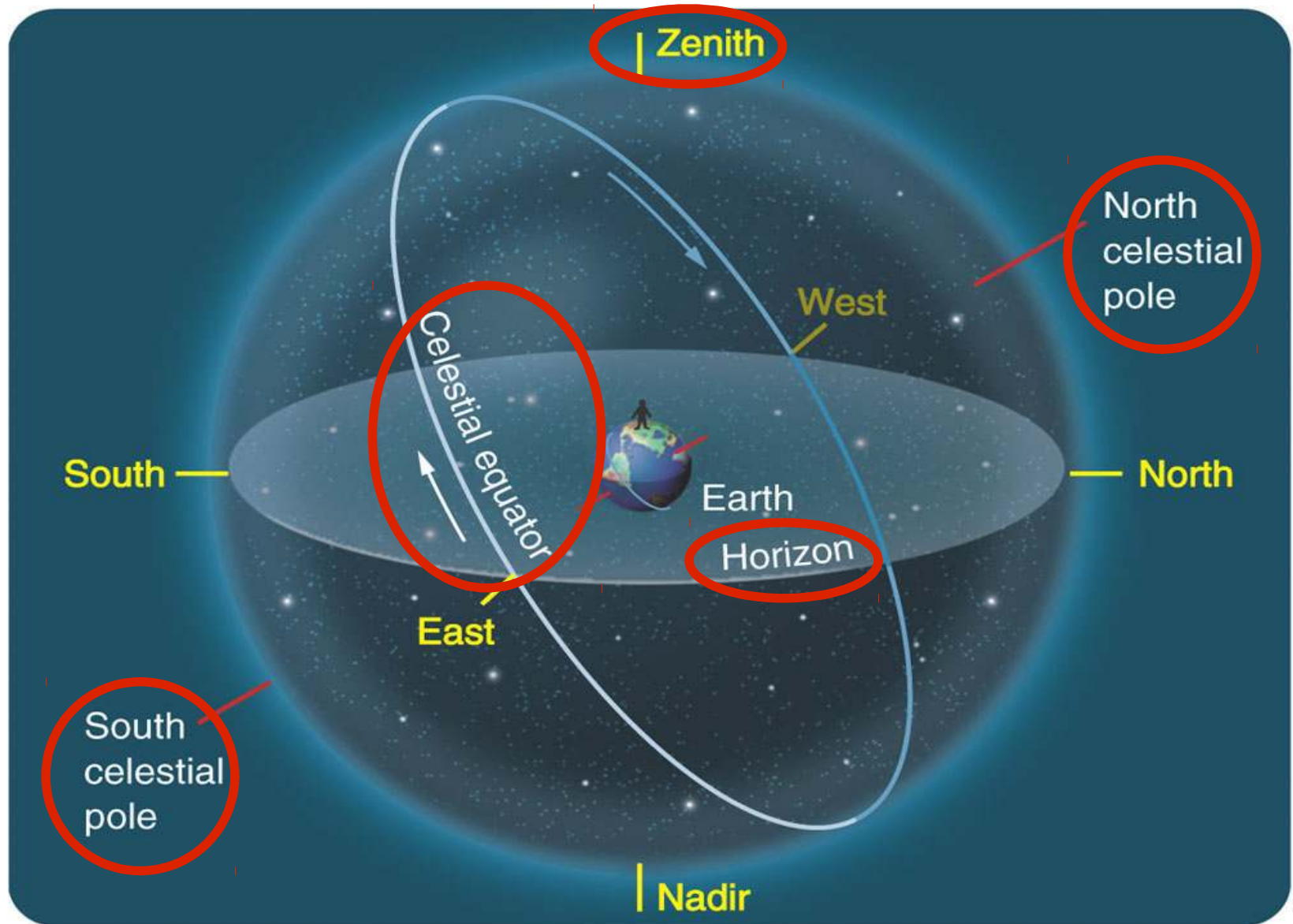
The **celestial sphere** is a *model* of the sky that helps us visualize the location and motion of stars.

The Celestial Sphere is not Real!

It is a model - the stars are not literally on a sphere.



Celestial Sphere from Morgantown



Celestial Sphere Definitions

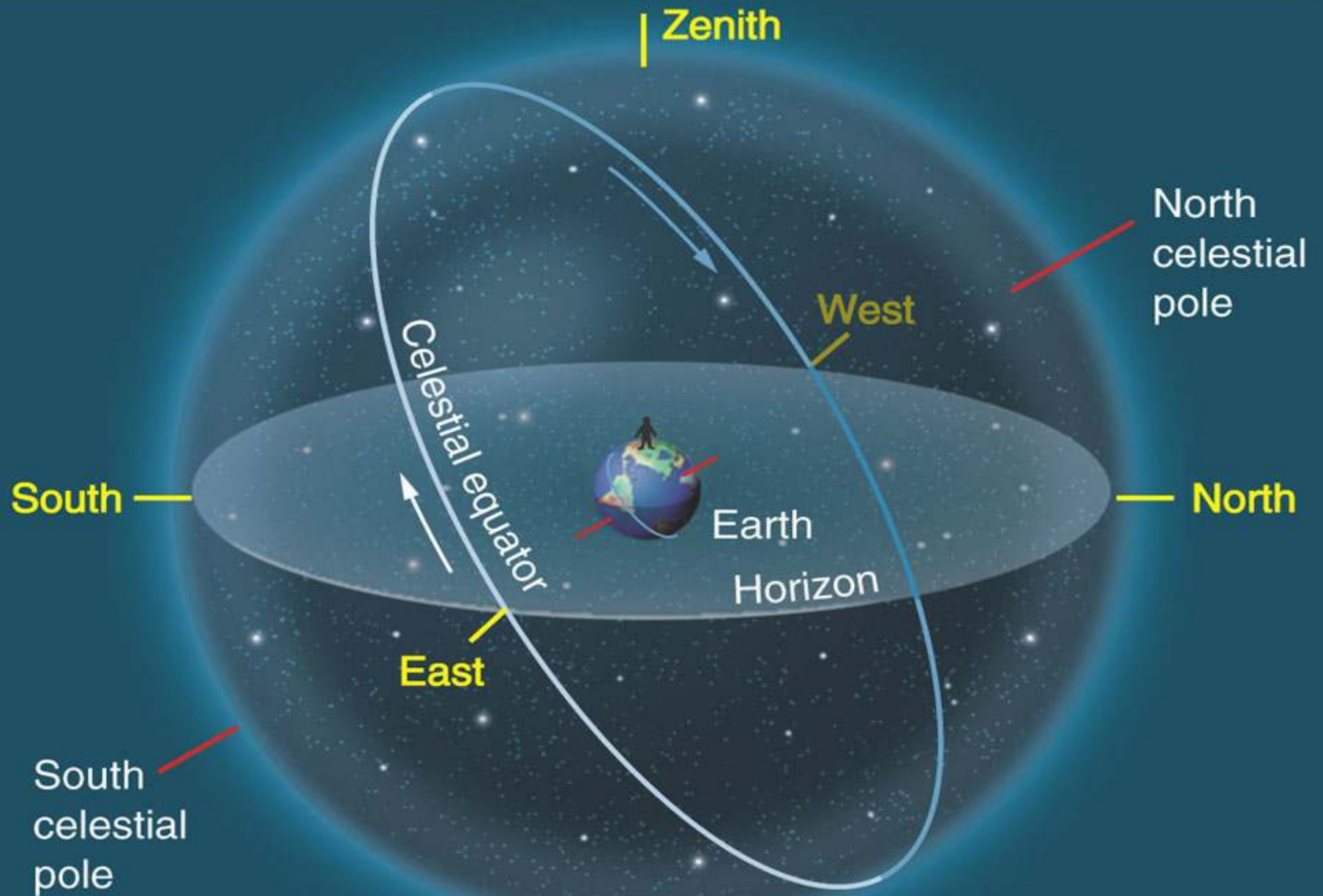
Celestial equator: the projection of the Earth's equator onto the sphere.

Horizon: the limit to what can be seen from a particular vantage point

North/South Celestial Poles: the projection of the North/South Poles onto the Celestial Sphere

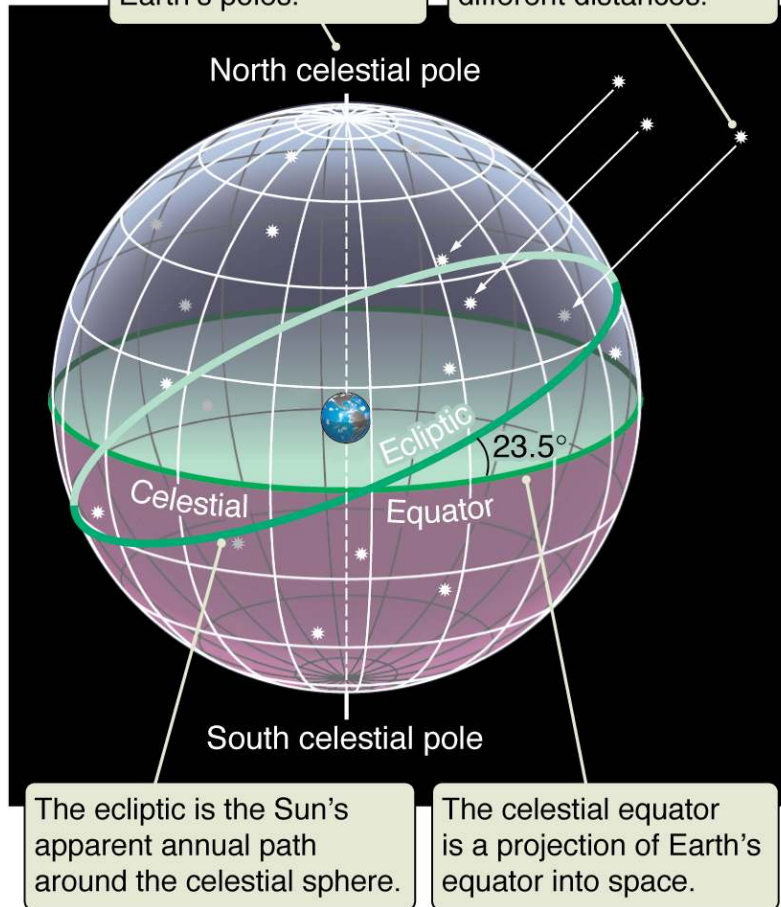
Zenith: the point directly overhead

Another View



The celestial poles (both north and south) are directly above Earth's poles.

Stars all appear to lie on the celestial sphere, but really they lie at different distances.



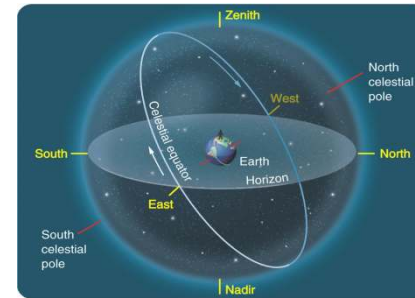
Ecliptic: Path of the Sun, inclined 23.5 degrees to equator

23.5 degrees !!!

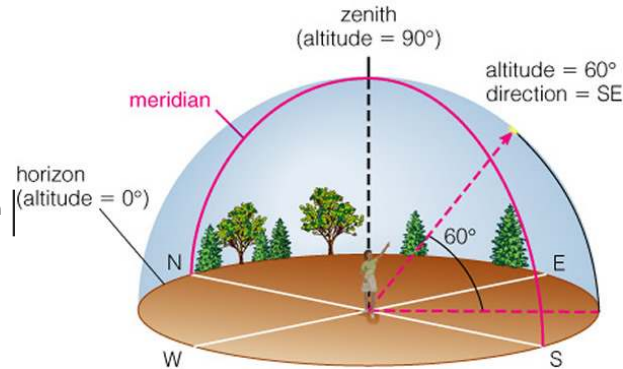
Three Views

You should be able to go back and forth between three different views of the sky:

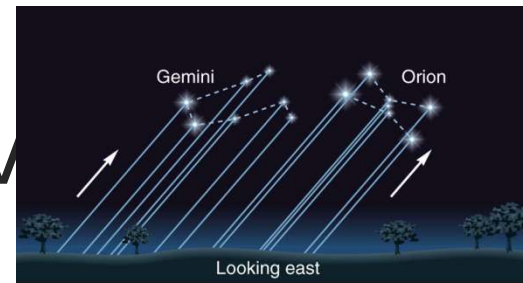
1) Above Earth



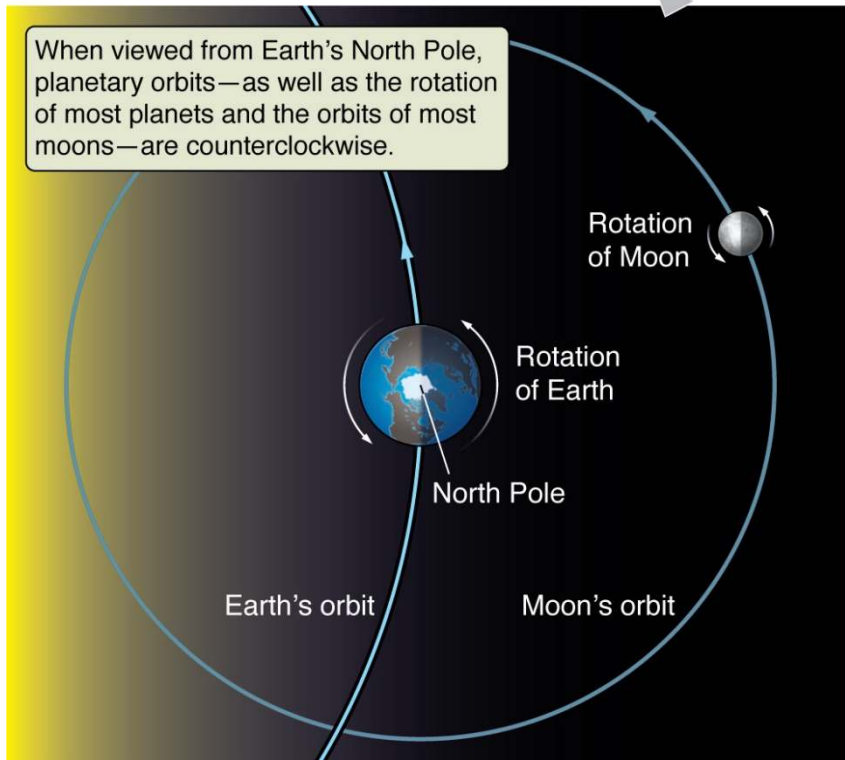
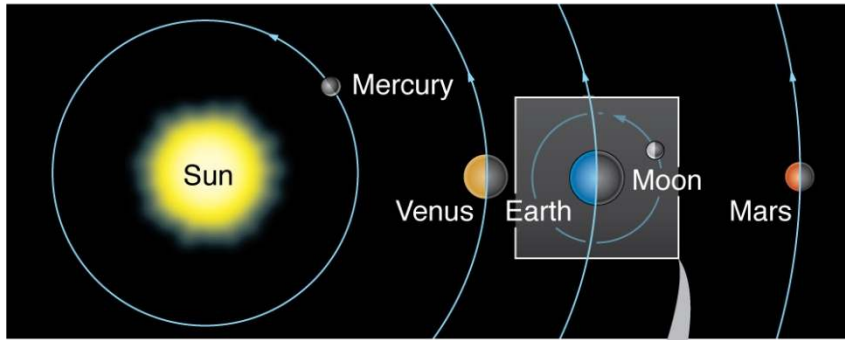
2) Above the viewer



3) Viewer's perspective



Earth Rotates on its Axis



There are two main motions that affect what we see in the sky:

Motion #1:

The Earth rotates on its axis. This causes stars to appear to rotate around the north and south *celestial* poles. The complete rotation of each star takes 24 hours.

(Motion #2 will be discussed next class)

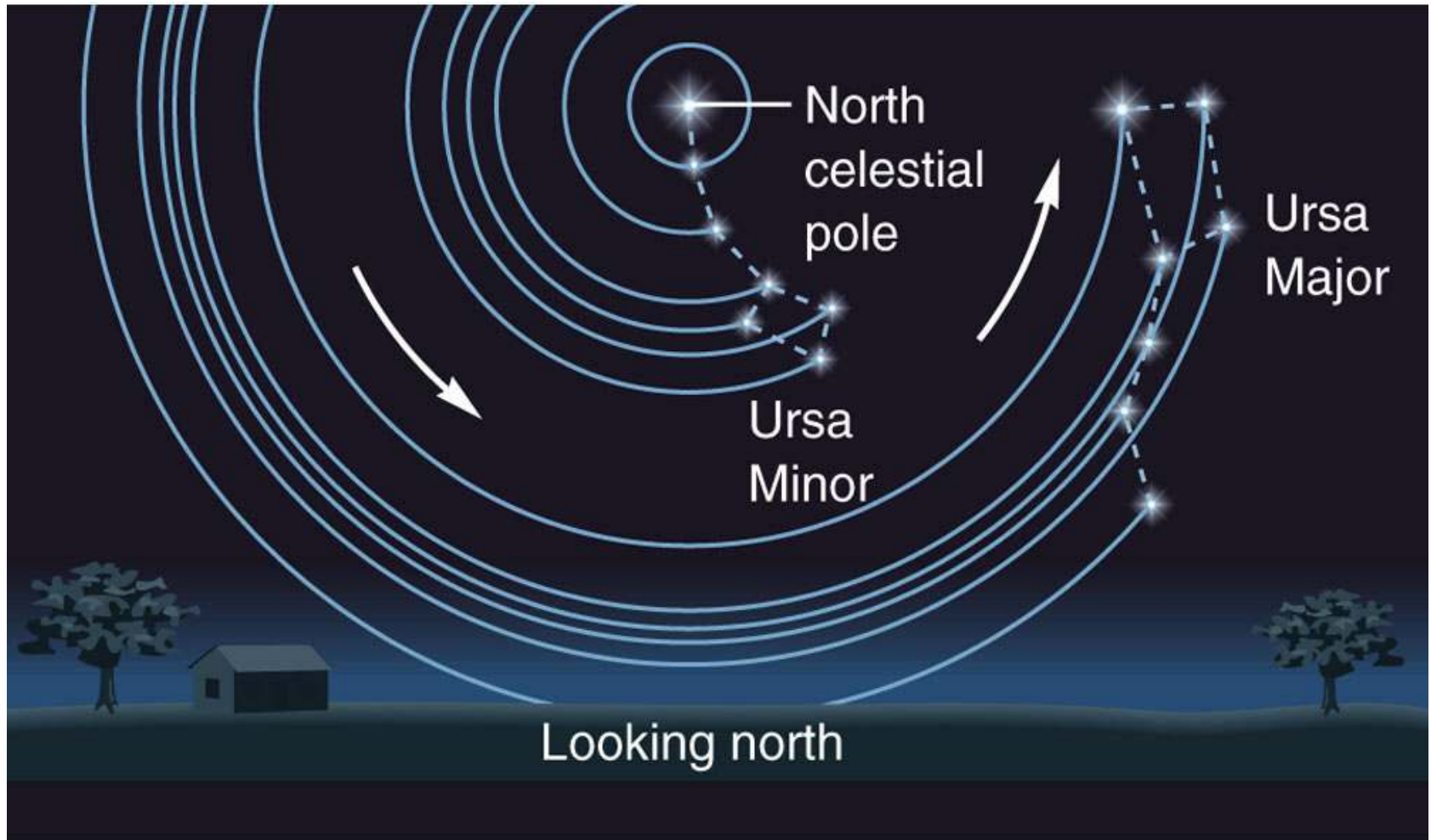
The Celestial Sphere Moves! (Daily)

Main points:

- 1) The motion of the stars can be understood as the 24 hour motion of the celestial sphere.
- 2) We see stars (and the Moon and the Sun) rise in the East and set in the West <- Important!
- 3) Stars appear to orbit the north celestial pole
In the north, there is a star very near the north celestial pole called the “North Star” or Polaris
- 4) Some stars are always visible - these are called “circumpolar”
- 5) Some stars are never visible!

What we see depends on the direction we are facing!

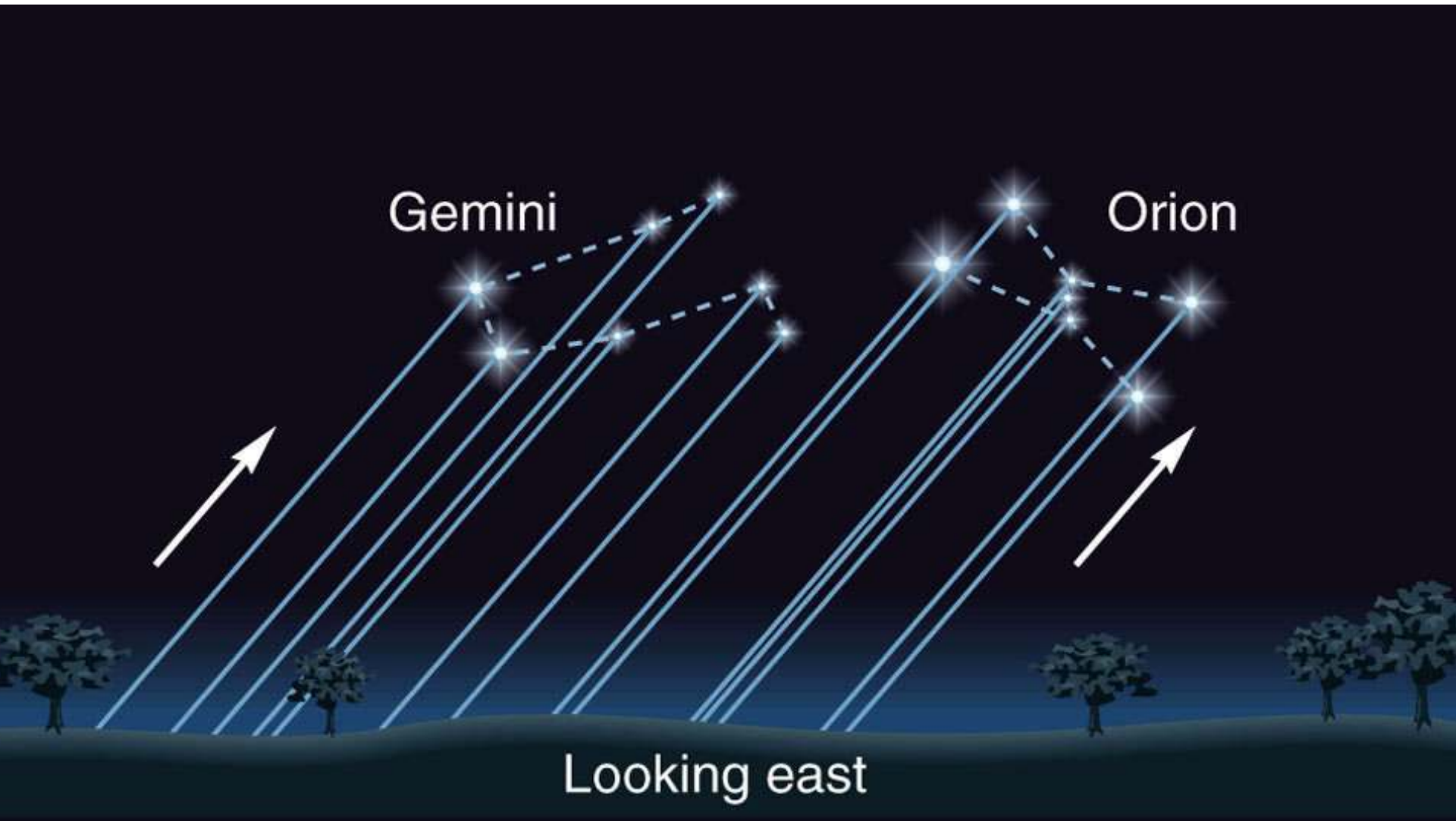
Looking North (from the Northern Hemisphere)



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Some of these stars are **circumpolar**, never rising or setting.

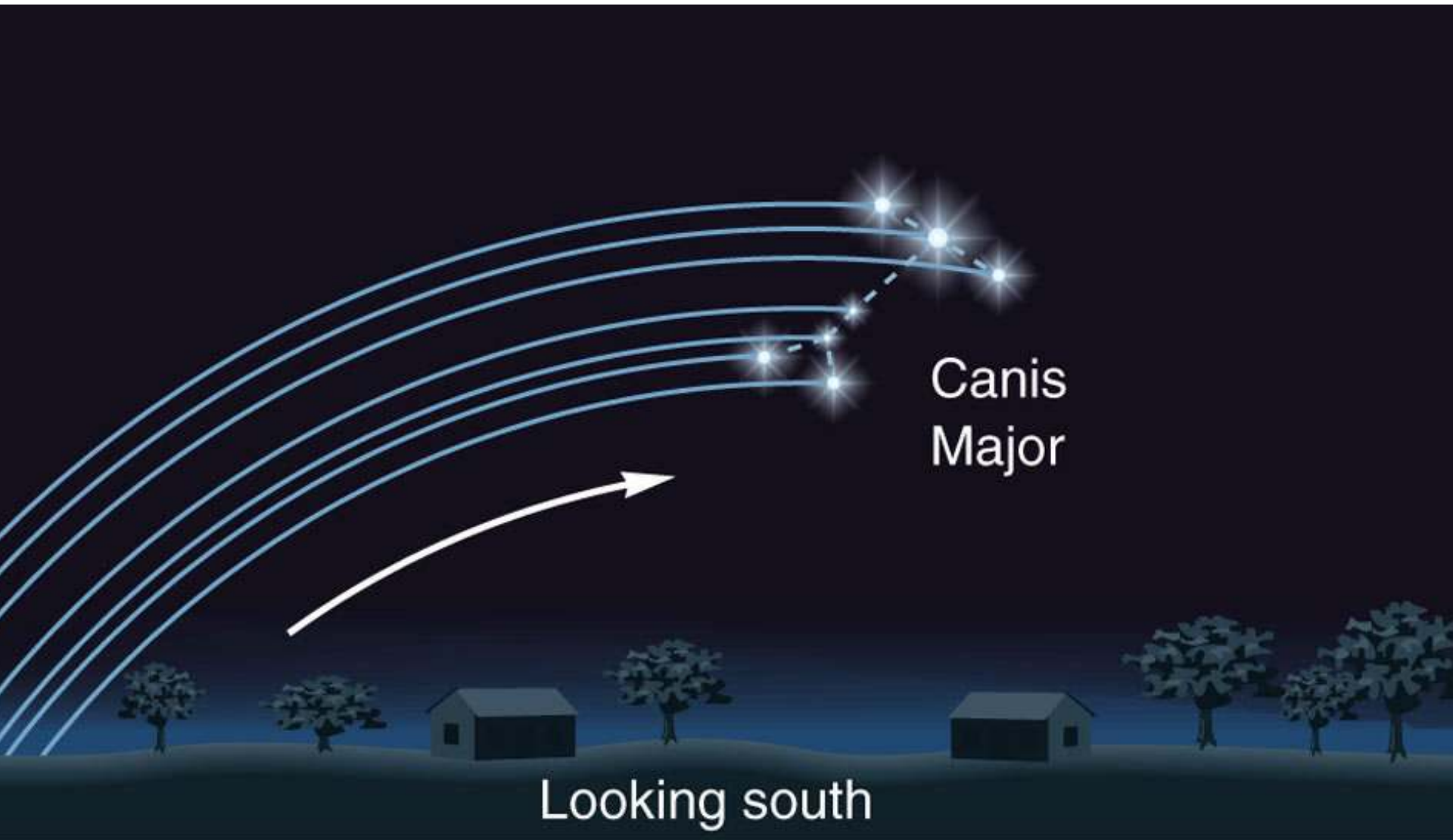
Looking East (from the Northern Hemisphere)



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Stars rise in the East....

Looking South (from the Northern Hemisphere)



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Pass through the South and set in the West.

VIDEOS!!!!

<http://www.youtube.com/watch?v=3V3rmDG5J8A>

<http://www.youtube.com/watch?v=uHcRPJFR47Q>

<http://www.youtube.com/watch?v=ANAmiuAkyGQ>

Object Rise/Set Directions

1) The direction an object rises determines where it sets

An object rising due East will set due West

An object rising South-East will set in the South-West

An object rising North-East will set North-West

2) The direction an object rises determines the amount of time it is visible.

Concept Quiz

Which direction is the observer facing in this picture (photo was taken from the northern hemisphere)?

- a) North
- b) East
- c) South
- d) West



Concept Quiz

Which direction is the observer facing in this picture (photo was taken from the northern hemisphere)?

a) North

b) East

c) South

d) West



In your Lecture-Tutorials Book

Do “Position”, page 1, #1-9, 11 (skip #10)

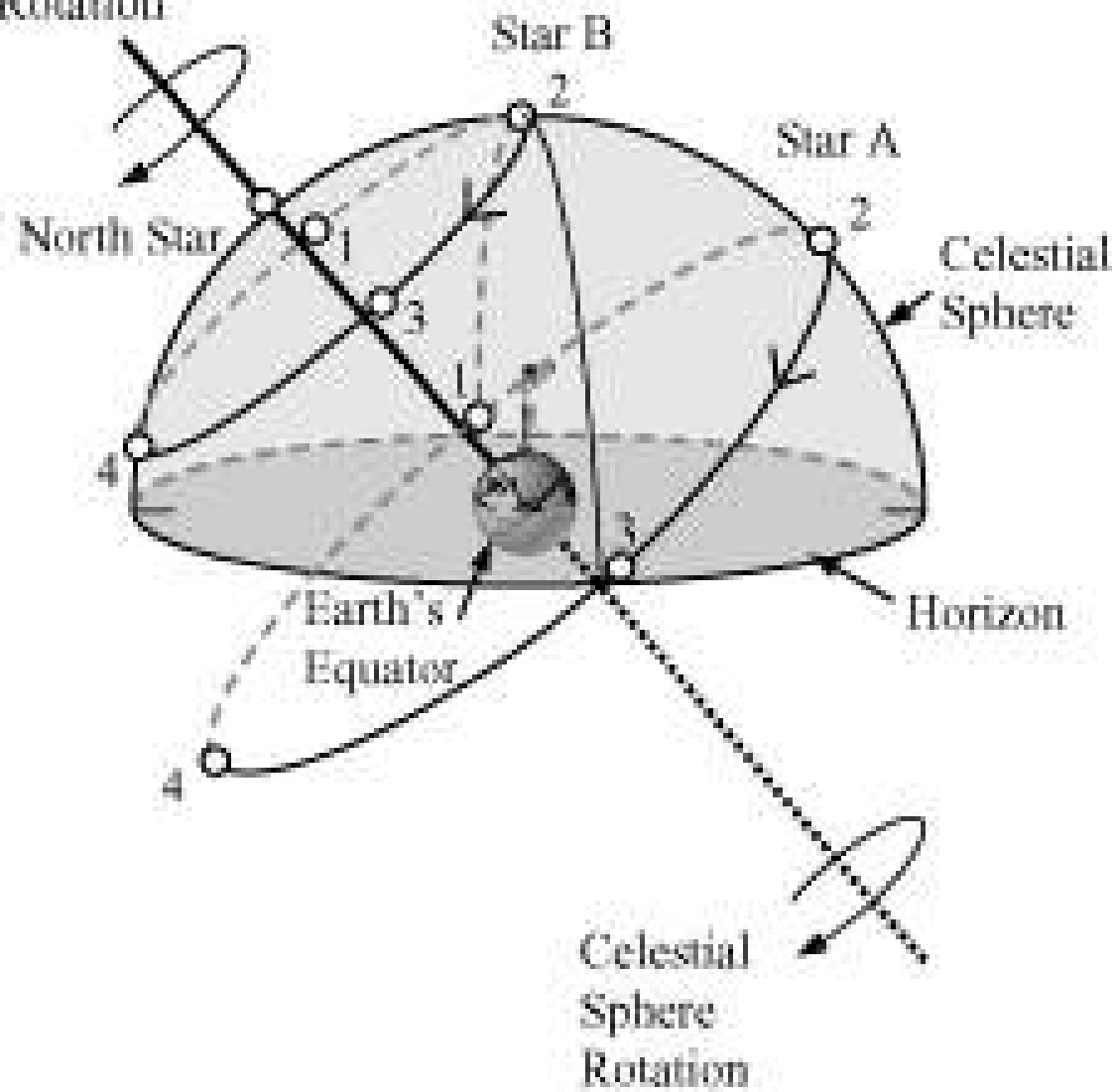
Work in pairs or small groups

Ask other groups for help

Have fun!

I'll give you ~10 min.

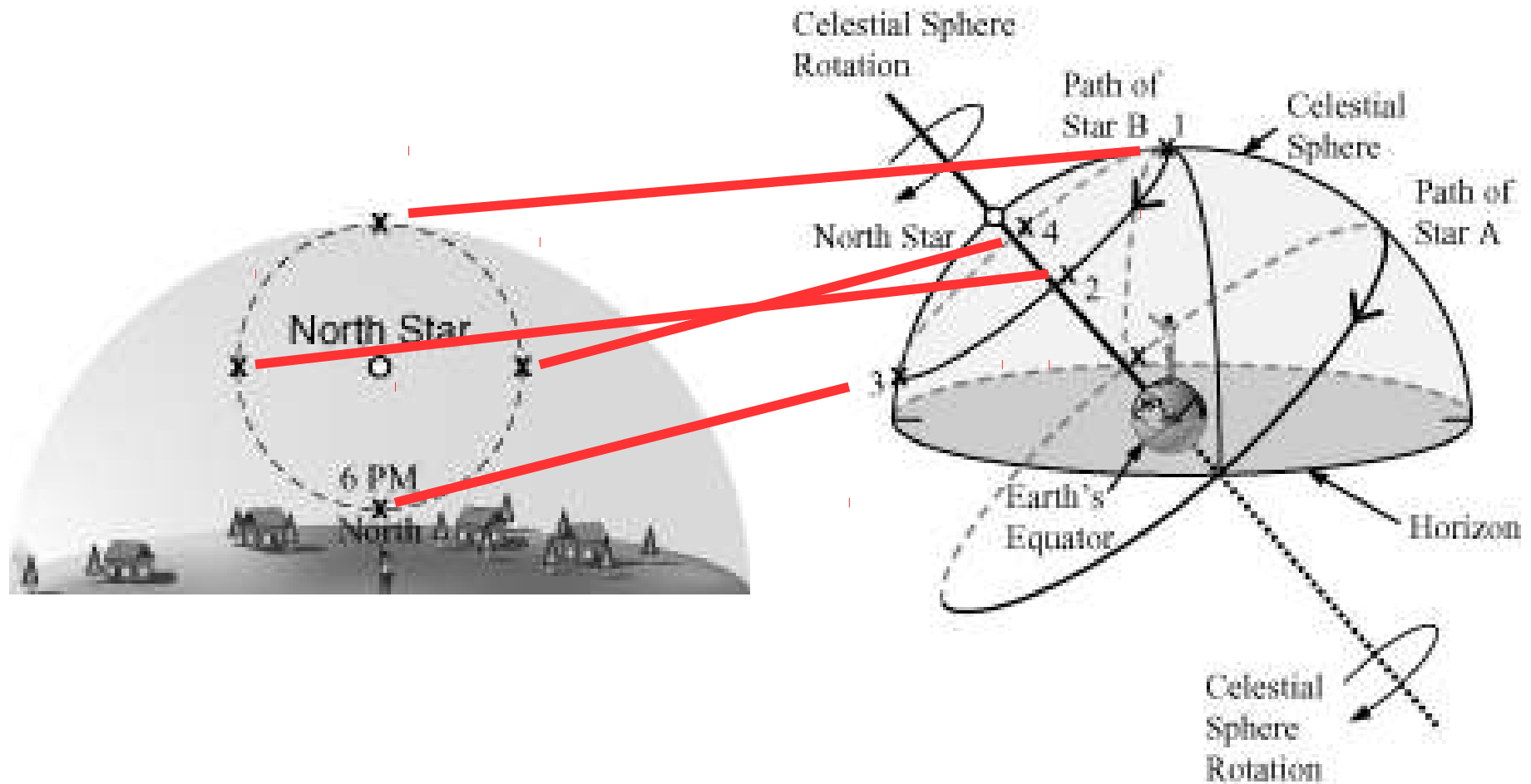
Celestial Sphere
Rotation



More!

Lecture-Tutorials “Motion” #1-6

LT - Motion



Animations

[http://
astro.unl.edu/naap/motion2/animations
/ce_hc.html](http://astro.unl.edu/naap/motion2/animations/ce_hc.html)

Things to notice:

- 1) Circumpolar, and “not visible” regions
- 2) How these change with latitude on Earth

<http://www.solarsystemscope.com>

The Night Sky

Goals for Today:

- 1) What does the Universe look like from Earth?
 - We can see ~2000 stars, a few Galaxies and the Milky Way
- 2) What are constellations and asterisms?
 - Constellations are regions on the sky enclosing groupings of stars. Asterisms are less-formal groupings of stars
- 3) What is the Celestial Sphere?
 - The projection of all of space onto a sphere that we are inside of

A User's Guide to the Night Sky

4) How do stars move?

- Stars rise in the East and set in the West.
- They appear to circle around the North Celestial Pole (in the northern hemisphere)
- Their entire motion takes 24 hours
- The location where the rise determines where they will set
- Some stars are never visible

Words to know: Asterism, celestial north and south poles, horizon, zenith, altitude, circumpolar