

**Astronomy 101**  
**Monday, Wednesday, Friday**  
**10:10 – 11:00 am**

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# Warning

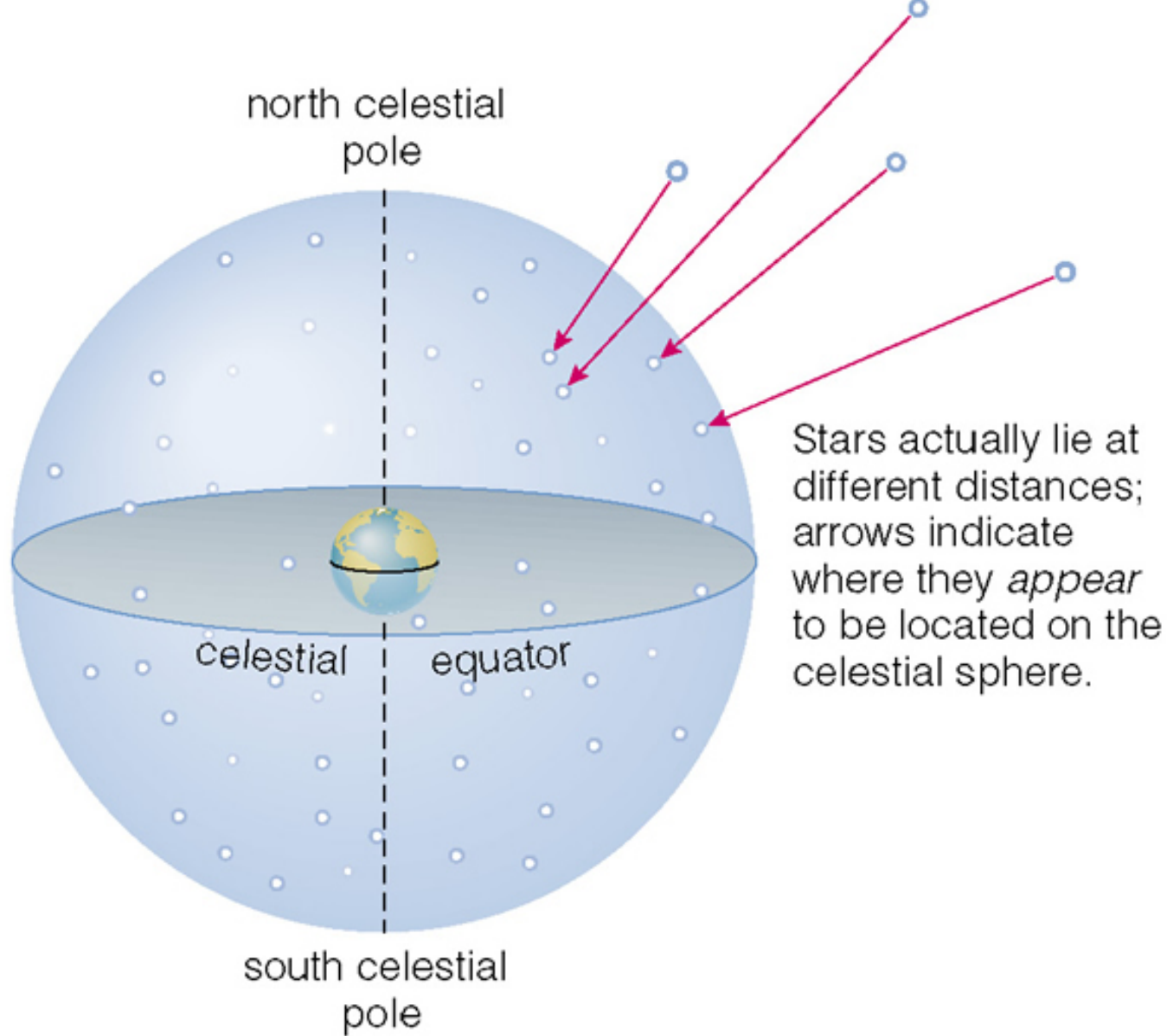
- About 15% of the class is not turning in any one assignment
- These 15% will probably fail or get a D in the class

# 5th Homework Assignment

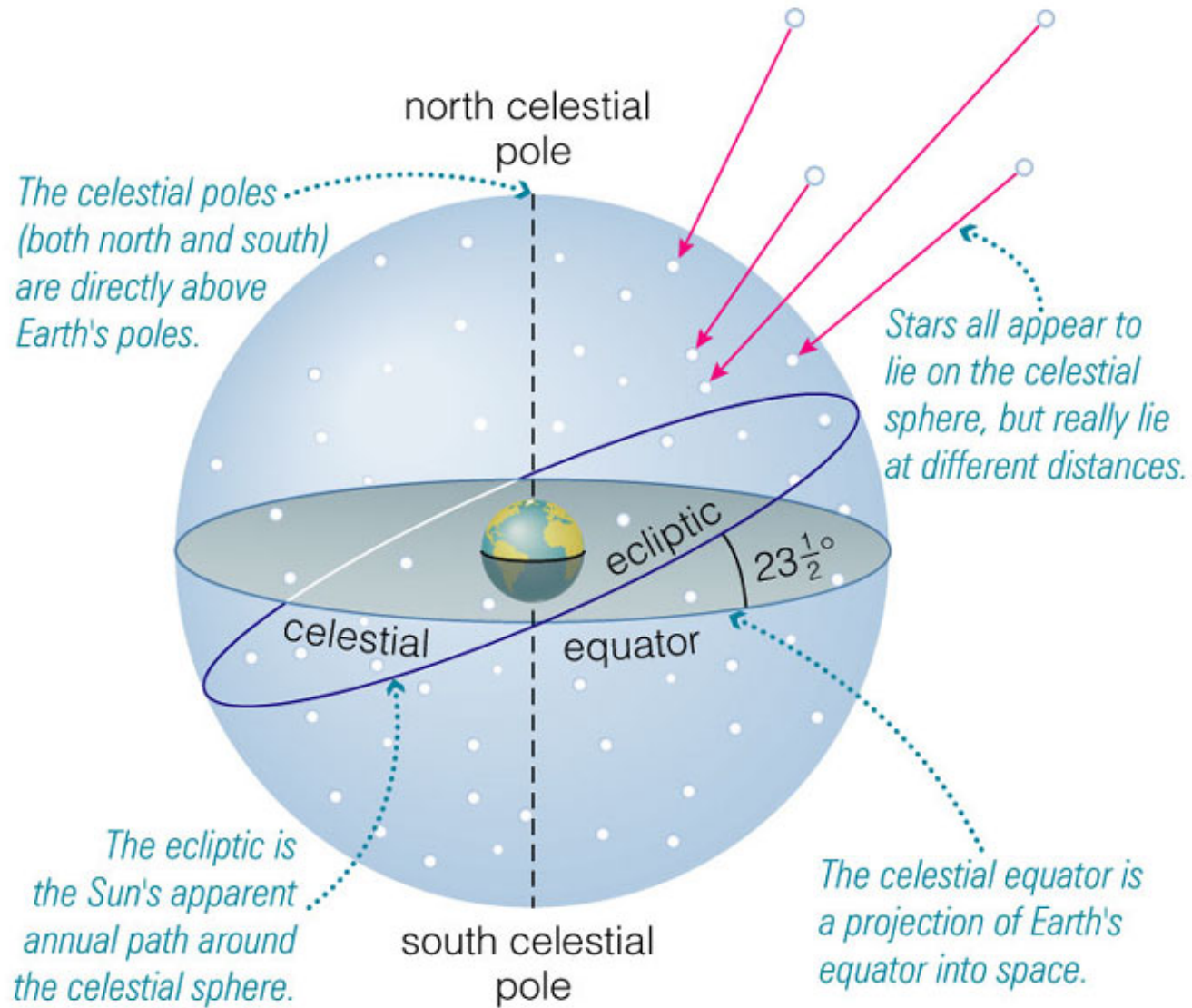
- [http://skyandtelescope.com/observing/skychart/article\\_1220\\_1.asp#](http://skyandtelescope.com/observing/skychart/article_1220_1.asp#)
- Print out the sky chart
- Go outside
- Circle and label how many constellations and planets you see
- Due Monday, Feb. 13

# 6th Homework Assignment

- Log into Owl
- Login is your ID number
- Password is your last name
- owl.oit.umass.edu
- Do Tutorial by Feb. 13 at 11 am
- If you complete it, you get 1 Homework point
- Very easy
- If you can't login, tell me



# Celestial Sphere



# Seasons

# Private Universe

- <http://www.learner.org/resources/series28.html>

# What causes seasons?

- The tilt of the Earth's axis relative to the ecliptic

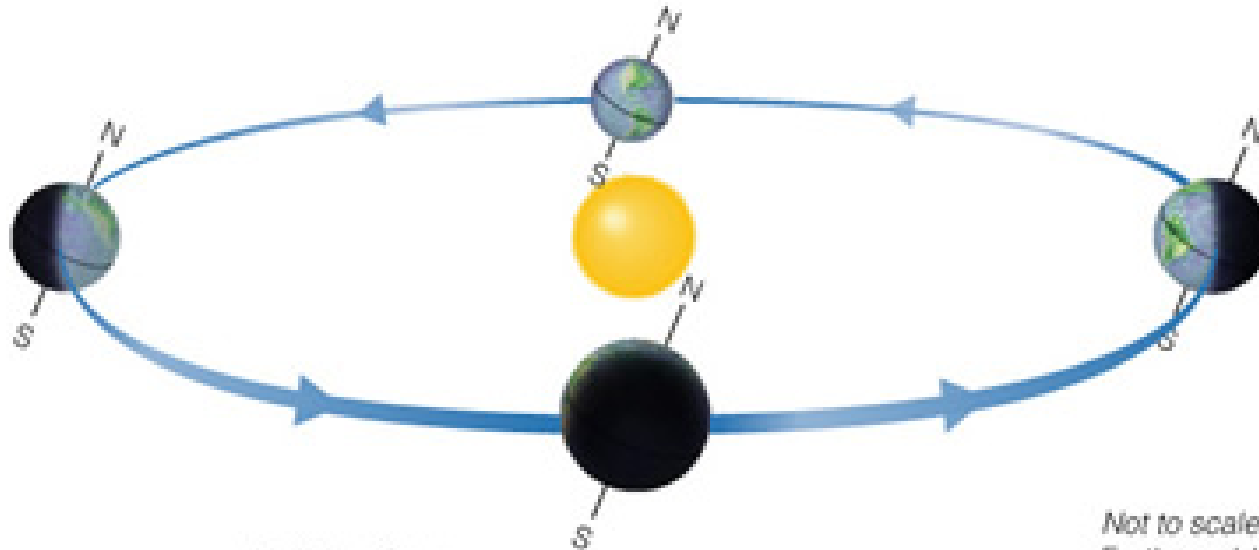
# Seasons

## Spring Equinox

The Sun shines equally on both hemispheres.  
Northern Hemisphere is entering spring; Southern Hemisphere is entering fall.

## Summer Solstice

Northern Hemisphere receives its most direct sunlight of the year (beginning of summer); Southern Hemisphere receives its least direct sunlight (beginning of winter).



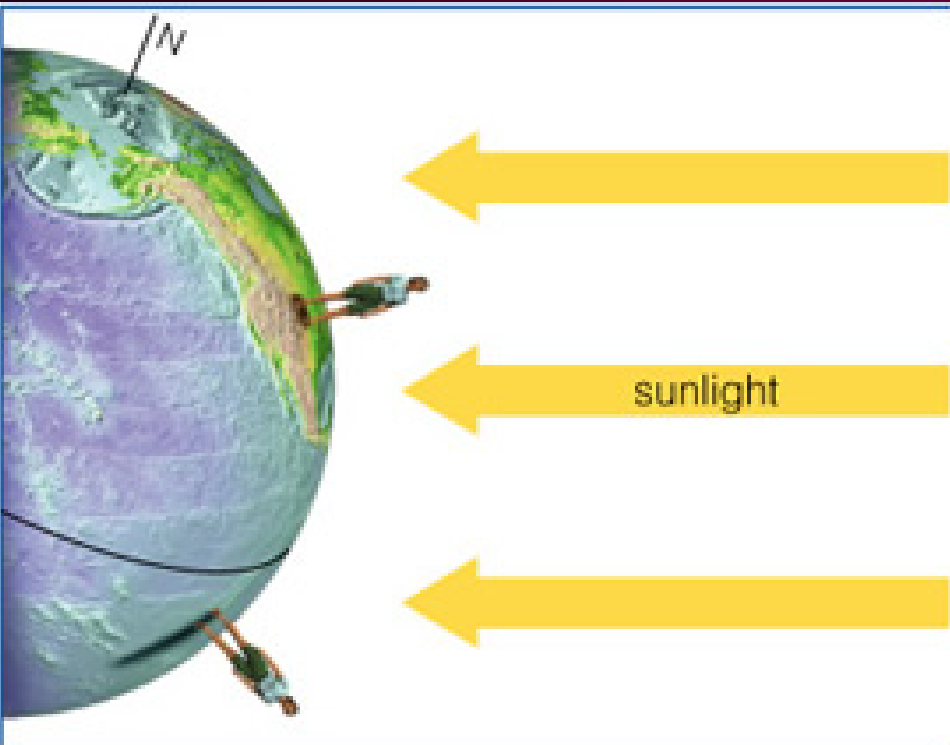
## Winter Solstice

Northern Hemisphere receives its least direct sunlight of the year (beginning of winter); Southern Hemisphere receives its most direct sunlight (beginning of summer).

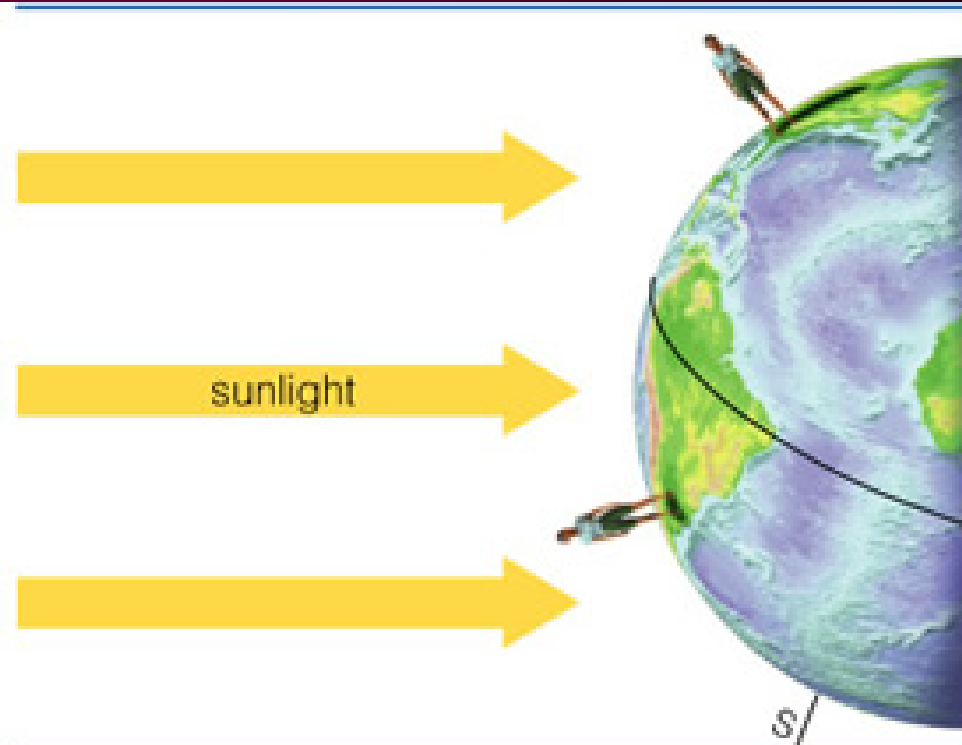
## Fall Equinox

The Sun shines equally on both hemispheres.  
Northern Hemisphere is entering fall; Southern Hemisphere is entering spring.

*Not to scale! On the scale the orbit is drawn, Earth would be too small to see (and the Sun would be a tiny dot).*



**Summer Solstice:** Midday sunlight strikes Earth more directly in the Northern Hemisphere—meaning the Sun is higher in the sky and casts smaller shadows—than in the Southern Hemisphere.



**Winter Solstice:** The situation is reversed from the summer solstice, with midday sunlight striking the Southern Hemisphere more directly and the Northern Hemisphere less directly.

# Solstices

- Summer Solstice – June 21 – Northern Hemisphere receives its most direct sunlight
- Winter Solstice – December 21 – Northern Hemisphere receives its least direct sunlight

# Equinoxes

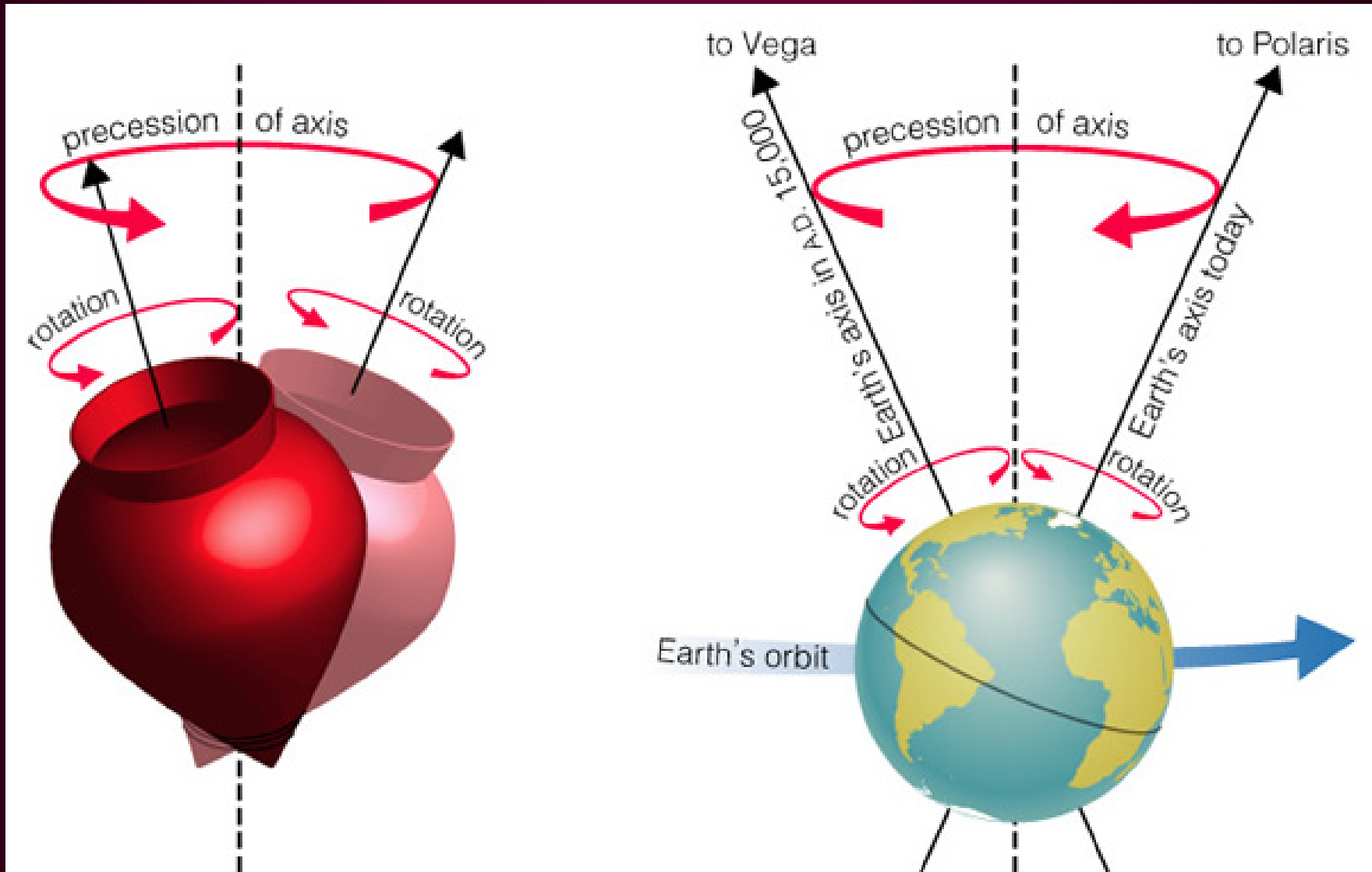
- Sun shines equally on both hemispheres
- Spring Equinox – March 21 – Northern Hemisphere goes from slightly tipped away from the Sun to slightly tipped towards
- Fall Equinox – September 21 - Northern Hemisphere goes from slightly tipped toward from the Sun to slightly tipped away

Why does the orbital  
difference not matter?

# Reasons

- There is only a 3% difference in the distance from the Earth to the Sun at its farthest and closest point
- The Earth is actually closer to the Sun in the winter than in the summer

# Long Term Changes

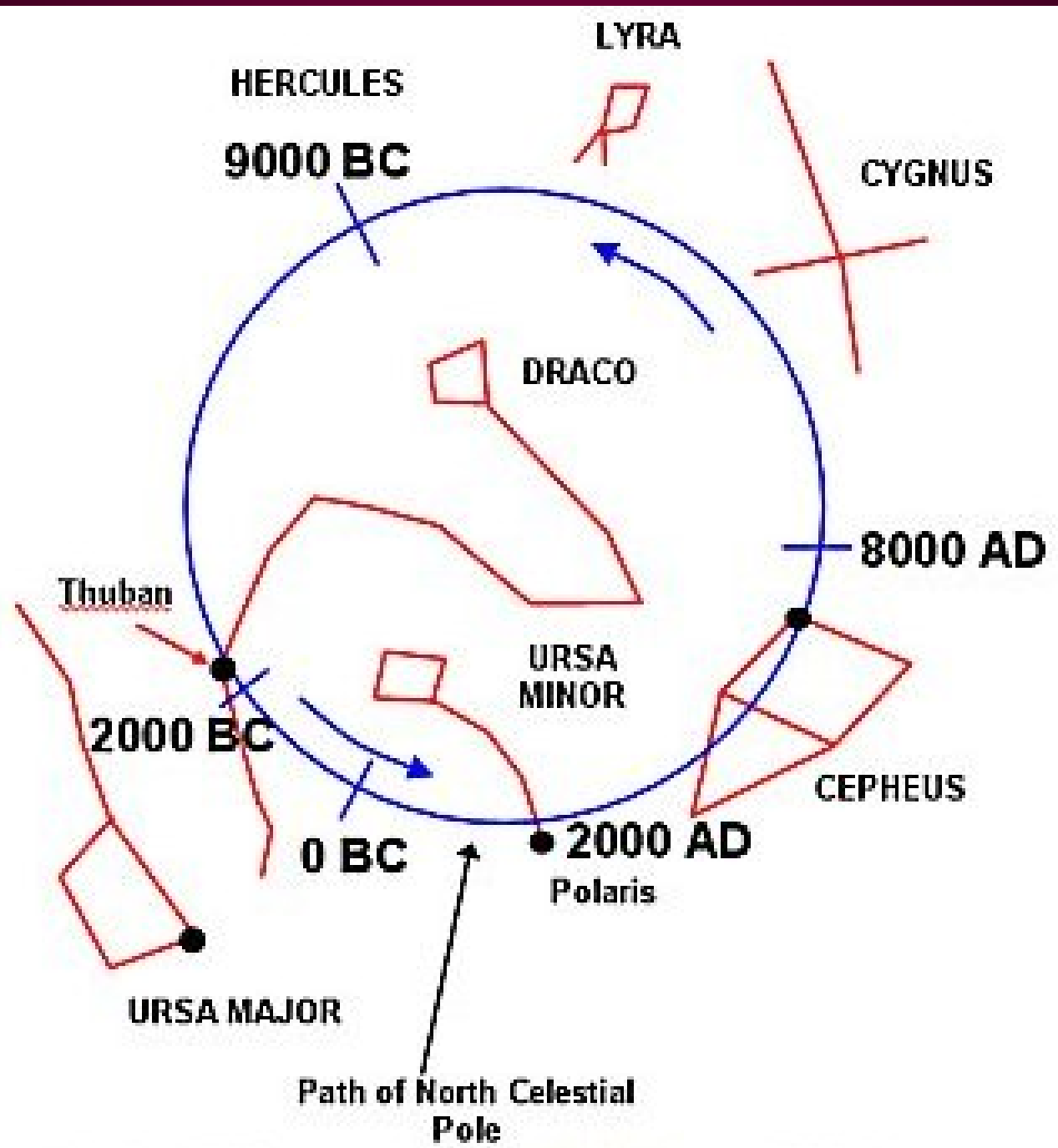


# Precession

- Earth precesses like a top
- Precession - phenomenon by which the axis of a spinning object (e.g. a part of a gyroscope) "wobbles" when a torque is applied to it

# Forces

- For a top, the force is gravity, which is trying to pull the top down
- For the Earth, the forces are due to the pull of the Sun and Moon, which is trying to align the Earth's axis with the ecliptic



# Because of precession

- The position of a star that corresponds to the North Celestial Pole changes

*Any Questions?*