

# The Night Sky and Seasons

9/4/2009

# Opening Discussion

- Have you seen anything interesting in the news?
- What did we talk about last class?
- How many days are in a year? (This is a trick question.)
- What constellation is Mars in?
- Does Venus ever rise at sunset?

# Minute Essays Responses

- Measuring the speed of other galaxies. Doppler shift. This is extremely accurate.
  - Light doesn't age.
  - We don't know inherent scales.
  - Tangential motion is too slow.
- Planets around neutron stars.
- Dark, icy death of the Universe.
- What happens if the Earth instantly stops spinning?

# More Responses

- Does spin impart a force?
- What happens if stars collide?
- Super-massive black holes.
- Shifts in planetary orbits.

# Motions of the Heavens

- We talked about all the ways the Earth is in motion last class. Of course, we don't feel like we are in motion. We see this motion when we look into the sky as the motion of objects across the sky.
- Most of the motions that we notice during our lives are caused by either the rotation of the Earth on its axis or the revolution of the Earth about the Sun. The exceptions are the motions of the Moon and planets that we will discuss tomorrow.
- Other things change, but those changes are too slow for us to really notice.

# Talking about the sky

- What is the zenith? (For trivia buffs, what is the opposite of zenith?)
- What is the celestial equator?
- What is the ecliptic?
- What is the meridian?
- What is the celestial sphere?
- What does it mean for a star to be circumpolar?
- How can you quickly and easily determine your latitude on a clear night?

# Angular Sizes

- When we look in the night sky we don't see real sizes or distances, we see angular sizes and distances. This is because you don't see distance from the Earth.

$$\frac{\textit{angularSize}}{360^\circ} = \frac{\textit{physicalSize}}{2\pi \times \textit{distance}}$$

- There are a few tricks you can use to estimate angular sizes of things in the sky.

# Seasons

- More than half of the class knew what the cause of the seasons was. Those who gave the wrong explanation generally mention the Earth being further from or closer to the Sun in it's orbit. You can quickly discount this by remembering that northern summer is southern winter.
- Seasons are actually caused by the tilt of the Earth's axis which points toward the same location in space as we orbit the Sun. This is also why days are longer in the summer and shorter in the winter.



# Significant Circles on the Earth

- 23.5 degrees above and below the equator are the tropics. These are the furthest north and furthest south the Sun ever reaches zenith. Between them the effects of the seasons are minimal.
- 23.5 degrees south of the north pole and north of the south pole are the arctic and antarctic circles. Beyond these latitudes some days the Sun will not rise close to the first day of winter.
- These lines are not arbitrary like the location of the prime meridian.

# Solstices and Equinoxes

- There are 4 special times of the year that we normally think of as the official changes of the seasons.
- The summer solstice is when the Earth's axis is pointing as directly towards the Sun as it can and we have the most sunlight of any day of the year.
- The winter solstice is the opposite.
- Directly between these, the axis is pointing neither toward, nor away from the Sun. Those times are the spring and fall equinoxes when we have equal parts day and night.

# Minute Essay

- What do you feel about the speed of the class?
- Have a good weekend. Don't show up on Monday. Remember to read 2.3-2.4 for next Wednesday.
- Our first quiz will be at the beginning of next class. A reading quiz will be posted this weekend for chapter 2.