2.5 Aberration of Starlight and Stellar Parallax

PRE-LECTURE READING 2.5

- *Astronomy Today,* 8th Edition (Chaisson & McMillan)
- *Astronomy Today,* 7th Edition (Chaisson & McMillan)
- *Astronomy Today,* 6th Edition (Chaisson & McMillan)

VIDEO LECTURE

- Aberration of Starlight and Stellar Parallax[1] (12:35)

SUPPLEMENTARY NOTES

Tests of the Geocentric and Heliocentric Models

- Venusian Phases (see Galilean Revolution)
- Aberration of Starlight
- Stellar Parallax

Venusian Phases

- Geocentric model predicts phase of Venus to change from new (when it is closest and largest) to crescent to new (when it is farthest and smallest) to crescent and back to new
- Heliocentric model predicts phase of Venus to change from new (when it is closest and largest) to quarter to full (when it is farthest and smallest) to quarter and back to new (like the moon)
- In 1609, Galileo confirmed the heliocentric prediction.

Aberration of Starlight

- See Aberration of Starlight[2].
- Heliocentric model predicts stars to appear to be shifted toward Earth's direction of motion, some by as much as 20 arcseconds. As Earth's direction of motion changes as it orbits the sun, so do the apparent positions of the stars, accordingly.
- Geocentric model predicts no aberration of starlight because in the geocentric model, Earth is stationary.
- By the mid-1700's, telescopes improved to the point that astronomers could, and did, confirm the heliocentric prediction.

[1] http://youtu.be/kqvBVC8hkTs
[2] http://en.wikipedia.org/wiki/Aberration_of_light

Stellar Parallax

- See Stellar Parallax[3].
- Heliocentric model predicts stars to appear to be shifted opposite Earth's direction of motion. Nearby stars will appear to be shifted more than faraway stars. As Earth's direction of motion changes as it orbits the sun, so do the apparent positions of the stars, accordingly.
- Geocentric model predicts no stellar parallax because in the geocentric model Earth is stationary
- Prior to the mid-1800's, all measurements of stellar parallax were consistent with zero, either confirming the geocentric prediction or implying that the stars are much farther away than anyone had previously imagined, resulting in stellar parallaxes that were too small to be measured given the telescopes of the day. However, by the mid-1800's telescopes improved to the point that astronomers could, and did, confirm the heliocentric prediction.
- For a mathematical treatment of parallax, see Measuring the Astronomical Unit.

EXERCISE

Hold your index finger vertically in front of your nose and focus on some distant object, such as a wall. Close one eye and then open it while closing the other. Notice how much your finger appears to shift with respect to the far off object. Now, hold your finger at arm's length and repeat this exercise. Do you notice a difference?

[3] http://en.wikipedia.org/wiki/Stellar_parallax