



The Scientific Revolution: Its Classical and Christian History with Dr. Ted Davis

Lecture 6.4: Saving the *Phenomena*, Ptolemy

Outline:

Saving the *Phenomena*, Ptolemy

- The history of Greek astronomy is a series of attempts to account for planetary motion using circles that rotate with constant speeds – according to Plato’s dictum. Finally, we consider the ideas of Claudius Ptolemy (c. 90 – c. 165 AD), the greatest astronomer of antiquity.
- Ptolemy worked at the Museum in Alexandria & resided in a nearby town. He also wrote on mathematics, music, geography, and astrology. His greatest work is actually known by the Latin form of the title of the Arabic translation, **Almagest** (“The Great Book”). That title conveys the magnitude of its influence on astronomy and general thought down into the 17th century.
- Astrology has a mixed relationship with Christianity throughout history.
- Ptolemy’s predecessors at the Museum, Apollonius and Hipparchus, had invented the **epicycle/deferent model** – the planetary “teacup” ride. This accounted nicely for the **changing brightness** of planets during retrogression.
- To account for the unequal speeds of planets as they move, Ptolemy introduced the **equant** – like a record with the hole off-center. The center of the deferent circle moves uniformly around a point that is off-center, relative to the earth. Copernicus later rejected this device and sought an alternative model.
- We find in Greek science a tension (never fully resolved):
 - Geocentric physics – real ether spheres centered on the Earth versus
 - Epicyclic astronomy – hypothetical mathematical circles not centered on the Earth.
- The ancients and the medievals saw hypotheses as useful fictions, known falsehoods that nevertheless have real explanatory value. Some resolution came by thinking of the planetary spheres as having thickness, within which the epicycles might roll like ball bearings.
- Dante’s synthesis of Aristotle & Christianity (14th century):
 - This comes from Aristotle or Medieval Christians thinking about Aristotle.
- According to a common myth, Copernicus “demoted” humanity by moving us out of the center. This is wrong! In fact, the center was not a good place



- to be in medieval cosmology. For Dante (for example), the very center of the universe was the worst place to be! If anything, Copernicus actually elevated our status by putting us into the heavens, away from the “base” Earth.
- As Galileo wrote in his *Dialogue*, “Has nature then, produced and directed all these enormous, perfect, most noble celestial bodies, invariant, eternal, and divine for no other purpose than to serve the changeable, transitory, and mortal earth? To serve that which you call the dregs of the universe, the sink of all uncleanness?”
 - “For more than three centuries scientists, historians, and popularizers of science have been repeating the claim that Copernicus ‘dethroned’ earth from its ‘privileged’ central position in the universe. However, a survey of pre-Copernican natural philosophy (which viewed the Earth as located in a cosmic sump) and of [the] Copernicans’ own account of the axiological meaning of the new heliocentric astronomy (which exalted earth to the dance of the stars) demonstrates that the cliché about earth’s ‘demotion’ is unwarranted and fit to be discarded.” (Dennis Danielson, “The Create Copernican Cliché,” *American Journal of Physics* 69.10 (Oct. 2001): 1029-1035)
 - The ancient picture of the world was geocentric, unique, very large but not infinite. It was a cosmos, not a chaos. It was assumed to be correct for nearly 2000 years.