



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

Lecture 12.2: Copernicus Moves the Earth: What He Did and What it Meant, Part 2

Outline:

Copernicus Moves the Earth: What He Did

- In the astronomy textbook from Kraków, the old world picture was **geocentric; hierarchical**, with two different worlds— celestial and terrestrial; and **finite** (bounded), with the stars all on a single sphere at the edge.
- What did Copernicus say?
 - The new world picture was **heliocentric, not hierarchical**—no division between the heavens & the earth— and **still finite** (bounded), at least for Copernicus himself and many others. But it led some others to speculate about an infinite universe—the absence of parallax contributes to this.
 - We do not know when or where Copernicus began to think about heliocentrism.
 - Somewhere between the latter half of 1508 and April 1514, around the time he arrived in Frombork, he wrote a very short, untitled version of his new ideas that Tycho Brahe later called *Commentariolus* (“Little Commentary”).
 - Though unpublished, he sent copies to some friends and his ideas started to become known.
 - In *Commentariolus*, Copernicus took issue with Ptolemy’s use of the equant to explain changing speeds of planetary motion. “Our ancestors ... thought it altogether absurd that a heavenly body, which is a perfect sphere, should not always move uniformly.” Ptolemy’s equant was not “sufficiently pleasing to the mind” in this respect.
 - To remedy “these defects, I often considered whether there could perhaps be found a more reasonable arrangement of circles, from which every apparent inequality would be derived and in which everything would move uniformly about its proper center, as the rule of absolute motion requires.”
 - The solution he offered to “this very difficult and almost insoluble problem” was based on interchanging the earth and the sun—creating the Solar System. The earth “is not the center of the universe, but only of gravity and of the lunar sphere.”



- Fully to understand the details of what he did, and why he did it, would get us into too many technical matters. The bottom line: it worked, without using equants.
- Copernicus believed that his new theory was aesthetically superior to that of Ptolemy; it was truer to the accepted rules of astronomy.
 - Yet, it in many instances it did not actually do a better job of predicting where planets would be found.
 - Nor did it do away with epicycles — although they weren't needed to explain retrograde motion, they did other things.
 - Copernicus also sorted out the real order of planets in their spheres, which Ptolemy had not done.
 - Ptolemy had thought that Venus, Mercury, and the Sun all have the same orbital period of one year—they are always close to the Sun in the sky and appear to share its period of revolution. Copernicus's theory cleverly removed the ambiguity.
 - He determined that Mercury's period is about 3 months and Venus' period is about 9 months [our numbers today are a bit different]. Thus, Mercury lies inside Venus, and both lie inside the earth.
 - The humanist scholar Giovanni Pico della Mirandola had recently attacked the validity of astrology on the basis of this very problem of the same periods for Mercury, Venus, and the Sun—what differentiated them in astrology?
 - Was Copernicus motivated to adopt heliocentrism partly by a wish to refute Pico's objection? There is no consensus about this.