



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

Lecture 3: The Stars in Their Courses

Outline:

The Stars in Their Courses

- The ancients had a clearer view of the night sky than we do today.
- Cultures invented pictures (constellations) in the sky. They thought of these stars as fixed stars.
- They were able to map the heavens on a sphere. Maps of the sky were commonplace.
- Motion in the heavens:
 - Everything seems to be going around a center.
 - The Earth *appears* to be stationary, with the stars all rotating around us on a great sphere.
 - This *apparent* motion was believed to be a real motion before the Scientific Revolution.
 - This motion, which happens every day, is called **diurnal motion**.
- Planets or “Wandering Stars” moved around against the background. Five planets were visible in the sky (seven when including the Sun and the Moon) to the ancients.
 - Using a model of the Solar System, we will focus on the observed behaviors of two types of planets as they wander against the background of the fixed stars. The **superior planets** (those outside the Earth’s orbit around the Sun) sometimes stop briefly and reverse course in the sky.
 - The **inferior planets** (those inside the Earth’s orbit around the Sun) are always seen in close proximity to the Sun, either in the evening or morning sky but never in the middle of the night. When viewed through a telescope, they have phases similar to the Moon.
 - The closer the planet is to the Sun, the faster it moves.
 - Mars appears to go backwards in the sky when the Earth overtakes Mars in orbit. This happens roughly every two years (for Mars). This is called **retrograde motion**. This is true for each of the superior planets.
 - The superior planets (3 were known prior to the discovery of Uranus) have stations and retrogressions – as seen from the earth. Also – the planet is at its brightest, when seen from the earth, just when it moves retrograde.



- From the Earth one could expect to see Venus going through phases, and in changing sizes. Galileo was the first to publish this result with the telescope. Venus is never seen at midnight because it is an inferior planet.
- The two inferior planets are often too close to the Sun to be seen. When they are visible, they are always seen in close proximity to the sun: Venus is either the “morning star” or the “evening star,” but never the “midnight star.”
- The ancients could see these things, but they did not interpret them in terms of a moving Earth with superior/inferior planets.
- Inferior planet also exhibit phases, like the moon – but the sizes of the phases change very noticeably, unlike the phases of the Moon. The ancients did not know this, since it cannot be seen without magnification. After Copernicus, however, this phenomenon would become very important when Galileo observed it – and publicized it as evidence in favor of Copernicus’ theory.
- Inferior planets also move directly across the face of the Sun, in a rare event called a **transit**. Transits of Venus take place in pairs, 8 years apart, but separated by more than a century from the next pair. It was first observed in 1639, by Jeremiah Horrocks and William Crabtree in England.
- The two most recent transits of Venus were on June 8, 2004 and June 6, 2012. It won’t happen again until December 2117 and December 2125. Transits of Mercury are more frequent, but much harder to see since Mercury is so small in diameter.
- The ancients did not know about this phenomenon either, since it cannot be seen without magnification. After the invention of the telescope, observations of transits were important for measuring the dimensions of the solar system. Several explorers in the 18th century were ordered to observe the transit of Venus; one was Captain James Cook, who observed it in Tahiti in 1769.