

The cosmological revolution

[History](#), [Revolution](#)



Nicolas Copernicus wrote a brief statement which essentially said we live in a heliocentric solar system and that the sun is the center of everything. Against the church however the church didn't seem to care that Copernicus was announcing his belief. Because his statement was poorly written so not many people paid attention to it and Copernicus was working on calendar reform, which the church wanted, meaning the church left him alone until he was done with the calendar.

So Copernicus wrote a book about his ideas. The book argued that the Earth revolved around the sun. God would surely find a simple heliocentric universe more pleasing than the complex Ptolemaic model, he wrote. Besides, Copernicus argued, the Pythagorean model, with all the rotating celestial spheres, wasn't logical either. What makes more sense, that the Earth revolves around the sun, or that giant celestial spheres rotate around the Earth at astronomical speeds without breaking apart?

Enemies of Copernicus and the Church criticized his book. Especially the fact that he couldn't explain why the Earth orbits the sun, and his model couldn't provide accurate data. Copernicus didn't get much credit while he was alive, but his idea started to catch on. Tycho Brahe 1546-1601 Tycho was friends with the king of Denmark, consequently the king gave Tycho a big observatory, which Tycho used to make precise measurements of the stars and planets. Tycho was the first to realize that the sky did change and evolve.

Opposite to the church's teachings that the sky didn't change because God made the sky, and as God was perfect, it was right the first time. Therefore, the sky did not change. Tycho realized the sky did change when he

discovered a comet in 1572. Tycho was good at measuring the paths of stars, but he wasn't good at maths so he hired a young mathematician, Johannes Kepler, to help him with his studies. Johannes Kepler was working on calculating the orbit of Mars, which was very time consuming.

Whilst doing this, Tycho died which meant Kepler inherited all of his data and equipment. When Kepler got all the data, it was up to him to do the math to bring things together. Kepler came up with three laws of planetary motion using Tycho's data. He didn't explain why things worked, just how. Kepler based his studies on Copernicus' theories. But Kepler couldn't make Tycho's data match up with Copernicus' system of circular orbits. Finally, to make the math fit Tycho's observations, Kepler realized that he would have to change the Copernican model.

Kepler was able to keep the sun as the center of the solar system, but to change the Copernican model enough to make the math work, he discovered that the orbits of the planets aren't circles at all. Planets orbit the sun in ellipses. With this knowledge, Kepler discovered three laws of planetary motion. 1. The orbits of planets are ellipses, with the sun at one focus 2. The Law of Areas - An imaginary line from a planet to the sun will sweep over equal areas of the ellipse in equal intervals of time.

A planet moves faster in its orbit when it's closer to the sun. When the planet is farther from the sun, it moves more slowly. Kepler discovered an inverse relationship between how far a planet is from the sun and how fast a planet is traveling. 3. The square of the orbital period of a planet is directly proportional to the cube of the semi-major axis of its orbit. Galileo Galilei 1564- 1642 He had his own ideas on how motion really worked, as opposed

to what Aristotle had taught, and devised a telescope that could enlarge objects up to 20 times.

He was able to use this telescope to prove the truth of the Copernican system of heliocentrism. He published his observations which went against the established teaching of the Church. He was brought to trial and, although he made a confession of wrong-doing, he was still imprisoned for life. But it was too late to lock away the knowledge that Galileo shared. Other scientists, including Sir Isaac Newton and Johannes Kepler, seized its importance and were able to learn even more about the ways of the world and the heavens beyond.