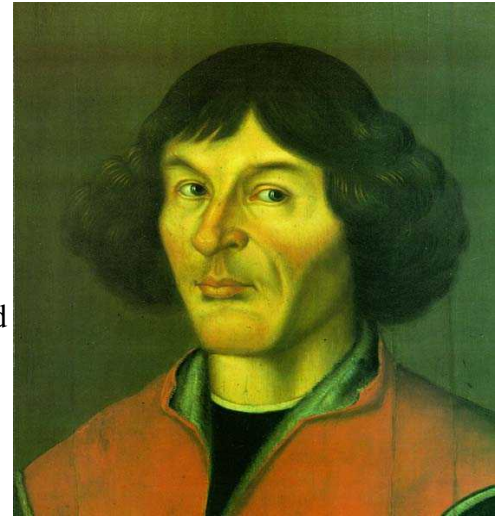


NICOLAUS COPERNICUS

Polish mathematician, physician, canon lawyer, cleric and astronomer **Nicolaus Copernicus** (February 19, 1473 – May 24, 1543) proposed a new and revolutionary cosmology. Some 1700 years before Copernicus, Aristarchus of Samos asserted that the sun was the center of the universe as a working hypothesis, as did the Muslim astronomer Ibn al-Shatir and Nicholas of Cusa.



Copernicus questioned the geocentric theories of Aristotle and Ptolemy, which held that the Earth was the center of the universe – that all the planets and stars, the sun and the moon revolved around the Earth. The geocentric model was a good fit for the ancient and medieval theological idea that God had made human beings special by creating them in His image. This being the case, it only made sense that God established the home of humans as the cradle of His universe. Copernicus did not discard the ideas of Ptolemy entirely. He tinkered with their assumptions, adding and subtracting until he came up with a theory that made sense to him. He proposed a simpler model with fewer assumptions in which the planets orbited in perfect circles around the Sun. It should be remembered that the telescope had not yet been invented and Copernicus made all his observations using only the naked eye.

Nicolaus Copernicus is the Latin version of his Polish name Mikolaj Kopernik in the German-Prussian dialect. He was born into a middle class family in Torun (Thorn), near the Vistula River in Eastern Poland. Torun had belonged to Poland since 1466, but its population was predominately German, making it possible for both Poland and Germany to claim Copernicus as a native son. Eventually his name was changed to the Latin form by which he is best known because Latin was the language that enabled scholars of one country to converse with those of other countries. When Nicolaus was ten

years old, his father died, and his uncle Lucas Watzenrode, later Prince-Bishop of Ermland saw to his nephew's education. Nicolaus attended the parish school of St. John in Torun before leaving for the University of Kraków, where he studied mathematics and science and first became interested in astronomy.

After four years Copernicus left Kraków without receiving a degree and like most Poles of his social class he went to Italy to continue his education. Bishop Watzenrode sent him to the University of Bologna to study medicine and law. Before leaving, his uncle had his nephew appointed canon (a church administrator) at the Cathedral of Frauenberg (now in Frombork), a post that entailed no priestly duties. He held the position until his death, although he was often absent while in the service of the bishop. For the next three-and-a-half years Copernicus studied Greek, mathematics, and Plato at Bologna, while living in the home of mathematics professor, Domenico Maria de Novara, an early critic of the accuracy of Ptolemy's Geography. Through his host, Copernicus became familiar with the astronomical theories of the day and made his first observation, an occultation (an eclipse) of the star Aldebaran by the Moon.

While in Rome in 1500, Nicolaus is believed to have lectured on mathematics and astronomy, disclosing a bit of his new cosmological theory. He also studied medicine and canon law, earning a doctorate in the latter from the University of Ferrara in 1503. The turrets of Heilsberg, where his uncle's Episcopal court was located, those of nearby Allenstein, and of Frauenberg became his observatories where he devoted himself to intensive studies and observations that culminated in his revolutionary astronomical theory.

As his studies progressed, Copernicus became increasingly dissatisfied with the Ptolemaic geocentric

system of the heavens, which had been accepted almost as gospel for some fourteen hundred years.

Ptolemy had devised an elaborate model of the heavens composed of large circles, called deferents, and small circles, called epicycles. Each planet rode on the circumference of an epicycle, the center of which revolved on the deferent. Phenomena that had bothered cosmologists and natural philosophers about the Ptolemaic system from ancient times were the seeming variations in planetary speed and the retrograde (backward) motion of planets on the outer range of the system, namely Mars, Jupiter and Saturn. Ptolemy devised a rather complex system to account for these challenging occurrences.

Copernicus sought a simpler way of explaining these anomalies and may have developed what would come to be known as the Copernican theory as early as 1513, although a full account of it was not published until the end of his life, and only then due to the entreaties of his pupil and disciple Georg Joachim Rheticus. It wasn't so much that Copernicus feared what the Church might say about his theory, although he would probably have been punished and those labeled heretics were frequently put to death. Rather, he was a perfectionist and even after thirty years he didn't feel his novel theory was a complete work. Legend has it that he was on his deathbed when the first printed copy of his *De Revolutionibus Orbium Coelestium (On the Revolutions of the Heavenly Spheres)* was placed in his shaking hands. He died of a cerebral hemorrhage.

Copernicus wrote a short manuscript "A Commentary on the Theories of the Motions of Heavenly Objects from Their Arrangements" (1510 – 1514), summarizing his new ideas, which he privately circulated among friends. He developed his arguments with diagrams and mathematical calculations and was able to describe the motions of the Moon and planets in aesthetically superior ways to those of Ptolemy. Copernicus didn't actually claim that the sun was the center of the universe; his system was heliostatic, rather than heliocentric, as he located the sun at some distance from the center of the

universe. He did insist that the Earth as it spins daily on its axis revolves annually around the sun. He retained some of the principles of Ptolemaic astronomy, employing the circle as the basic curve on which the explanations of the motions of the heavenly bodies were constructed.

The vast majority of his contemporaries, many who couldn't understand the system and many who didn't wish to understand anything so revolutionary, considered Copernicus' theory implausible. His mathematics was highly complex and difficult to understand. It wasn't until the middle of the seventeenth century when Johann Kepler and Galileo championed the system that it gained a measure of support. The Copernican system was provided with a strong theoretical basis when Isaac Newton professed his theory of universal gravitation in 1687.

Protestant theologians were the first to raise objections to the Copernican system for Biblical reasons. The idea that the Earth could no longer be considered the epitome of creation and that it was no more special than other planets also brought into question the importance of human beings and even the existence of God. The opposition of the Roman Catholic Church did not fully surface until some seventy-three years later. In 1616, Copernicus's work was banned by the Congregation of the Index "until corrected", and in 1620 the corrections were indicated. Nine sentences, by which the certainty of the heliocentric system was represented, had to be either omitted or changed. If this was done Copernicus' book could be read. *De Revolutionibus Orbium Coelestium* disappeared from the revised Index of Benedict XIV in 1758.

Quotation of the Day: "In the middle of everything is the sun. For in this most beautiful temple [the universe] who would put this lamp in another or better position than that from which it can light up the

whole thing at the same time? For, the sun is not inappropriately called by some the lantern of the universe, by others, its mind, and, its ruler by still others. ... Thus indeed, as though seated on a royal throne, the sun rules the family of planets revolving around it.” – Nicolaus Copernicus