

Biographical Encyclopedia of Astronomers

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Oresme, Nicole

Born in the diocese of Bayeux, (Calvados), France, circa 1320

Died in Lisieux, (Calvados), France, 11 July 1382

French bishop, scholastic philosopher, economist, and mathematician Nicole Oresme is considered today as one of the principal forerunners of modern science. Oresme's contributions to mathematics and physics are considered decisive ideas for the development of modern science in the 16th and 17th centuries. Editions of Oresme's work were published well into the Renaissance.

Probably Oresme took his philosophical training at the University of Paris under John Buridan, whose influence in Oresme's works is evident. By 1348 he had a scholarship in theology at the College of Navarre in Paris, of which he became grand master (head) in 1356. Oresme left Navarre after his appointment as a canon at Rouen (1362). Later he was appointed Canon at the Sainte-Chapelle in Paris (1363) and Dean of the Cathedral of Rouen (1364). At the behest of King Charles V of France, from about 1370 Oresme translated and annotated many works of Aristotle, including *On the Heavens*, from Latin into French. In his commentaries, he expressed his critique of several Aristotelian tenets by developing many original astronomical, physical, and economic ideas. As a reward for this extensive and challenging work, Charles V appointed him Bishop of Lisieux in 1377. Little is known of Oresme's last years.

Oresme is the author of more than 30 works, the majority of which are still unpublished and remain in manuscript form. As a scholastic philosopher, he is famous for his critique of several Aristotelian positions. Oresme rejected two of Aristotle's main definitions, replacing them with his own: he rejected the definition of the place of a body as the inner boundary of the surrounding medium in favor of a definition of place as the space occupied by the body, and he replaced the definition of time as the measure of motion with a definition of time as the successive duration of things, independent of motion

Oresme's main contributions to astronomy, mathematics, and kinematics are contained in several works produced throughout his life. His two major scientific works are the *Tractatus de configurationibus qualitatum et motum* (Treatise on configurations of qualities and motions), and the *De proportionibus proportionum* (On ratios of ratios). Oresme's main astronomical views are exposed in his early works *Questiones de Celo* and *Questiones de Spera*, in a work opposing astrology, *Questio contra divinatores*, and in his later work written in French, *Le livre du ciel et du monde* (Book on the heavens and the world), a translation of and commentary on Aristotle's *On the Heavens*

A very interesting characteristic of his argumentation is that it often permitted Oresme to suggest unorthodox and radical philosophical ideas while disclaiming any commitment to them. For example, in treating the question of the plurality of worlds, he stressed the possibility that God, by His omnipotence, could create such a plurality, though he ultimately rejected this in

favor of a single Aristotelian cosmos. Another famous example of Oresme's argumentation is his study of the Earth's rotation. He brilliantly argued against Aristotle's "proofs" for a stationary Earth, mainly in his *Le livre du ciel et du monde*. His arguments were based primarily on the idea of complete relativity in the detection of motion and the demonstration that all observed phenomena can be saved equally

By the diurnal rotation of the Earth as well as by the rotation of the heavens, Oresme explained why we cannot exclude the possibility of a rotating Earth. Though he finally concluded, "The truth is, that the earth is not so moved but rather the heavens," he added, "However I say the conclusion [about the nonexistence of such a rotation] can-not be demonstrated but only argued by persuasion."

Another original astronomical idea of Oresme is the metaphor of the heavens as a mechanical clock, which is considered the first attempt to understand mechanically the celestial motions. He suggested the possibility that God implanted in the heavens at the time of their creation special forces and resistances—differing from those on Earth—by which the heavens move continually like a mechanical clock. Through his opposition to astrology, Oresme was also able to expose other aspects of his views about the relation of celestial and terrestrial phenomena. For Oresme, terrestrial phenomena arise from natural and immediate causes rather than from celestial influences, with the exception of the influences of the light of the Sun. Only ignorance, he claimed, causes men to attribute terrestrial phenomena to the heavens, to God, or to demons. Oresme composed his anti-astrology dissertation in Latin, but so strong was his desire to divert people from the false science that he produced a short tract against the practice in French.

Finally, we must mention Oresme's idea to develop mathematical arguments in order to prove the probable incommensurability of the ratio of any two celestial motions. He started from a suggestion by the theologian-mathematician Thomas Bradwardine that an arithmetic increase in velocity corresponds to a geometric increase in the original ratio of force to resistance. Oresme went on to give an extraordinary elaboration of the problem of relating ratios exponentially by treating fractional exponents as ratios of ratios. His idea was the distinction between irrational ratios, of which the fractional exponents are rational, and those of which the exponents are themselves irrational. Based on this treatment, he claimed (without any real proof) that the ratio of any two celestial motions is probably incommensurable. This excluded precise predictions of successively repeating conjunctions, oppositions, and other astronomical aspects using the methodology of astrologers. Oresme presented his original method for manipulating ratios in an independent work, *The Algorithm of Ratios*.

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