

Biographical Encyclopedia of Astronomers

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Theodosius of Bithynia

Born Bithynia, (Anatolia, Turkey), circa 160 BCE

Died circa 90 BCE

Theodosius compiled a three-volume text on spherical geometry, which was much used in the Middle Ages and Renaissance

Euclid's *Elements of Geometry*, while no minor work, does not treat spherical geometry. Astronomers throughout the Hellenistic world thus longed for a text on this important subject. This appetite was satisfied by Theodosius's three-volume *Spherics*. *Spherics* attracts little praise from modern writers: The mathematician T. Heath (1921) judged Theodosius "simply a laborious compiler," for "there was practically nothing original in his work." Otto Neugebauer observed that Theodosius failed to recognize the significance of the great-circle triangle, that his theorems seldom address more than what is obvious, and that his Euclidean rigor is merely cosmetic: his "proofs" do little more than reword the conjectures, and Theodosius seldom admits his assumptions. Writers as early as Pappus commented that the *Spherics* had a very theoretical tone, that (in contrast to a competing text by Apollonius) it hardly ever indicated where in astronomy the mathematics might be applied. Yet the *Spherics* has proven useful enough to endure nearly as long as Euclid's *Elements*: The Greek manuscript was translated into Arabic in the 10th century, and then into Latin by Gerard of Cremona (and perhaps Campanus of Norara) in the 12th century. A Latin edition was printed in 1518, soon followed by Johannes Vögelin's much-improved translation of 1529. The *Spherics* inspired Christoph Clavius to produce a new Latin translation and commentary in 1586, of which an English translation appeared in 1721. Latin translations were also published by other influential thinkers such as Jean Pena (1558, including the first printing of the Greek text), Francesco Maurolico (1558), and Isaac Barrow (1675). Boring and unoriginal *Spherics* may have been, but useless and disregarded it was not.

Theodosius' other astronomical works include two books, *On Days and Nights*, and a 12-theorem book, *On Habitats*. These works, which have survived, discuss how views of the stars and the lengths of night and day depend on the observer's location on Earth, and which parts of the Earth have habitable climates. *On Days and Nights* treats the daily passage of the Sun, with a view to determining the conditions under which the solstice occurs on the meridian, and when equinoctial night and day are truly equal. One interesting conclusion is that, if the year is equal to an irrational number of days, then the stellar phases will show no annual periodicity

Theodosius is also credited with a work on astrology (containing material important to astronomy) and a commentary on Archimedes' *Mechanics*, both of which are lost. Some fragments survive from his *Description of Houses*, which treats problems in architecture. On the practical front, Vitruvius credits Theodosius with inventing a universal sundial, but of this we know no details.

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Vitruvius. *De architectura*. 9.9. (Names Theodosius as the inventor of a sundial "for all climates," i.e., for any latitude.)