Biographical Encyclopedia of Astronomers

Oenopides of Chios

Born Chios, (Khíos, Greece), circa 490 BCE

Died circa 420 BCE

Little is known about the life of mathematician and astronomer Oenopides; his place of birth in Chios is reasonably well documented, and there is circumstantial evidence indicating that he spent time in Athens as a young man.

Oenopides made a number of contributions to mathematics and astronomy. He is thought to have settled on the value of 24° as an estimate for the angle that the ecliptic makes with the celestial equator. (Eudemus attributed the concept of the ecliptic to Oenopides, although the Babylonians were aware that the apparent path of the Sun through the zodiacal constellations was inclined to the plane of the equator.) This is uncertain because there is no explicit reference

to this estimate in the Greek sources; however, Proclus, discussing Euclid IV, 16, says that the construction of a 15-sided regular polygon within a circle was included because it is useful in astronomy. (The 360° division of the circle was not yet developed as a common usage, and this figure would generate central angles of 24°.) It is possible that Oenopides originated both the estimate (24°) and the construction of the 15-sided figure. Plato appears to allude to Oenopides's research on the ecliptic when he includes him in the Erastae

Oenopides seems to be best known for his research on the Great Year. As knowledge of astronomy progressed in classical times, this concept came to refer to the period after which the motions of the Sun, the Moon, and all of the planets would repeat themselves. Aelian and Aetius give Oenopides credit for an estimate of 59 years for the period of the Great Year; it is not clear which years, if any of the planets, were intended to be accounted for within this period. It seems likely that Oenopides made his estimate based on a lunar month of roughly 29 and a half days, and a 365-day solar year. This could quickly lead to the ratio of 730 lunar months for every 59 years; since 59 is a prime number, it would then provide a possible figure for the Great Year period. It appears that Oenopides attempted to confirm this estimate based on observations throughout his life

Oenopides's contributions to mathematics may have a wider significance as well. In his commentary on Euclid's Elements, Proclus cites Oenopides as the originator of two theorems (I.12 and I.23), both having to do with elementary constructions. Ivor Bulmer-Thomas in the *Dictionary of Scientific Biography* makes the interesting conjecture that "it may have been [Oenopides] who introduced into Greek geometry the limitation of the use of instruments in all plane constructions... to the ruler and compass." This may be significant for astronomy because it suggests that Oenopides developed a serious interest in the methodology of mathematics, with a particular focus on the distinctions between theoretical and applied mathematics.

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Selected References

Dicks, D. R. (1985). *Early Greek Astronomy to Aristotle*. Ithaca, New York: Cornell University Press

Heath, Sir Thomas L. (1960). *A History of Greek Mathematics*. 2 vols. Oxford: Clarendon Press.

—— (1956*). The Thirteen Books of Euclid's Elements*. New York: Dover.

Mau, Jürgen (1972). "Oinopides." In *Der kleine Pauly*. Vol. 4, cols. 263-264. Munich: Alfred Druckenmüller.

Morrow, Glenn R. (1970). *Proclus: A Commentary on the First Book of Euclid's Elements*. Princeton, New Jersey: Princeton University Press.

Neugebauer, Otto (1975). *A History of Ancient Mathematical Astronomy*. 3 pts. New York: Springer-Verlag.

Steele, A.D. (1936). "On the Role of Compass and Straightedge in Greek Mathematics." *Quellen und Studien zur Geschichte der Mathematik* 2: 3

Tannery, Paul (1888). "La grande année d'Aristarque de Samos." *Mémoires de la Société des sciences physiques et naturelles de Bordeaux* 4: 79-96.

—— (1976). *Recherches sur l'histoire de l'astronomie ancienne*. Hildesheim, New York: Georg Ohms. (Reprint of the 1893 edition published by Gauthier-Villars, Paris. Includes bibliographical references.)

Thurston, Hugh (1994). *Early Astronomy.* New York: Springer-Verlag