

# Theon of Smyrna | Encyclopedia.com

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(fl. early second century a.d.),

*mathematics, astronomy.*

Theon is known chiefly for his handbook, usually called *expositio rerum mathematicarum adlegendum platonem utilium*. He may well have been the person called “the old Theon” by Theon of Alexandria in his commentary on the *Almagest*. Ptolemy referred to “Theon the mathematician,” who is almost certainly the Theon discussed here, and ascribed to him observations of the planets Venus and Mercury made in 127, 129, 130, and 132 (*Almagest* 9.9, 10.1, 10.2). The latest writers named by Theon were Thrasyllus, who was active under Tiberius, and Adrastus, the Peripatetic and Aristotelian scholar, who flourished not earlier than a.d. 100. A contemporary bust of Theon from Smyrna has an inscription calling him *Platonikos*: he was thus also known as a philosopher, and his philosophical interests are evident in the *Expositio*.

The treatise is valuable for its wide range of citation from earlier sources. There is little evidence of mathematical originality. Despite the title, the book has little to offer the specialist student of Plato’s mathematics. It is, rather, a handbook for philosophy students, written to illustrate how arithmetic, geometry, stereometry, music, and astronomy are interrelated. Geometry and stereometry are cursorily treated, however, perhaps because Theon assumed his readers to be adequately acquainted with them. A promise to provide a lengthy treatment of the harmony of the cosmos (p.17, l. 24, Hiller edition) is not kept in the extant manuscripts; if that part of the treatise was ever written, it may have been lost early.

The arithmetical section treats the types of numbers in the Pythagorean manner; Theon dealt, for example, with primes, geometrical numbers (such as squares), “side” and “diameter” numbers, and progressions.

Music is divided into three kinds: instrumental, musical intervals expressed numerically (theoretical music), and the harmony of the universe. Theon stated clearly that he is not claiming to have discovered any musical principles himself; his aim is to expand the findings of his predecessors. He therefore quoted amply from his authorities—Thrasyllus, Adrastus, Aristoxenus, Hippasus, Eudoxus, and, of course, Plato. In the account of proportions and ratios the discussion concerns the treatment in Eratosthenes’ *Platonikos* of the difference between interval and ratio (διάστημα and λόγος). Eratosthenes is also followed in the exposition of the different kinds of means. Some of the musical part descends into mere number mysticism; it is perhaps the least satisfactory feature of the work. A typical remark (p. 106, Hiller ed.) is that “the decad determines number in all respects. It embraces nature entire within itself, even and odd, moving and unmoved, good and bad.”

In contrast, the astronomical section, which also depends much on Adrastus, is of great merit. The earth is a sphere; mountains are minute when compared with the earth, which lies at the center of the universe. The several circles of the heavens are explained, as are the assumed deviations in latitude of the sun, moon, and planets. The various views concerning the order of the heavenly bodies are noted; those of the (neo)Pythagoreans are contrasted with the systems of Eratosthenes and “the mathematicians.” Some interesting hexameter verses quoted (pp. 138–140, Hiller ed.) on this topic are said to be by Alexander of Aetolia, but are perhaps by Alexander of Ephesus, a contemporary of Cicero; to the other planets, the earth, the sun, the moon, and the sphere of the fixed stars, Alexander gives a tone, so that all are set in an octave by arrangement of the intervals. Eratosthenes he gave a note each to all seven moving bodies and an eighth to the sphere of the fixed stars. This is as close as Theon came to delivering the promised exposition of the harmony of the cosmos.

Theon explained the progressions, stations, and retrogradations of the planets. He described the eccentric and epicyclic hypotheses, and their equivalence. He seemed to consider Hipparchus as the inventor of the epicyclic hypothesis (p. 188, l. 16, Hiller ed.) that “Hipparchos praised as his own”; but there is a misunderstanding, because Apollonius clearly understood the principle of the epicycle before Hipparchus. Apollonius is not among the authorities cited by Theon.

Estimates of the greatest arcs of Mercury and Venus from the sun are given as 20° and 50° (p.187, ll. 10–13, Hiller ed.). After an extensive account of the systems of rotating spheres worked out by Eudoxus, Callippus and Aristotle (pp. 178 ff., Hiller ed.), Theon turned to conjunctions, transits, occultations, eclipses, and the axis through the poles and the center of the zodiac.

Historically the most valuable part of the concluding pages is the brief fragment from Eudemus on pre-Socratic astronomy, which is full of problems. For example, the extant archetype manuscript here states that according to Anaximander, the earth is “on high” (μετέωρος) and “moves” (κινεῖται) about the center of the cosmos. Montucla’s emendation of κινεῖται to κεῖται (“rests”) (see p. 198, l. 19, Hiller ed.) is attractive but by no means certain, since we do not know what Eudemus wrote,

whatever Anaximander's view of the matter may have been. Anaximenes, not Anaxagoras, is here said to have declared that the moon "has her light from the sun."

Other works by Theon are lost. He himself referred to a commentary on Plato's *Republic* (*Expositio* p. 146, 1, 4, Hiller ed.). Ibn al-Nadīm's *Fihrist* mentioned a treatise by him on the titles of Plato's writings and the order in which they should be read. He wrote on the ancestry of Plato, but not certainly in a separate treatise; the study may have formed part of the *Republic* commentary (see Hiller ed., p. 146, on Proclus, *On Timaeus*, p. 26A).

## BIBLIOGRAPHY

The text of the *Expositio* depends almost entirely on two MSS in Venice: the [number theory](#) and the music are in Venet. Marc. 307 (11th-2th cent.), and the astronomy in Venet. Marc. 303 (13th-14th cent.). The first part (pp. 1–119, Hiller ed.) was edited by Ismael Boulliau (Paris, 1644); the other (pp. 120–205, Hiller ed.) by T. H. Martin (Paris, 1849; repr. Groningen, 1971). Both were edited together by E. Hiller in the Teubner version (Leipzig, 1878).

For further discussion, see K. von Fritz, in Pauly-Wissowa, *Real-Encyclopädie der classischen Altertums wissenschaft*, 2nd, ser., X (1934), 2067–2075, s.v. Theon (14), with bibliography; and T. L. Heath, *A History of Greek Mathematics*, II (Oxford, 1921), 238–244. On the hexameter verses, see E. Hiller, in *Rheinisches Museum für Philologie*, **26** (1871), 586–587; and A. Meineke, *Analecta Alexandrina* (Berlin, 1843; repr. Hildesheim, 1964), 372–374.

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