Diocles | Encyclopedia.com

(second century b.c. [?])

mathematics, physics.

Nothing is known of the life of this Greek mathematician, but he must have lived after Archimedes (*d*. 212 b.c.) and before Geminus of Rhodes [*fl*. 70 b.c.). Eutocius, a Byzantine mathematician of the fifth and sixth centuries, preserved two fragments of Diocles' work *On Burning Mirrors* in his commentary on Archimedes' *On the Sphere and Cylinder*.

One of these fragments deals with the solution of the problem of the two mean proportionals by means of the cissoid, which Diodes invented. The problem of doubling the cube, the celebrated Delian problem of ancient geometry, had been the subject of mathematical investigation at least as early as the fifth century B.C. Hippocrates of Chios is reported to have discovered that a solution could be found if a way could be devised for finding two mean proportionals in continued proportion between two straight lines, the greater of which line is double the lesser. The question was studied by Plato's Academy and a mechanical solution is even attributed, erroneously, to Plato. Before Diocles, solutions were offered by Archytas, Eudoxus, Menaechmus, Eratosthenes, Nicomedes, Apollonius, Hero, and Philo of Byzantium. All of these, and later solutions, are preserved by Eutocius.

Proposition 4 of Book II of Archimedes' *On the Sphere and Cylinder* presents the problem of how to cut a given sphere by a plane in such a way that the volumes of the segments are in a given ratio to one another. Diocles' solution to the problem, as given in the fragment preserved by Eutocius, was an ingenious geometrical construction that satisfied, by means of the intersection of an ellipse and a hyperbola, the three simultaneous relations which hold in Archimedes' proposition.

Diocles' work *On Burning Mirrors*, judging from the time at which he lived and the work of his predecessors, must have been of considerable scope. It can be assumed that it discussed concave mirrors in the forms of a sphere, a paraboloid, and a surface described by the revolution of an ellipse about its major axis. Apollonius of Perga, a mathematician who was born about 262 b.c., had earlier written a book on burning mirrors, but Arabic tradition associated Diocles with the discovery of the parabolic burning mirror. The Greek *Fragmentum mathematicum Bobiense* contains a fragment of a treatise on the parabolic burning mirror, and some authorities have attributed this work to Diocles. Others consider this attribution very doubtful. William of Moerbeke translated into Latin the fragments of Diocles on mean proportionals and the division of the sphere as a part of his general translation from the Greek of the works of Archimedes and Eutocius' commentaries on them.

BIBLIOGRAPHY

The fragments of Diocles' work can be found in *Archimedis Opera omnia cum commentariis Eutocii iterum*, J. L. Heiberg, ed., III (Leipzig, 1915), 66–70, 160–176.

On Diocles or his work, see Moritz Cantor, *Vorlesungen über Geschichte der Mathematik*, I (Stuttgart, 1907, repr. New York, 1965), 350, 354–355; Thomas Heath, *A History of Greek Mathematics*, 2 vols. (Oxford, 1960), I, 264–266;II, 47–48, 200–203; George Sarton, *Introduction to the History of Science*, I (Baltimore, 1927), 183; Moritz Steinschneider, *Die europäischen Uebersetzungen aus dem arabischen bis Mitte des 17. Jahrhunderts* (Graz, 1965), p.17; and E. Wiedemann, "Ibn al Haitams Schrift über parabolische Hohlspiegel," in *Bibliotheca mathematica*, 3rd ser., **10** (1909–1910), 202.

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