MENAECHMUS' PHILOSOPHICAL INVESTIGATIONS

Known as a distinguished member of Plato's Academy, Menaechmus lived about the middle of the forth century B.C.[1]. F.A. Wright[2], J. Mantinband[3], M. Clagett[4], and W.R. Knorr[5] insisted that Menaechmus was a disciple of Eudoxus, whereas J. Mau[6] asserted that Menaechmus was on good terms with Plato. According to P. Kroh[7], Menaechmus accelerated the scientific process that started within the Platonic Academy, while on the other hand, according to I.A. Fabricius[8], Menaechmus was very much in favour with the Later Pythagoreans. In our opinion, it is worth mentioning that, according to F. Lasserre[9], Isocrates, who was not versed in geometry and astronomy, made some depreciatory remarks about the scientific process that had started within the Platonic Academy. As a matter of fact, Isocrates admitted that even if geometry and astronomy «cannot make better men of them, they have at least the advantage of keeping young people out of mischief»[10], but he maintained that «after the examinations which qualify one for the rights of an adult...these activities are less appropriate»[11]. Taking into account that Isocrates found fault with the work of the mathematicians who lived about the year 340 B.C.[12], we are inclined to think that he chiefly argued against Menaechmus, who was tutoring Alexander the Great in mathematics[13].

Eudemus of Rhodes[14] implied that Menaechmus was almost the same age as Philippus of Opus, who was born in 388/ 387 B.C.[15]. According to F.

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1. Cf. G. Sarton, *A History of Science*, Vol. 1, London, Oxford Univ. Press, 1953, p. 503.
2. Cf. F.A. Wright, Menaechmus, *Lemprière's Classical Dictionary*, London, Routledge and Kegan Paul, 1958[5], p. 371.
3. Cf. J. Mantinband, Menaechmus, *Concise Dictionary of Greek Literature*, London, Owen, 1963[2], p. 258.
4. Cf. M. Clagett, *Greek Science in Antiquity*, London, Abelard-Schuman Ltd, 1957, p. 187.
5. Cf. W.R. Knorr, Menaechmus, *The Oxford Classical Dictionary*, New York, Oxford Univ. Press, 1996, p. 956.
6. Cf. J. Mau, Menaichmos, *Der kleine Pauly*, Vol. 3, Stuttgart, Druckenmüller, 1969, p. 1196.
7. Cf. P. Kroh, Menaichmos, *Lexikon der antiken Autoren*, Stuttgart, Kröner, 1972, p. 406.
8. Cf. I.A. Fabricius, *Bibliotheca Graeca*, Vol. 1, Hildesheim, Olms, 1966[5], p. 852.
9. Cf. F. Lasserre, *The Birth of Mathematics in the Age of Plato*, London, Hutchinson, 1964, p. 41.
10. Cf. Isocr., *Panath.*, 27. The translation is by F. Lasserre, *op. cit.*, p. 41.
11. Cf. Isocr., *Panath.*, 28. The translation is by F. Lassserre, *op. cit.*, p. 41.
12. Cf. Idem, *loc. cit.*, p. 41.
13. Cf. Menaechm., T3 Lasserre.
14. Cf. Phil. Op., F15[b] Lasserre.
15. Cf. C.N. Polycarpou, The Hedonism of Philippus of Opus (in Greek), *Philosophia*, 27-28, 1997 - 1998, p. 398.

Lasserre[16], Philippus of Opus was the first to give an orderly account of a series of events concerning Menaechmus'life. In spite of the fact that Philippus'writings have been lost, we consider that Plutarchus and Proclus gave the principal points of Menaechmus'intellectual and emotional characteristics. According to E. Hoppe[17], Menaechmus was a native of Alopeconnesus, whereas, according to G. Hauser[18], Menaechmus was a native of Proconnesus. In our opinion, the question about Menaechmus'native land has given rise to much controversy because an anonymous compilator, who lived before Hesychius of Miletus[19] and had no idea of the difference between Old and New Proconnesus[20], did not realize that Menaechmus was a native of Old Proconnesus, who became a citizen of Cyzicus because of the events of 360 B.C.[21]. On the contrary, the anonymous compilator, who did not keep in mind that, according to Demosthenes[22], all the inhabitants of Alopeconnesus were practising piracy, assumed that Menaechmus was a native of Alopeconnesus.

F. Lasserre[23] held that for a time Eudoxus was a lecturer at Athens, surrounded by Menaechmus and other disciples, who were to carry on the work of the distinguished mathematician and astronomer of Cnidus. According to F. Lasserre, Philippus of Opus[24] was the first to stress the point that Menaechmus and Amyclas of Heraclea, who went to live in Plato's Academy, made the whole of geometry more perfect. In our opinion, it is worth mentioning that, according to Hermodorus of Syracuse[25], Amyclas was a Platonist, whereas, according to Aelian[26], it was generally admitted that Plato held Amyclas in great esteem. Taking into account that Amyclas was a mathematician noted for his knowledge of philosophy, we are inclined to think that, according to Menaechmus, who regarded Amyclas with friendship, mathematics was indissolubly linked to philosophy. Furthermore, we are of the opinion that Menaechmus, who lived in Plato's Academy for a long time, decided to return to his native land because of the events of 355 B.C.[27]. As far as we know, afterwards Menaechmus became an eminent scholarch, who dedicated the best of himself to science. In point of fact,

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16. Cf. F. LASSERRE, *De Léodamas de Thasos à Philippe d'Oponte*, Napoli, Bibliopolis, 1987, p. 545.

17. Cf. E. HOPPE, *Mathematik und Astronomie im klassischen Altertum*, Heidelberg, Winter, 1911, p. 186.

18. Cf.G. HAUSER, *Geometrie der Griechen von Thales bis Euklid*, Luzern, Haag, 1955, p. 148.

19. Cf. MENAECHM., T2 Lasserre.

20. Cf. STR., *Geog.*, 6. 33.

21. Cf. A.M. MANSEL, Prokonnesos, *Der kleine Pauly*, Vol. 4, Stuttgart, Druckenmüller, 1972, p. 1163.

22. Cf. DEMOSTH., *Aristocr.*, 166.

23. Cf. F. LASSERRE, *The Birth of Mathematics*, p. 166.

24. Cf. PHIL. OP., F15[b] Lasserre.

25. Cf. AMYCL., T2 Lasserre.

26. Cf. IDEM, T4 Lasserre.

27. Cf. K.D. KAPSALIS, Cyzicus, *Great Greek Encyclopedia*, Vol. 15, Athens, Phoenix, p. 336.

it is not merely implied but distinctly stated by Philippus of Opus[28] that Menaechmus exerted influence upon mathematicians such as Dinostratus and Athenaeus of Cyzicus.

According to F. Kliem[29], the question whether Menaechmus tutored Alexander the Great in mathematics or not has never been answered because it is a question formed so as to elicit an opinion rather than an affirmative answer or a negative one. On the contrary, J. Barnes[30], who did not adopt a sceptical attitude towards Stobaeus and John of Damascus, was inclined to accept that Menaechmus and Aristotle «were for some years fellow tutors at the court of Pella». As a matter of fact, T.C. Sarikakis[31] took into account that, according to Pseudocallisthenes and Julius Valerius, Menaechmus of Peloponnesus tutored Alexander the Great in mathematics. In our opinion, the question about Menaechmus' native land has given rise to much controversy because an anonymous compilator, who lived before Pseudocallisthenes and Julius Valerius, failed to distinguish between the mathematician Menaechmus of Proconnesus and the historian Menaechmus of Sicyon because he did not keep in mind that Aristotle was well acquainted not only with Menaechmus of Proconnesus but also with Menaechmus of Sicyon[32]. Moreover, it is noteworthy that Menaechmus was on good terms with Aristotle, who lectured in the Lyceum for thirteen years[33], but he never paid a visit to him at Athens. On the other hand, no one can deny the fact that Callippus of Cyzicus, who was well acquainted with Menaechmus, corrected Eudoxus' theory of homocentric spheres with Aristotle's help while on a visit to him at Athens[34]. This being so, we are inclined to believe that Menaechmus' death took place about the year 335 B.C..

According to P.H. Michel[35], T.H. Martin was the first to argue that the eminent mathematician Menaechmus and the philosopher Menaechmus, who was regarded as the author of a commentary on Plato's *Republic*, may be the

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28. In our opinion, it is worth mentioning that Philippus of Opus, who was a well educated associate of Plato, alluded to οἱ περὶ Μέναιχμον (cf. MENAECHM., D5 Lasserre). Indeed, according to E. ZELLER - R. MONDOLFO, *La filosofia dei Greci nel suo sviluppo storico*, Part 1, Vol. 2, Firenze, La Nuova Italia, 1950², pp. 48-49, οἱ περί τινα was a phrase used in order to indicate the associates of a scholarch.

29. Cf. F. KLIEM, Menaichmos, *Paulys Realencyclopädie der klassischen Altertumswissenschaft*, Vol. 15, Part 1, Stuttgart, Metzler, 1931, p. 700.

30. Cf. J. BARNES, Aristotle, Menaechmus, and Circular Proof, *The Classical Quarterly*, 70, 1976, p. 288.

31. Cf. T.C. SARIKAKIS, Alexander's Tutors at the Court of Pella (in Greek), *in Alexander the Great*, Thessaloniki, A Publication of the Hellenic Society for Macedonian Studies, 1980, p. 237.

32. Cf. P. MORAUX, *Les listes anciennes des ouvrages d'Aristote*, Louvain, Éditions Univ. de Louvain, 1951, pp. 200-201.

33. Cf. DIOG. LAERT., *V.P.*, 5. 10.

34. Cf. D.R. DICKS, *Early Greek Astronomy to Aristotle*, Ithaca, Cornell Univ. Press, 1970, p. 190.

35. Cf. P.H. MICHEL, *De Pythagore à Euclide*, Paris, Les Belles Lettres, 1950, p. 253.

same person. On the other hand, A. Rey[36] criticized T.H. Martin for arguing that the mathematician Menaechmus and the philosopher Menaechmus may be the same person. In our opinion, T.H. Martin rightly placed great emphasis on Proclus' phrase Μέναιχμος... Πλάτωνι... συγγεγονώς[37] but he never realized that συγγεγονὼς was an ambiguous term used either in order to indicate that Menaechmus «studied with Plato»[38] or in order to indicate that Menaechmus «held converse with Plato»[39]. Being of the opinion that Menaechmus «studied with Plato», G. Sarton[40] maintained that Menaechmus was a disciple of Plato personally known to and on at least nodding terms with Eudoxus. On the contrary, being of the opinion that Menaechmus «held converse with Plato», F. Lasserre[41] maintained that Menaechmus was a disciple of Eudoxus personally known to and on at least nodding terms with Plato.

In our effort to facilitate research, we place great emphasis on Hesychius' phrase Μέναιχμος... Πλατωνικός[42] and we take into account that Πλατωνικὸς was an ambiguous term used either in order to indicate that Menaechmus was regarded as a disciple of Plato or in order to indicate that Menaechmus adhered to Plato's doctrines. In our opinion, it is noteworthy that, according to the commentator Asclepius[43], Eudoxus was considered an ἀστρονόμος Πλατωνικὸς because he was present at a course of lectures given by Plato. This being so, we are inclined to think that Menaechmus was regarded as an ἀστρονόμος Πλατωνικὸς because he was present at the above- mentioned course of lectures. As far as we know, Menaechmus was considered a Πλάτωνι... συγγεγονὼς because, according to Philippus of Opus[44], Amyclas and Menaechmus «conducted their investigations in common»[45]. Taking into account that Amyclas was primarily interested in Plato's geometry, whereas Menaechmus was primarily interested in Eudoxus' geometry, we reckon that both mathematicians concerned themselves with the theorems about the section[46]. In our opinion, Amyclas probably emphasized the importance of «the

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36. Cf. A. Rey, *La jeunesse de la science grecque*, Paris, La Renaissance du Livre, 1933, p. 211.

37. Cf. Menaechm., T1 Lasserre.

38. Cf. F. Lasserre, *The Birth of Mathematics in the Age of Plato*, London, Hutchinson, 1964, p. 40.

39. Cf. H.G. Liddell-R. Scott, *A Greek-English Lexicon*, London, Oxford Univ. Press, 1940[9], p. 1660.

40. Cf. G. Sarton, *op. cit.*, p. 503.

41. Cf. F. Lasserre, *De Léodamas de Thasos à Philippe d'Oponte*, Napoli, Bibliopolis, 1987, p. 545.

42. Cf. Menaechm., T2 Lasserre.

43. Cf. Eudox., D30 Lasserre.

44. Cf. Phil. Op., F15[b] Lasserre.

45. The translation is by F. Lasserre, *The Birth of Mathematics*, p. 40.

46. According to H.G. Liddell-R. Scott, *op. cit.*, p. 1804, τομὴ was a term used in order to indicate the golden section.

theorems which originated with Plato about the section»[47] and Menaechmus probably stressed the point that Eudoxus was the first to multiply those theorems[48].

According to F. Schachermeyr[49], Menaechmus approved of Plato's position that the Forms are to be explained in terms of number. On the other hand, H.J. Krämer[50] remarked that Menaechmus never proceeded from the level of mathematics to that of ontological principles. In our opinion, Menaechmus probably did not develop any theory of ontological principles because he adhered to Eudoxus'doctrines. This being so, we are inclined to think that Menaechmus' theory of Forms was different from the Platonic one. According to F. Lasserre[51], Menaechmus never used the term θεώρημα, which was indissolubly linked «to the idea of contemplation and thus to the whole Platonic doctrine of knowledge». Furthermore, according to F. Lasserre[52], Menaechmus never used the term ἀξίωμα, which was indissolubly linked to «the Platonic idea of perfect beings underlying the expressions of mathematics». As a matter of fact, A.C. Bowen[53] held that Menaechmus «was provoked by Plato's representation of geometry in the *Republic* to respond» and that he «was probably the first to detail the geometer's viewpoint». Moreover, A. Capizzi[54] contended that Menaechmus disagreed with Theodorus of Cyrene and Theatetus of Athens about the approach on the solution of geometrical problems. Taking into account that Socrates was an advocate of Theodorus'and Theatetus'representation of geometry[55], one may be under the impression that Menaechmus disagreed with Socrates about the approach on the solution of geometrical problems.

According to F. Lasserre[56], it is remarkable that Menaechmus' name was connected in antiquity with «the identification of the three curves, other than the circle, which can be determined by the intersection of a plane with a cone: the *ellipse*, the *parabola* and the *hyperbola*»[57]. In our opinion, Plutarchus implied that Menaechmus and the mathematicians of his School were followers

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47. Cf. EUDOX., D22 Lasserre. The translation is by F. LASSERRE, *op. cit.*, p. 40.

48. Cf. EUDOX., D22 Lasserre.

49. Cf. F. SCHACHERMEYR, *Alexander der Grosse*, Wien, Verlag der österreichischen Akademie der Wissenschaften, 1973, p. 79.

50. Cf. H. FLASHAR, *Die Philosophie der Antike*, Vol. 3, Basel, Schwabe, 1983, p. 132.

51. Cf. F. LASSERRE, *The Birth...*, London, Hutchinson, 1964, p. 30.

52. Cf. IDEM, *loc. cit.*, p. 31.

53. Cf. A.C. BOWEN, Menaechmus versus the Platonists: two Theories of Science in the Early Academy, *Ancient Philosophy*, 3, 1983, p. 21.

54. Cf. A. CAPIZZI, *Platone nel suo tempo*, Roma, Edizioni dell'Ateneo, 1984, p. 93.

55. Cf. C.G. NIARCHOS, *Plato's Theatetus* (in Greek), Athens, Kardamitsas, 1989, pp. 63-64.

56. Cf. F. LASSERRE, *The Birth...*, p. 120.

57. Cf. MENAECHM., D2[c] Lasserre. According to Pappus, the terms *ellipse*, *parabola* and *hyperbola* were introduced by Apollonius of Perga.

of Archytas and the mathematicians of his School[58] because he reckoned that Menaechmus had respect for Archytas, who encouraged his disciples to use instruments other than the ruler and the compasses[59]. In point of fact, we have reason to believe that, according to Plutarchus[60], Eudoxus, who was an outstanding disciple of Archytas[61], encouraged Menaechmus to use instruments other than the ruler and the compasses. This being so, we concur with J. Gow[62] in observing that Menaechmus probably used a machine for drawing the *ellipse*, the *parabola* and the *hyperbola* . On the other hand, it is worth recalling that Dinostratus, who contributed to Menaechmus' mathematical theories[63], tried to find a square of the same area as the circle by means of a curve used for the first time by Hippias of Elis[64]. Taking into account that, according to Hippias[65], the mode of existence of the objects of mathematics has to do with the mode of existence of sensible things, we are inclined to think that Hippias exerted influence upon Menaechmus.

According to Philippus of Opus[66], Menaechmus disagreed with Speusippus about the character of the propositions of mathematics, although both thinkers had willingly devoted time and attention to philosophy of mathematics[67]. By adopting a critical attitude towards Menaechmus and his followers, Speusippus maintained that the objects of mathematics are «eternal entities which have separate existence»[68]. In his effort to facilitate research, R.M. Dancy[69] asserted that, according to Menaechmus, the objects of mathematics «are products of the mathematicians' minds». Furthermore, R.M. Dancy concurred with G.E.R. Lloyd[70] in observing that «in the very heart of Plato's Academy there were

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58. Cf. IDEM, D1[e] Lasserre.

59. Cf. P.H. MICHEL, *op. cit.*, p. 64.

60. Cf. MENAECHM., D1[d] Lasserre.

61. Cf. EUDOX., T7 Lasserre.

62. Cf. J. GOW, *A Short History of Greek Mathematics,* London, Cambridge Univ. Press, 1884, p. 186.

63. Cf. DINOSTR., T1 Lasserre. According to F. LASSERRE, *De Léodamas de Thasos à Philippe d'Oponte,* 1987, p. 561, Dinostratus was a disciple of Eudoxus. Granting this to be true, we consider that Eudoxus exerted influence upon Dinostratus, who was probably the first to study point for point the properties of curves such as *hippopede* (cf. EUDOX., F124 Lasserre).

64. Cf. I. TÓTH, Le problème de la mesure dans la perspective de l'être et du non-être, *in* R. RASHED, *Mathématiques et philosophie, de l'antiquité à l'âge classique*, Paris, Éditions du C.N.R.S., 1991, p. 98.

65. Cf. M. UNTERSTEINER, *I Sofisti*, Vol. 2, Milano, Lampugnani Nigri, 1967, p. 125.

66. Cf. MENAECHM., D5 Lasserre.

67. Cf. G. MILHAUD, *Platon et ses prédécesseurs. Les philosophes géomètres de la Grèce*, Paris, Vrin, 1934[2], p. 177.

68. Cf. L. TARÁN, *Speusippus of Athens*, Leiden, Brill, 1981, p. 425.

69. Cf. R.M. DANCY, *Two Studies in the Early Academy*, Albany, State Univ. of New York Press, 1991, p. 83.

70. Cf. G.E.R. LLOYD, *The Revolutions of Wisdom*, Berkeley and Los Angeles, Univ. of California Press, 1987, p. 76.

disputes of a more than purely nominal kind». Being in agreement with G.E.R. Lloyd on that point, J. Cleary[71] criticized Proclus for adopting «a typical syncretic approach» which «does not restored the report of an ancient debate that originated in Plato's Academy».

According to L. Tarán[72], Proclus, who gave an outline of the above-mentioned debate, was at least using Speusippus'and Menaechmus'own terminology. On the other hand, A.C. Bowen[73] maintained that, according to Proclus, Speusippus was the first to argue against Menaechmus in order to state in a different way Plato's position on the mode of existence of the objects of mathematics. Moreover, A.C. Bowen[74] insisted that Proclus'commentary on the first book of Euclid's *Elements* drew on Geminus. One should particularly mention that, according to T. Kouremenos[75], notwithstanding the fact that Geminus was in favour of Menaechmus'position on the mode of existence of the objects of mathematics, Proclus was not of the same opinion. As a matter of fact, G. Molland[76] gave the principal points of Menaechmus'and Speusippus' intellectual characteristics by taking into account that Menaechmus was primarily a mathematician, whereas Speusippus was primarily a philosopher. This being so, we may conclude, from the evidence produced by Plutarchus[77] and John of Damascus[78], that, according to Menaechmus, the truths of geometry have the quality of being elegant.

Taking into account that Menaechmus was an advocate of the doctrine that almost everything can be explained in mathematical terms, C. Mugler[79] implied that Menaechmus was not a mere speculatist. Being of the same opinion, J. Barnes[80] pointed out that, according to Menaechmus, «there can be demonstration of everything-of all the truths of geometry without exception». Furthermore, J. Barnes[81] reckoned that Menaechmus, who «observed that mathematical proofs often exhibited a certain limited reciprocity or circularity», «conveyed the fact to Aristotle, who attempted to formalize and

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71. Cf. J. Cleary, *Aristotle and Mathematics*, Leiden, Brill, 1995, p. xxvii.

72. Cf. L. Tarán, Proclus on the Old Academy, *in* J. Pépin-H.D. Saffrey, *Proclus lecteur et interprète des anciens*, Paris, Éditions du C.N.R.S., 1987, p. 243.

73. Cf. A.C. Bowen, *op. cit.*, p. 21.

74. Cf. Idem, *loc. cit.*, pp. 28-29.

75. Cf. T. Kouremenos, Posidonius and Geminus on the Foundations of Mathematics, *Hermes*, 122, 1994, p. 448.

76. Cf. G. Molland, Implicit versus explicit geometrical methodologies: the case of construction, *in* R. Rashed, *op.cit.*, p. 184.

77. Cf. Menaechm., D1[d] Lasserre.

78. Cf. Idem, T3 Lasserre.

79. Cf. C. Mugler, *Platon et la recherche mathématique de son époque*, Strasbourg, Heitz, 1948, p. 324.

80. Cf. J. Barnes, *op. cit.*, p. 286.

81. Cf. Idem, *loc. cit.*, p. 292.

explain it within his syllogistic». On the other hand, W. Burkert[82] stressed the point that Menaechmus was the first to distinguish between the two meanings of the term στοιχεῖον, which had been introduced by Hippocrates of Chios. Moreover, according to T. Eide[83], it stands to reason that Menaechmus exerted influence upon Aristotle and from this viewpoint one can see «why Aristotle adopted στοιχεῖον as a term of logical inference». In our opinion, it is remarkable that, according to Philippus of Opus[84], Menaechmus and the mathematicians of his School were greatly interested in τὸ ζητούμενον ...περιωρισμένον ἰδεῖν ἢ τί ἐστιν, ἢ ποῖόν τι, ἢ τὶ πέπονθεν, ἢ τίνας ἔχει πρὸς ἄλλο σχέσεις[85] and thus they drew Aristotle's attention to the categories of οὐσία, ποιόν, πάσχειν, πρὸς τι[86].

L. Robin[87] contended that Menaechmus surpassed all empirical investigators because he was one of Eudoxus'immediate followers, whereas C. Ritter[88] reckoned that the spirit of Plato's Academy enabled Menaechmus to highlight the importance of rationalistic research. Really, according to W. Knorr[89], Menaechmus was credited with going towards a solution of the problem of doubling the cube on the basis of Plato's analytical method. As a matter of fact, H.G. Zeuthen objected to Menaechmus' solution of the problem of doubling the cube, but the criticism at this point was subdued by Sir T.L. Heath[90]. On the other hand, C. Mugler[91] held that Menaechmus became an opponent of the Eleatics because he was a mechanician. In our opinion, Menaechmus' way of thinking was different from that of the Eleatics because, according to the Eleatics[92], the concept of motion had to do with the mode of existence of sensible things, whereas, according to Menaechmus[93], the concept of motion had to do not only with the mode of existence of sensible things but also with the mode of existence of the objects of mathematics.

In addition, it is worth recalling that Plutarchus[94] and Proclus[95], who drew on

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82. Cf. W. BURKERT, *Στοιχεῖον*. Eine semasiologische Studie, *Philologus*, 103, 1959, p. 195.

83. Cf. T. EIDE, Aristotelian Topos and Greek Geometry, *Symbolae Osloenses*, 70, 1995, p. 15.

84. Cf. MENAECHM., D5 Lasserre.

85. Cf. IDEM, D5 Lasserre. Sir T.L. HEATH, *The Thirteen Books of Euclid's Elements*, Vol. 1, New York, Dover Publications, 1956[3], p. 125, stressed the point that Menaechmus and the mathematicians of his School were able «to take a determinate object and see either what it is, or of what nature, or what is its property, or in what relations it stands to something else».

86. Cf. ARIST., *Top.*, A9, 103 b 22-23.

87. Cf. L. ROBIN, *Platon*, Paris, P.U.F., 1968[2], p. 59.

88. Cf. C. RITTER, *Platon*, Vol. 2, München, Beck, 1923, p. 397.

89. Cf. W. KNORR, Mathématiques, *in* J. BRUNSCHWIG-G. LLOYD, *Le savoir grec*, Paris, Flammarion, 1996, p. 425.

90. Cf. Sir T.L. HEATH, *Apollonius of Perga*, Cambridge, Heffner and Sons, 1961[2], p. xxx.

91. Cf. C. MUGLER, *op. cit.*, p. 15.

92. Cf. ZENO ELEAT., B4 Diels.

93. Cf. S. PAPADAKIS, *A General History of Science* (in Greek), Vol. 1, Athens, Voyatzis, 1957, p. 252.

94. Cf. MENAECHM., D1[e] Lasserre.

95. Cf. IDEM, D7 Lasserre.

Philippus of Opus, made mention not only of Menaechmus but also of «the mathematicians of the School of Menaechmus». Taking into account that Menaechmus, Dinostratus of Proconnesus and Athenaeus of Cyzicus «consorted together in the Academy and conducted their investigations in common»[96], we are inclined to think that Dinostratus and Athenaeus were regarded as the most eminent mathematicians of the School of Menaechmus. As far as we know, the mathematicians of the School of Menaechmus surpassed their rivals and, according to Philippus of Opus, Athenaeus of Cyzicus «became famous...in geometry»[97] to such an extent that Hippocrates of Chius and Theodorus of Cyrene had become famous in geometry[98]. Furthermore, it is noteworthy that, according to Philippus of Opus, Athenaeus of Cyzicus «became famous in other branches of mathematics»[99]. In our opinion, one may conclude, from the evidence produced by Plato[100], that Athenaeus, who was a disciple of Eudoxus[101], became famous not only in geometry but also in astronomy. Taking into account that Athenaeus and Dinostratus conducted their investigations in common, we consider that Athenaeus held that every angle can be trisected by means of a curve used for the first time by Hippias of Elis[102]. A. Szabó and E. Maula[103] were the first to realize that Hippias concerned himself with the problem of trisecting every angle because this problem had to do with important new developments in astronomy. In point of fact, according to A. Szabó and E. Maula[104], some Greek astronomers who lived before Claudius Ptolemaeus were able to divide every angle into three approximately equal parts. This being so, we have reason to believe that Athenaeus, who lived after Hippias, shed light on some aspects of the problem of trisecting every angle and thus he contributed to Menaechmus' mathematical theories.

In his effort to facilitate research, P. Tannery[105] maintained that Menaechmus was the first to develop the theory of conic sections[106] because Eudoxus was the first to multiply the theorems about the section. On the other

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96. Cf. PHIL. OP., F15[b] Lasserre. The translation is by F. LASSERRE, *The Birth of Mathematics in the Age of Plato*, London, Hutchinson, 1964, p. 40.

97. Cf. ATHEN., T1 Lasserre. The translation is by F. LASSERRE, *op. cit.*, p. 40.

98. Cf. PHIL. OP., F15[b] Lasserre.

99. Cf. ATHEN., T1 Lasserre. The translation is by F. LASSERRE, *op. cit.*, p. 40.

100. Cf. PL., *Lg.*, Z, 817 e.

101. Cf. F. LASSERRE, *De Léodamas de Thasos à Philippe d'Oponte*, p. 573.

102. Cf. DINOSTR., T2 Lasserre.

103. Cf. A. SZABÓ-E. MAULA, *Enklima. Untersuchungen zur Frühgeschichte der griechischen Astronomie, Geographie und der Sehnentafeln*, Athen, Forschungsinstitut für griechische Philosophie, 1982, pp. 240-241.

104. Cf. IDEM, *op. cit.*, pp. 231-232.

105. Cf. R. TATON, *La science antique et médiévale*, Paris, P.U.F., 1966[2], p. 239.

106. According to Geminus (cf. MENAECHM., D2[b] LASSERRE), the mathematicians who lived after Apollonius of Perga called the *ellipse*, the *parabola*, and the *hyperbola*, conic sections.

hand, O. Neugebauer[107] stressed the point that the acceptance of the astronomical origin of the theory of conic sections can fulfil all requirements which lead to Menaechmus' definition of conic sections. As a matter of fact, E. Stamatis[108] insisted that Menaechmus was the first to conceive and develop the theory of conic sections, whereas H.J. Waschkies[109] explained that, according to Apollodorus of Athens, Plato, Archytas, Eudoxus, and Menaechmus conducted their investigations in common. Moreover, it is worth recalling that K.D. Georgoulis[110] concluded, from the evidence produced by the author of *Vita Marciana*, that Aristotle had a thorough knowledge of Menaechmus' theory of conic sections. To the great advantage of the history of astronomy, Sir T.L. Heath[111] expounded «the only reference in the Aristotelian writings to a section of a cone... discovered... by Menaechmus». In our opinion, it is remarkable that Apollonius of Perga asserted that the forth book of his *Conic Sections* «contains other matters in addition, none of which has been discussed by earlier writers»[112] because he was keeping in mind that Menaechmus and his followers did not discuss every matter related to the theory of conic sections.

F. Lasserre[113] concluded, from the evidence produced by Geminus, that Menaechmus was the first to use the names *section of a right-angled*, *acute-angled*, and *obtuse-angled cone* . Indeed, according to Pappus, «Aristaeus used the names *section of a right-angled*, *acute-angled*, and *obtuse-angled cone*, by which up to the time of Apollonius the three conic sections were known»[114]. In our effort to emend Pappus'above-mentioned passage, we consider that the term ὥσπερ may be inserted between the terms ἐκάλει and καί. In other words, we maintain that the true reading of Pappus' text is as follows: Ἀρισταῖος δέ...ἐκάλει<ὥσπερ> καὶ οἱ πρὸ Ἀπολλωνίου τῶν τριῶν κωνικῶν γραμμῶν τὴν μὲν ὀξυγωνίου, τὴν δὲ ὀρθογωνίου, τὴν δὲ ἀμβλυγωνίου κώνου τομήν[115]. In addition, it is noteworthy that, according to Pappus[116], Euclid never criticized Menaechmus for using the names *section of a right-angled, acute-angled* and *obtuse-angled cone* . Taking into account that Euclid was an

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107. Cf. O. Neugebauer, The Astronomical Origin of the Theory of Conic Sections, *Proceedings of the American Philosophical Society*, 92, 1948, p. 136.

108. Cf. E. Stamatis, On the Problem of Doubling the Cube, *The Helios Encyclopedia*, Vol. 5, Athens, Helios, p. 911.

109. Cf. H.J. Waschkies, *Von Eudoxos zu Aristoteles*, Amsterdam, Grüner, 1977, p. 40.

110. Cf. K. D. Georgoulis, *Aristotle of Stagira* (in Greek), Thessaloniki, Chalcidicean Society for Historical and Folkloric Studies, 1962, pp. 287-288.

111. Cf. Sir T.L. Heath, *Mathematics in Aristotle*, London, Oxford Univ. Press, 1970², p. 263.

112. Cf. Idem, *Apollonius of Perga*, Cambridge, Heffner and Sons, 1961², p. lxxi.

113. Cf. F. Lasserre, De Léodamas de Thasos à Philippe d'Oponte, Napoli, Bibliopolis, 1987, p. 551.

114. Cf. Sir T.L. Heath, *op. cit.*, p. xxxiii.

115. Cf. Menaechm., D2ᶜ Lasserre.

116. Cf. Idem, D2ᶜ Lasserre.

enthusiastic Platonist[117], we concur with P. Brunet and A. Mieli[118] in observing that Menaechmus, who was a distinguished member of Plato's Academy, exerted influence upon Euclid. In our opinion, Menaechmus was greatly interested in the properties of the cone because Eudoxus was the first to prove the proposition «that every cone is one third part of the cylinder having the same base with the cone and equal height»[119]. On the other hand, J. Salem[120] held that Democritus was the first to study the properties of the cone. This being so, we are inclined to think that Democritus exerted influence upon Menaechmus.

Being primarily a mathematician, Menaechmus became an advocate of mathematical astronomy. In point of fact, according to N.P. Andriotis[121] and O. Neugebauer[122], Menaechmus worked on Eudoxus'homocentric spheres, whereas, according to E. Maula[123], Menaechmus supported Eudoxus' cosmological theories. In spite of the fact that there is not enough evidence to outline a programm for the reconstruction of Menaechmus' cosmological theories, we reckon that Menaechmus was the author of a commentary on Eudoxus'treatise *On Speeds* [124]. In our opinion, Menaechmus was probably the first to take into account that, according to Polemarchus of Cyzicus, who was a follower of Eudoxus, «the distances of the planets do not remain the same as they should in Eudoxus'theory of homocentric spheres»[125]. Moreover, it is worth mentioning that W.K.C. Guthrie[126] criticized Theon of Smyrna for associating Menaechmus with Callippus in the introduction of counteracting spheres into the motions of the planets. Granting this to be true, we consider that, according to Menaechmus, the introduction of counteracting spheres into the motions of the planets might have been of some help to the astronomers who assumed the same arrangement of the spheres as did Eudoxus. In other words, we maintain that Menaechmus did not attempt any essential correction to

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117. Cf. D.D. Moukanos, Ontologie der «Mathematica» bei Proklos Diadochos (in Greek), *Philosophia*, 10-11, 1980-1981, p. 394.

118. Cf. P. Brunet-A. Mieli, *Histoire des sciences. Antiquité*, Paris, Payot, 1935, pp. 349-350.

119. Cf. Eudox., D62[b] Lasserre. The translation is by F. Lasserre, *The Birth of Mathematics*, p. 109.

120. Cf. J. Salem, *Démocrite*, Paris, Vrin, 1996, p. 184.

121. Cf. N. P. Andriotis, Menaechmus, *Great Greek Encyclopedia*, Vol. 16, Athens, Phoenix, p. 897.

122. Cf. O. Neugebauer, *A History of Ancient Mathematical Astronomy*, Berlin, Springer, 1976, p. 676.

123. Cf. E. Maula, *Studies in Eudoxus'Homocentric Spheres*, Helsinki, Societas Scientiarum Fennica, 1974, p. 11.

124. Cf. Eudox., F124 Lasserre.

125. Cf. E. Maula, *op. cit.*, p. 11.

126. Cf. W.K.C. Guthrie, *A History of Greek Philosophy*, Vol. 5, London, Cambridge Univ. Press, 1978, p. 491.

Eudoxus'theory of homocentric spheres. This being so, Aristotle[127] rightly decided not to make critical or explanatory notes on Menaechmus'theory of homocentric spheres.

According to F. Lasserre[128], Menaechmus was probably the author of a commentary on some mathematical and astronomical passages taken from Plato's *Republic* . Furthermore, F. Lasserre, who argued for the authenticity of Menaechmus' commentary on Plato's *Republic* [129], was inclined to think that Philippus of Opus had a thorough knowledge of that commentary[130]. In our opinion, it is worth mentioning that, according to Diogenes Laertius[131], somewhere in his *Republic* Plato implied that Archytas was the first to conceive of a theoretical solution of the problem of doubling the cube. Taking into account that nowhere in his *Republic* did Plato mention Archytas by name, we hold that Diogenes Laertius drew on Aristoxenus, who had written a biography of Archytas[132] and had made explanatory notes on some passages taken from Plato's *Republic* [133]. In other words, we maintain that Aristoxenus had a thorough knowledge of Menaechmus' commentary on Plato's *Republic* and thus he took into account that somewhere in his *Republic* Plato alluded to Archytas' solution of the problem of doubling the cube.

In our opinion, Menaechmus, who was a disciple of Eudoxus, probably implied that, according to Archytas, his predecessors had handed down to him «clear knowledge about the speeds of the stars, their risings and settings, and about geometry, arithmetic, and sphaeric, and last, not least, about music : for these sciences seem to be sisters»[134]. Moreover, it is worth recalling that, according to H. Diels[135], somewhere in his *Republic* Plato alluded to Archytas'above-mentioned statement. This being so, we consider that Menaechmus was the first to write a commentary on some mathematical and astronomical passages taken from Plato's *Republic*, because he was willing to carry out a research into Plato's philosophy of mathematics. As a matter of fact, according to F. Lasserre[136], Plato took the mathematics syllabus from the School of Archytas. Furthermore, according to A. and E. Zachariou[137], it is

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127. Cf. ARIST., *Metaph.*, Λ 8, 1073 b 17-38.
128. Cf. F. LASSERRE, *De Léodamas de Thasos à Philippe d'Oponte*, p. 548.
129. Cf. *ibid.*, p. 553.
130. Cf. *ibid.*, p. 547.
131. Cf. ARCHYT., A1 Diels.
132. Cf. ARISTOX., F50 Wehrli.
133. Cf. IDEM, F67 Wehrli.
134. Cf. ARCHYT., B1 Diels. The translation is by F. LASSERRE, *The Birth of Mathematics in the Age of Plato*, London, Hutchinson, 1964, p. 21.
135. Cf. H. DIELS-W. KRANZ, *Die Fragmente der Vorsokratiker*, Vol. 1, Berlin, Weidmann, 1974[17], p. 432.
136. Cf. F. LASSERRE, *The Birth*..., p. 15.
137. Cf. A. AND E. ZACHARIOU, Menaechmus (in Greek), *Great Soviet Encyclopedia*, Vol. 21, Athens, Academos, 1981, p. 314.

remarkable that Eudemus of Rhodes implied that Menaechmus' way of thinking was a Pythagorean one. In our opinion, Menaechmus probably exerted influence upon Clearchus of Soli, who lived after Menaechmus and made explanatory notes on some mathematical passages taken from Plato's *Republic*[138]. In other words, we maintain that, in all probability, Clearchus, who was the author of an *Encomium on Plato* [139], had a thorough knowledge of Menaechmus' commentary on Plato's *Republic* .

According to Theon of Smyrna[140], Menaechmus was merely a mathematician, whereas, according to Photius the Great[141], Menaechmus was reputed to be a philosopher. In our opinion, Diogenes Laertius stressed the point that Eudoxus was an eminent Pythagorean[142] surrounded by a constellation of disciples[143], who were to carry on his work, because he realized that Menaechmus' way of thinking was a Pythagorean one. In addition, we reckon that Plutarchus made mention of τοὺς περὶ Εὔδοξον καὶ Ἀρχύταν καὶ Μέναιχμον[144] because he realized that, according to Sotion of Alexandria[145], the Pythagorean School came to an end by passing from Archytas to Eudoxus, and from Eudoxus to Menaechmus. In point of fact, we concur with E. Moutsopoulos[146] in observing that Menaechmus was a thinker with views upon some philosophical topics.

According to Hesychius of Miletus[147], Menaechmus wrote on a variety of philosophical topics. G.C. de Santillana[148], and G.M. Pozzo[149], had no intention of doubting the truth of Hesychius' statement, whereas M.C.P. Schmidt[150] criticized Hesychius for making that statement. On the other hand, F. Lasserre[151] argued that the distinction between Menaechmus' philosophical writings and Menaechmus' commentary on Plato's *Republic* may be a distinction without a difference. In our opinion, C.P. Mason[152] rightly

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138. Cf. CLEARCH., F3 Wehrli.
139. Cf. IDEM, F2a Wehrli.
140. Cf. MENAECHM., F2 Lasserre.
141. Cf. PHOT., *Bibl.*, 114 b 9-26.
142. Cf. DIOG. LAERT., *V.P.*, 8. 91.
143. Cf. EUDOX., T7 Lasserre.
144. Cf. MENAECHM., D1[e] Lasserre.
145. Cf. EUDOX., T7 Lasserre.
146. Cf. E. MOUTSOPOULOS, *Philosophers of the Aegean* (in Greek), Athens, Foundation of the Aegean, 1991, p. 170.
147. Cf. MENAECHM., F1 Lasserre.
148. Cf. G.C. DE SANTILLANA, Menecmo, *Enciclopedia Italiana*, Vol. 22, Milano, Rizzoli, 1934, p. 849.
149. Cf. G.M. POZZO, Menecmo, *Enciclopedia Filosofica*, Vol. 4, Firenze, Sansoni, 1967, p. 528.
150. Cf. M.C.P. SCHMIDT, Die Fragmente des Mathematikers Menaichmos, *Philologus*,42, 1884, p. 80.
151. Cf. F. LASSERRE, *De Léodamas de Thasos à Philippe d'Oponte*, p. 550.
152. Cf. C.P. MASON, Menaechmus, *in* W. SMITH, *A Dictionary of Greek and Roman Biography and Mythology*, Vol. 2, London, Murray, 1880, p. 914.

emphasized the importance of the above-mentioned distinction. Moreover, it is worthy of consideration that Photius the Great, who was deeply read in the classics, never made a summary of Menaechmus' philosophical writings[153]. This being so, one may conclude that Menaechmus' philosophical writings were lost before the times of Photius the Great.

According to G. Panagiotidis[154], Menaechmus attached great importance to Plato's doctrines because Plato was a philosopher of the highest attainments. On the other hand, one may be under the impression that, although Menaechmus was a distinguished member of Plato's Academy[155], he never produced evidence in support of Plato's doctrines. As a matter of fact, Hesychius of Miletus asserted that Μέναιχμος... ἔγραψε *φιλόσοφα*[156], but he did not contend that *φιλόσοφα* was a term used in order to indicate that Menaechmus adhered to Plato's doctrines. In our effort to explain the meaning of the term *φιλόσοφα*, we stress the point that, according to Cyrillus of Alexandria, Archelaus had the reputation of being the thinker who drew Socrates' attention ἐπὶ τὰ *φιλόσοφα*[157]. Taking into account that Archelaus was not only «called the physicist»[158] but he «also treated of ethics»[159], we consider that *φιλόσοφα* was a term used in order to indicate that Archelaus was greatly interested in physics and ethics. This being so, we are inclined to think that *φιλόσοφα* was a term used in order to indicate that Menaechmus was greatly interested in physics and ethics.

In our opinion, Aristotle probably referred to Menaechmus' theory of causes in his *Metaphysics* . In point of fact, according to Aristotle, the theory of causes «which was stated first by Anaxagoras and later by Eudoxus in his discussion of difficulties, and by others also, is very readily refuted; for it is easy to adduce plenty of impossibilities against such a view»[160]. In that case, it would seem that Menaechmus concurred with Aristotle in observing that Plato's Forms «are no help towards the knowledge of other things (for they are not the substance of particulars, otherwise they would be in particulars) or to their existence (since they are not present in the things which participate in them)»[161]. As a matter of fact, it is worth mentioning that, according to Plutarchus, *παραδείγματα* was an

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153. Cf. PHOT., *op. cit.*, 114 b 9-26.
154. Cf. G. PANAYOTIDIS, *Plato* (in Greek), Athens, Dimitracos, 1935, p. 96.
155. Cf. MENAECHM., D1[b] Lasserre.
156. Cf. IDEM, F1 Lasserre.
157. Cf. ARCHEL., A3 Diels.
158. Cf. IDEM, A1 Diels. The translation is by R.D. HICKS, *Diogenes Laertius*, Vol. 1, Cambridge Massachusetts, Harvard Univ. Press, 1972[7], p. 147.
159. Cf. ARCHEL., A1 Diels. The translation is by R.D. HICKS, *op. cit.*, p. 147.
160. Cf. EUDOX., D1 Lasserre. The translation is by H. TREDENNICK, *Aristotle. Metaphysics X-XIV*, Cambridge Massachusetts, Harvard Univ. Press, 1935, p. 203.
161. Cf. ARIST., *Metaph.*, M5, 1079 b 15-18. The translation is by H. TREDENNICK, *op. cit.*, pp. 201-203.

Eudoxean term used in order to indicate the mode of existence of sensible things[162]. Taking into account that Menaechmus was an outstanding disciple of Eudoxus[163], we are inclined to think that, according to Menaechmus, Plato's *παραδείγματα*[164] had nothing to do with the substance of sensible things and thus they were somewhat different from Eudoxus' *παραδείγματα*. In all probability, Menaechmus concurred with Aristotle in observing that «above all we might examine the question what on earth the Ideas contribute to sensible things...; for they are not the cause of any motion or change in them»[165]. This being so, we have reason to believe that Menaechmus concerned himself with the secondary causes of any motion or change in sensible things and that he was probably the first to detail the mechanician's viewpoint[166].

In our opinion, it is worth recalling that, according to Plutarchus, Menaechmus and his followers worked on *μηχανικὰς κατασκευάς*[167], whereas Eudoxus and his followers worked on *ὀργανικὰς κατασκευάς*[168]. In other words, it is significant that Plutarchus used the adjective *μηχανικὰς* to describe constructions which were more mechanical than geometrical, whereas he used the adjective *ὀργανικὰς* to describe constructions which were more geometrical than mechanical. We should also note that, according to Eutocius, Menaechmus was greatly interested in problems concerned with *χειουργῆσαι...καὶ εἰς χρείαν πεσεῖν...δύνασθαι*[169]. Granting this to be true, we hold that Menaechmus was a mathematician skilled in constructing machines. This being so, we are inclined to think that Menaechmus exerted influence upon the author of *Mechanical Problems*, who maintained that mechanical problems «are not altogether identical with physical problems, nor are they entirely separate from them, but they have a share in both mathematical and physical speculations, for the method is demonstrated by mathematics, but the practical application belongs to physics»[170].

Furthermore, we consider that Aristotle maintained that mechanics had to do with stereometry[171] because he was keeping in mind that, according to Menaechmus, some stereometric problems could be solved with mechanical aids. Indeed, according to S.T. Teodorsson[172], Menaechmus was the first to

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162. Cf. EUDOX., D27 Lasserre.

163. Cf. MENAECHM., T1 Lasserre.

164. Cf. ARIST., *Metaph.*, M5, 1079 b 24-26.

165. Cf. *ibid.*, M5, 1079 b 12-15. The translation is by H. TREDENNICK, *op. cit.*, p. 201.

166. Cf. MENAECHM., D1[f] Lasserre.

167. Cf. IDEM, D1[e] Lasserre.

168. Cf. EUDOX., D27 Lasserre.

169. Cf. MENAECHM., D1[b] Lasserre.

170. Cf. ARIST., *Mech.*, 847 a 24-28. The translation is by W.S. HETT, *Aristotle, Minor Works*, Cambridge Massachusetts, Harvard Univ. Press, 1936, p. 331.

171. Cf. ARIST., *APr.*, 13, 78 b 36-38.

172. Cf. S.T. TEODORSSON, *A Commentary on Plutarch's Table Talks*, Vol. 3, Göteborg, Acta Universitatis Gothoburgensis, 1996, p. 166.

construct a real altar of exactly double the size of the cubic altar of the Delians. In our opinion, Eutocius had not the least intention of doubting Menaechmus'ability to solve stereometric problems with mechanical aids, although he implied that in the times of Plato there was some difficulty in *χειρουργῆσαι*[173]. Taking into account that, according to A. Szabó[174], the distinction between geometry as *ἱστορία* and geometry as *μάθημα* was an obvious one for the mathematicians who went to live in Plato's Academy, we reckon that, according to Eutocius, *χειρουργῆσαι* had to do with geometry as *ἱστορία*, whereas *ἀποδεικτικῶς γεγραφέναι* had to do with geometry as *μάθημα*.

According to Plutarchus, Plato admonished Menaechmus and his followers for bringing geometry «down to the level of tangible objects instead of raising it to the knowledge of immaterial and eternal ideas over which rules the god who is-through them-eternally god»[175]. In other words, according to Plutarchus, Plato admonished Menaechmus for denying any knowledge of *ἀϊδίων καὶ ἀσωμάτων εἰκόνων*[176]. In our opinion, Plutarchus contended that, according to Plato, Menaechmus failed to take into consideration that *ὀλίγοι ἐπὶ τὰς εἰκόνας ἰόντες θεῶνται τὸ τοῦ εἰκασθέντος γένος*[177]. Moreover, we may be assured that Menaechmus emphasized the omnipotent power of *god*, who is not eternally *god* because of the existence of immaterial and eternal Forms. In point of fact, C. Hubert[178] asserted that, according to Plutarchus, Menaechmus was not quite in agreement with Plato's theory about the nature of the soul. This being so, we are inclined to think that Menaechmus'theory about the nature of the soul was somewhat different from the Platonic one[179]. In other words, we may conclude, from the evidence produced by Plutarchus[180], that, according to Menaechmus, there is no existence of the soul before the generation of the body with which it is united in this world.

Taking into account that Menaechmus found himself in opposition to Speusippus on the question of the mode of existence of the objects of mathematics[181], we consider that Menaechmus also found himself in

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173. Cf. MENAECHM., D1[b] Lasserre.

174. Cf. A. SZABÓ, Anfänge des Euklidischen Axiomensystems, *in* O. BECKER, *Zur Geschichte der griechischen Mathematik*, Darmstadt, Wissenschaftliche Buchgesellschaft, 1965, pp. 431-432.

175. Cf. EUDOX., D28 Lasserre. The translation is by F. LASSERRE, *The Birth of Mathematics*, p. 117.

176. Cf. MENAECHM., D1[e] Lasserre.

177. Cf. PL., *Phdr.*, 250 b.

178. Cf. C. HUBERT, *Plutarchi Moralia*, Vol. 4, Leipzig, Teubner, 1971, p. 262.

179. E. MOUTSOPOULOS, Intimité ou refoulement? Sur quelques aspects ontologiques, épistémologiques et méthodologiques de la théorie platonicienne de la réminiscence, *Diotima*, 23, 1995, pp. 148-151, shed light on some aspects of Plato's theory about the nature of the soul.

180. Cf. EUDOX., D28 Lasserre.

181. Cf. D.D. MOUKANOS, *On the Mode of Existence of the Objects of Mathematics, according to Plato and Aristotle* (in Greek), Diss., Athens University, 1979, p. 64.

opposition to Speusippus on the question of the relation between the concept of Pleasure and that of the Supreme Good. In our opinion, Menaechmus was probably the first to criticize Speusippus'theory of freedom from pain[182], which, according to R. Laurenti[183], drew on Antiphon. Indeed, Dinostratus, who contributed to Menaechmus'mathematical theories[184], realized that Antiphon was credited with going towards a solution of the problem of doubling the cube by giving a fallacious proof[185]. Granting this to be true, we are inclined to think that, according to Menaechmus, Antiphon was the first to develop a theory of freedom from pain[186]. This being so, we reckon that Menaechmus was probably the first to imply that Speusippus'dialogue *On Pleasure* [187] drew on Antiphon. On the other hand, we consider that Philippus of Opus was familiar with the hedonistic conceptions attributed to Menaechmus[188]. Moreover, we are of the opinion that Menaechmus concurred with Plato in observing that spiritual pleasures are preferable to those of the flesh[189]. Taking into account that Menaechmus was a distinguished member of Plato's Academy, we assert that C. Eggers Lan[190] rightly attached great importance to Menaechmus' philosophical investigations.

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182. Cf. R. LAURENTI, *Scritti sul piacere, di Aristotele*, Palermo, Aesthetica, 1989, p. 148.
183. Cf. IDEM, *loc. cit.*, p. 144.
184. Cf. DINOSTR., T1 Lasserre.
185. Cf. ANTIPHON, B13 Diels.
186. Cf. IDEM, A6 Diels.
187. Cf. DIOG. LAERT., *V.P.*, 4. 4.
188. Cf. C. N. POLYCARPOU, *op.cit.*, p. 406.
189. Cf. *ibid.*, p. 408.
190. Cf. C. EGGERS LAN, Eudemo y el «catálogo de geómetras» de Proclo, *Emerita,* 53, 1985, p. 149.

ΟΙ ΦΙΛΟΣΟΦΙΚΕΣ ΖΗΤΗΣΕΙΣ ΤΟΥ ΜΕΝΑΙΧΜΟΥ

Ὁ Μέναιχμος ὁ Προκοννήσιος, ὁ ὁποῖος ἐγεννήθη περὶ τὸ 390 π.Χ. καὶ ἀπέθανε περὶ τὸ 335 π.Χ., ὑπῆρξε διαπρεπὴς φιλόσοφος καὶ μαθηματικός. Μαθητὴς τοῦ Εὐδόξου καὶ ἐπιφανὲς μέλος τῆς πλατωνικῆς Ἀκαδημείας, ὁ Μέναιχμος ἐπεδόθη στὴν φιλοσοφία τῶν μαθηματικῶν καὶ ἤσκησε ἐπίδρασι ὄχι μόνον ἐπὶ τῶν μαθηματικῶν Δεινοστράτου καὶ Ἀθηναίου ἀλλὰ καὶ ἐπὶ τοῦ Ἀριστοτέλους. Εὑρετὴς τῶν κωνικῶν τομῶν, ὁ Μέναιχμος ὑπεμνημάτισε τὴν *Περὶ Ταχῶν* πραγματεία τοῦ Εὐδόξου καὶ ἀνέλυσε μαθηματικὰ καὶ ἀστρονομικὰ χωρία προερχόμενα ἐκ τοῦ ἑβδόμου βιβλίου τῆς *Πολιτείας* τοῦ Πλάτωνος. Ἐπιδιώκων τὴν προαγωγὴ τοῦ φιλοσοφεῖν, ὁ Μέναιχμος ἐμελέτησε τὴν περὶ Ἰδεῶν θεωρία τοῦ Πλάτωνος καὶ ἤσκησε κριτικὴ ἐπὶ τῆς περὶ ἀλυπίας θεωρίας τοῦ Σπευσίππου.

Χριστόφορος Ν. Πολυκαρπου