ECPHANTUS' THEORY OF THE CONSTITUTION OF THE COSMOS

According to Hippolytus of Rome[1], Ecphantus, who was strongly and consistently interested in the science of the constitution of the cosmos, had quite an impact on late thinkers versed in philosophy. Far from falling in with Hippolytus' views O. Voss[2] and P. Tannery[3] attempted to demonstrate that Ecphantus was merely a fictitious character in a dialogue entitled *Of Celestial Phenomena,* which can be safely regarded as a writing of Heracleides of Pontus. As a matter of fact, W.A. Heidel[4] and B.L. van der Waerden[5] attached credence to such an hypothesis, whereas G. Calogero[6], F. Susemihl[7] and G. Vlastos[8] maintained that Ecphantus had made a reputation for himself as a forth-century thinker. On the other hand, J.A. Fabricius[9] was not willing to argue for accepting that the Pythagorean philosopher Ecphantus of Croton and the Pythagorean philosopher Ecphantus of Syracuse may be the same person. In our opinion, it seems reasonable to infer that the Pythagorean philosopher Ecphantus was a native of Croton, who became a citizen of Syracuse because of the events of 377 B.C.[10], but this fact had quite dropped out of the consciousness of late doxographers. Furthermore, we consider that Hippolytus placed great emphasis on the phrase «Ecphantus a Syracusan»[11] because he did not fail to distinguish between the philosopher Ecphantus of Syracuse and the painter Ecphantus of Corinth[12]. In addition, the natural conclusion to draw from Eusebius' presentation[13] would seem to us to be that the alleged fictitiousness

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1. Cf. HIPPOL., *Haer.*, I 10.
2. Cf. O. VOSS, *De Heraclidis Pontici vita et scriptis*, Diss., Rostock, 1896, p. 64.
3. Cf. P. TANNERY, Pseudonymes antiques, *Revue des Études Grecques*, 10, 1897, p. 136.
4. Cf. W. A. HEIDEL, The Pythagoreans and Greek Mathematics, *American Journal of Philology*, 61, 1940, p. 19.
5. Cf. B. L. VAN DER WAERDEN, *Die Astronomie der Griechen,* Darmstadt, Wissenschaftliche Buchgesellschaft, 1988, p. 75.
6. Cf. G. CALOGERO, Ecfanto, *Enciclopedia Italiana,* Vol. 13, Milano, Rizzoli, 1932, p. 399.
7. Cf. F. SUSEMIHL, O. Voss, De Heraclidis Pontici vita et scriptis, Diss., Rostock, 1896, book rewiew, *Berliner Philologische Wochenschrift,* 18, 1898, pp. 266- 267.
8. Cf. G. VLASTOS, Raven, Pythagoreans and Eleatics, London, Cambridge Univ. Press, 1948, book review, *Gnomon,* 25, 1953, p. 33.
9. Cf. J.A. FABRICIUS, *Bibliotheca Graeca,* Vol. 1, Hildesheim, Olms, 1966[5], p. 843.
10. Cf. B. CAVEN, *Dionysius I,* New Haven, Yale Univ. Press, 1990, p. 196.
11. Cf. ECPHANT., F1 Diels.
12. Cf. N. HOESCH, Ekphantos 1, *Der neue Pauly,* Vol. 3, Stuttgart, Metzler, 1997, p. 942.
13. Cf. EUS., *Pr. Ev.*, 850 d.

of Ecphantus of Syracuse falls wide of the mark.

According to A. Boeckh[14] and T. Bergk[15], Theophrastus, who was the first to depict Ecphantus as an exponent of the Pythagorean tradition not only in his *Astronomical Research*[16] but also in his *Physical Opinions*[17], knew that Ecphantus had attached himself to the Pythagorean philosopher Hicetas of Syracuse. Taking into account that Hicetas abandoned the view of the Earth as immovable[18], we have reason to believe that he seriously entertained the conception of a spherical Earth rotating on its axis. This being so, we are inclined to think that Hicetas, who had concerned himself with the exact sciences, tutored Ecphantus in astronomical doctrines which may go back to Philolaus[19]. In point of fact, it deserves to be noted that , according to A. Capizzi[20], it is sought to be inferred that Hicetas was the anonymous νεανίσκος whose imprisonment by Dionysius the Younger for his involvement with Pythagorean politics had the result of enabling him to make the acquaintance of Plato. In our opinion, the implication of A. Capizzi' s argument is that Hicetas the Pythagorean set up his own School in Syracuse and attracted many disciples, who were known as οἱ περὶ Φιντίαν[21]. From this evidence we may conclude that Ecphantus of Croton came to Syracuse as a teenager and remained for some decades as a member of Hicetas' School. Being chiefly influenced by his association with Hicetas, Ecphantus probably suceeded him as scholarch and dedicated the best of himself to science during the period of time between the fiftieth and seventieth years of the forth century B.C.[22].

Keeping in mind that Ecphantus took over the leadership of a group of

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14. Cf. A. Boeckh, *Untersuchungen über das kosmische System des Platon*, Berlin, Veit, 1852, p. 126.

15. Cf. T. Bergk, *Griechische Literaturgeschichte*, Vol. 4, Berlin, Weidmann, 1887, p. 525.

16. Cf. A. Boeckh, *Kleine Schriften*, Vol. 3, Leipzig, Teubner, 1866, p. 273.

17. Cf. J. Mansfeld, *Physikai doxai* and *Problemata physica* from Aristotle to Aëtius, in W.W. Fortenbaugh- D. Gutas, *Theophrastus : His Psychological, Doxographical, and Scientific Writings*, New Brunswick, Transaction Publishers, 1992, p. 108.

18. Cf. Philol., A1 Diels.

19. Cf. E. Schroedinger, *Nature and the Greeks*, London, Cambridge Univ. Press, 1996^2, p. 49. As a matter of fact, Hicetas and Ecphantus modified Philolaus'astronomical doctrines (cf. E. Hoppe, *Mathematik und Astronomie im klassischen Altertum*, Heidelberg, Winter, 1911, p. 98), which may represent the earlier Pythagorean view (cf. M. R. Cohen- I. E. Drabkin, *A Source Book in Greek Science*, New York, McGraw-Hill, 1948, p. 105).

20. Cf. A. Capizzi, *Platone nel suo tempo*, Roma, Edizioni dell'Ateneo, 1984, p. 186.

21. According to Aristoxenus (cf. Aristox., F31 Wehrli), Damon was one of τοὺς περὶ Φιντίαν Pythagoreans, who lived in Syracuse during the period of time between the thirtieth and fiftieth years of the forth century B.C.. Taking into account that οἱ περὶ τινα was a phrase used in order to indicate the associates of a scholarch (cf. E. Zeller- R. Mondolfo, *La filosofia dei Greci nel suo sviluppo storico*, Part 1, Vol. 2, Firenze, La Nuova Italia, 1950^2, pp. 48-49), we are inclined to think that Phintias made a reputation for himself as Hicetas'longtime collaborator.

22. Cf. G. Sarton, *A History of Science*, Vol. 1, London, Oxford Univ. Press, 1953, p. 291.

Pythagoras' spiritual descendents because of Hicetas' death, we do not leave out of consideration the fact that no mention has been ever made of οἱ περὶ Ἔκφαντον. In our opinion, it is worth recalling that, according to Aëtius, Ecphantus abandoned the view of the Earth as immovable[23] and «moved the Earth...in the sense of rotation, like a wheel fixed on its axis...about its own center»[24]. Furthermore, one should particularly mention that a similar account is given by Plutarchus in a short and very clear notice of the opinions of Aristarchus of Samos[25]. In point of fact, from Plutarchus we learn that Cleanthes the Stoic, who had never obtained any theoretical information concerning the motions of the heavenly bodies, indicted Aristarchus on a charge of impiety because he disapproved of Aristarchus' conception of a moving Earth[26]. Now it is perhaps worth adding that the hypothesis of an Earth rotating on its axis· is stated to have been taught by Philolaus[27] and Heracleides[28], who probably died by violence because they had shown unwillingness to recant their views[29]. This being so, we are inclined to think that Ecphantus, who had combined opinions of Philolaus and Hicetas and had accustomed himself to the Philolaic ideal of demonstrative science, was indicted on a charge of impiety, because he never declared the Earth to be the motionless seat of the gods. Granting this to be true, we have reason to believe that the Pythagorean School of Syracuse did not come to an end by passing from Ecphantus to τοὺς περὶ Ἔκφαντον.

According to S. Placidis[30], Plato had a thorough knowledge of Ecphantus' theory of the Earth's axial rotation, whereas, according to V. Kalfas[31], it is an accepted fact that nowhere in his *Timaeus* did Plato imply that this theory was a mentionable one. Indeed, V. Kalfas[32] supports the view which goes back to H.

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23. Cf. Aet., *Plac. Phil.*, III 13. 1.

24. Cf. Ecphant., F5 Diels. The translation is by G. Sarton, *op. cit.*, p. 291.

25. Cf. Plut., *Mor.* 60, 923 A.

26. E. Moutsopoulos, Sur l'origine philosophique possible du modèle aristarchéen de l'univers, in *Philosophie de la culture grecque*, Athènes, Académie d'Athènes, 1998, pp. 241- 242, justly argues that there was a lot of opposition to Aristarchus'ideas because Aristarchus attended the lectures of Straton and admired not only the writings of Philolaus but also those of Archytas and Eudoxus.

27. Cf. Philol., A21 Diels.

28. Cf. Heracl. Pont., F104 Wehrli.

29. Cf. Philol., A1 Diels, and Heracl. Pont., F14a Wehrli. In our opinion, Diogenes Laertius hinted without actually stating that a formal charge was made against Philolaus for refusing to recognize the goddess (Ἑστία) of the public *altar* (ἑστία) of Croton. On the other hand, it may be a coincidence, but in a way Philolaus reminds us of Heracleides, who, according to Hermippus, was seized with apoplexy because he did not show devotion to the god of the Delphic shrine (γᾶς ἑστία).

30. Cf. S. Placidis, Astronomy (in Greek), *The Helios Encyclopedia*, Vol. 3, Athens, Helios, p. 836.

31. Cf. V. Kalfas, *Plato's Timaeus* (in Greek), Athens, Polis, 1995, p. 501.

32. Cf. Idem, *loc. cit.*, p. 500.

Cherniss that only for Heracleides of Pontus and his followers one may conclude, from the evidence produced by Plato's choice of the word ἴλλεσθαι, that, according to the account of the *Timaeus*, the Earth has an axial rotation of its own. In our opinion, Heracleides was probably implying that Plato provided a satisfactory explanation of the Earth's behaviour in the *Timaeus* because he had familiarized himself with Hicetas' corrections to Philolaus' astronomical doctrines[33]. Now, according to F. Lasserre[34], it may be no coincidence that there is a magnificent depiction of Plato surrounded by Heracleides and other philosophers, who were attempting to define the scope of an investigation related with measurements on the celestial sphere. As a matter of fact, F. Lasserre makes it seem probable that, in view of the account of the Pythagoreans given by Heracleides, one of those philosophers has enough in common with Ecphantus. To our mind, the famous passage quoted by Geminus[35] may be taken as an indication that, according to the tertiary sources, Heracleides had made no allusion to Ecphantus' theory of the Earth's axial rotation. In point of fact, it is sufficiently clear that the famous passage quoted by Geminus has enough in common with the evidence of Theophrastus about the innovation of Hicetas[36].

Being chiefly influenced by his association with Hicetas, Ecphantus believed that the Earth is the centre of the cosmos[37] and conceived the rotatory movement of the Earth to be from west to east[38]. Moreover, G. Marinos[39] stressed the point that Hicetas and Ecphantus were the first to declare that the apparent motion of the celestial objects around the sky results from the rotation of the Earth on its axis. On the other hand, D. R. Dicks[40] maintained that, according to Cicero, Hicetas had regarded the Earth as the only moving body in the cosmos and «this, if true, would demonstrate an undeniably imperfect knowledge of astronomy on Hicetas' part, since it would argue that he completely ignored the proper motions of the planetary bodies in the zodiac». To our mind, it deserves to be noted that, according to Heracleides[41], it was Hicetas' considered opinion that the Earth may be regarded as κινουμένη πως,

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33. Cf. *supra* and n. 20.

34. Cf. F. Lasserre, *De Léodamas de Thasos à Philippe d'Oponte*, Napoli, Bibliopolis, 1987, pp. 442- 443.

35. Cf. Heracl. Pont., F110 Wehrli.

36. Cf. Hicet., F1 Diels.

37. Cf. P. Brunet- A. Mieli, *Histoire des sciences. Antiquité*, Paris, Payot, 1935, p. 431.

38. Cf. Ecphant., F5 Diels. As a matter of fact, P. Tannery, *op. cit.*, p. 130, pointed out that the work *On Kingship* is wrongly attributed to Ecphantus, because the author of this work disapproves of Ecphantus' conception of a moving Earth.

39. Cf. G. Marinos, Earth (in Greek), *The Helios Encyclopedia*, Vol. 5, Athens, Helios, p. 337.

40. Cf. D. R. Dicks, *Early Greek Astronomy to Aristotle*, London, Thames and Hudson, 1970, pp. 73- 74.

41. Cf. Heracl. Pont., F110 Wehrli.

whereas the Sun may be regarded as μένων πως. From the astronomical perspective, it is perhaps more relevant to emphasize that Hicetas, who was an older contemporary of Eudoxus, did not concern himself with the proper motions of the planetary bodies in the zodiac because he could not make use of «three- dimensional spatial coordinates of the planets for defining their positions relative to the Sun and Earth»[42]. This being so, we may suppose that Hicetas was following the rules of science[43]. Indeed, Hicetas exerted influence upon Ecphantus, who was the first to imply that «where one body moves and the other is at rest, and the vision is not corrected by a comparison with a third body, the body at rest may appear to be in motion»[44].

In view of an epistemological passage taken from Hippolytus' *Refutation of All Heresies* [45], L. Duncker and F. G. Schneidewin[46] asserted that for Ecphantus there is not any certain kind of universal truths because the world has no intrinsic characteristics. On the other hand, W. Burkert[47] maintained that Ecphantus had some sympathy with Alcmaeon's epistemological views, whereas W. von Kienle[48] was under the impression that Ecphantus advocated the Xenophanean type of epistemological reasoning. In this connection we may note especially that neither Alcmaeon's reference to imperishable celestial objects[49] nor Xenophanes' conception of the infinite depths of the Earth[50] are in conformity with Ecphantus' cosmological pronouncements. This being so, we concur with M. Timpanaro Cardini[51] in observing that Ecphantus could portray himself with complete confidence as the last genuine exponent of what he proclaimed as the epistemological doctrine of Philolaus. As a matter of fact, it is legitimate to argue that Ecphantus, who had familiarized himself with the Philolaic way of thinking[52], was quite in agreement with Philolaus' view that «secure knowledge is possible insofar as we grasp the *number* in accordance

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42. Cf. J. MITTON, *The Penguin Dictionary of Astronomy,* London, Penguin Books, 1998, p. 84.

43. Cf. N. R. HANSON, *Constellations and Conjectures,* Dordrecht, Reidel, 1973, p. 229.

44. Cf. Sir G. C. LEWIS, *A Historical Survey of the Astronomy of the Ancients,* London, Parker, 1862, p. 171.

45. Cf. ECPHANT., F1 Diels.

46. Cf. L. DUNCKER - F. G. SCHNEIDEWIN, *S. Hippolyti refutationis omnium haeresium librorum decem quae supersunt,* Göttingen, Dieterich, 1859, pp. 29- 30.

47. Cf. W. BURKERT, *Lore and Science in Ancient Pythagoreanism,* Cambridge Massachusetts, Harvard Univ. Press, 1972, p. 257.

48. Cf. I. MUELLER, Heterodoxy and Doxography in Hippolytus' *Refutation of All Heresies*, in W. HAASE, *Aufstieg und Niedergang der römischen Welt,* Vol. 36, Part 6, Berlin, de Gruyter, 1992, p. 4370.

49. Cf. ALCMAEON, A1 Diels.

50. Cf. XENOPH., A47 Diels.

51. Cf. M. TIMPANARO CARDINI, *Pitagorici,* Vol. 2, Firenze, La Nuova Italia, 1962, p. 416.

52. Cf. *supra* and n. 33.

with which things are put together»[53]. In the light of this quotation we must realize that for Ecphantus it is not possible to obtain true knowledge of existing things without giving a description of the cosmos as a whole which has been ordered according to pleasing mathematical relations. In addition, we may grant that Ecphantus was a disciple of Hicetas, who, according to Heracleides[54], had attempted to make hypothesis agree with observation.

F. Copleston[55] and F. Wehrli[56] held that the cosmological beliefs attributed to Ecphantus can be accepted as evidence for those of Heracleides but W. K. C. Guthrie[57], H.B. Gottschalk[58] and H.J. Krämer[59] contended that the supposed resemblance in doctrine between Heracleides and Ecphantus is only partial. It is nevertheless to be remarked that Theodoretus of Cyrros[60] was inclined to regard Ecphantus as a Pythagorean who had attached great importance to ontological views which sound like those of Democritus and Metrodorus of Chios. Moreover, it is permissible to notice that, according to E. Zeller[61] and A. Kolár[62], Ecphantus' theory of *indivisible bodies* appears to be a modification of Democritus' theory of *atoms*. On the other hand, O.F. Gruppe[63] and I. Zervos[64] affirmed that Ecphantus was the first to present a doctrine which is in almost every essential particular the counterpart of the views attributed to Democritus. In our opinion, it is most probable that A. Rey[65] and W. Windelband[66] were right in observing that Ecphantus had the reputation of being a philosopher who saw the possibilities of combining Pythagoreanism with genuine Atomism as taught by Democritus. It is also fair to mention that, if we piece together the statements attributed to Metrodorus and Ecphantus touching their theory of

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53. Cf. PHILOL., B4 Diels. The translation is by C. A. HUFFMAN, Philolaus, in R. AUDI, *The Cambridge Dictionary of Philosophy*, London, Cambridge Univ. Press, 1995, p. 580.

54. Cf. HERACL. PONT., F110 Wehrli.

55. Cf. F. COPLESTON, *A History of Philosophy*, Vol. 1, Norwich, Jarrold, 1946, p. 265.

56. Cf. F. WEHRLI, *Herakleides Pontikos*, Basel, Schwabe, 1953, p. 102.

57. Cf. W.K.C. GUTHRIE, *A History of Greek Philosophy*, Vol. 1, London, Cambridge Univ. Press, 1962, p. 324.

58. Cf. H.B. GOTTSCHALK, *Heraclides of Pontus*, London, Oxford Univ. Press, 1980, p. 44.

59. Cf. H. FLASHAR, *Die Philosophie der Antike*, Vol. 3, Basel, Schwabe, 1983, p. 90.

60. Cf. THEODORET., *Graec. Affect. Cur.*, IV 9- 11.

61. Cf. E. ZELLER - R. MONDOLFO, *op. cit.*, p. 627.

62. Cf. A. KOLÁR, L'attitude de Démocrite à l'égard du Pythagoréisme, *Listy Filologické*, 81, 1958, p. 31. L.J. ZMUD, *Pythagoras and his School* (in Russian), Leningrad, Akademija Nauk SSSR, 1990, p. 164, fell in with A. Kolár's views.

63. Cf. O.F. GRUPPE, *Die kosmischen Systeme der Griechen*, Berlin, Reimer, 1851, p. 92.

64. Cf. I. ZERVOS, Ecphantus (in Greek), *The Eleutheroudacis Encyclopedia*, Vol. 5, Athens, Eleutheroudacis, 1929, p. 173.

65. Cf. A. REY, *La jeunesse de la science grecque*, Paris, La Renaissance du Livre, 1933, p. 205.

66. Cf. W. WINDELBAND - H. HEIMSOETH, *A Manual of the History of Philosophy* (in Greek), Vol. 1, Athens, Foundation of the National Bank of Greece, 1980, p. 311.

indivisible bodies, we discover that Metrodorus, who advocated a version of Atomism, exerted influence upon Ecphantus by using the terms ἀδιαίρετα σώματα[67] and ὄντα[68] instead of the Democritean term ναστά. Indeed, Metrodorus[69] posited the existence not only of a plurality of *indivisible bodies* but also of the void and Ecphantus[70] fell in with Metrodorus' views.

Building on Metrodorus and his Atomism, Ecphantus «was the first to declare that the Pythagorean units are corporeal»[71]. Far from dismissing this statement in Aëtius as merely tantalizing, we take into account that, according to Theodoretus[72], Ecphantus was the first to argue for giving Pythagoreanism a push in the direction of Atomism of the Democritean type. Now G. Roeper[73] points out that in all probability Ecphantus was fascinated by Philolaus' distinction between *unlimiteds* and *limiters.* In our opinion, Ecphantus may have adapted Metrodorus' Atomism to his own cosmology and may have introduced a modification of the Philolaic theory of the constitution of the cosmos by identifying not only Philolaus' *limiters* with Metrodorus' *indivisible bodies* but also Philolaus' *unlimiteds* with Metrodorus' *void.* This being so, we have reason to believe that Aëtius included Ecphantus in a list of philosophers who regarded the cosmos as being unique[74] in order to imply that Ecphantus concurred with Philolaus in observing that the cosmos and everything in it is a combination of *unlimiteds* and *limiters*[75]. Moreover, we are inclined to think that Ecphantus is mentioned along with Empedocles in a lengthy list of believers in a single cosmos[76] because Aëtius was keeping in mind that Ecphantus concurred with Empedocles in observing that the cosmos is merely a small part of the universe (οὐ...τὸ πᾶν)[77]. From this point of view it may be inferred that Ecphantus, who applied the term πᾶν to the entirety of all that exists, held that no body whatsoever can exist beyond this cosmos and declared

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67. Cf. THEODORET., *op. cit.*, IV 9.

68. Cf. METROD. CHIUS, A3 Diels.

69. Cf. *ibid.*, A2 Diels.

70. Cf. ECPHANT., F2 Diels. Taking into consideration that Metrodorus' treatise was entitled *On Nature* (cf. METROD. CHIUS, B1 Diels), we think that in all probability Ecphantus also left a written composition treating the philosophy of nature systematically. Granting this to be true, it seems reasonable to infer that Ecphantus' treatise was entitled *On Nature.*

71. Cf. ECPHANT., F2 Diels. The translation is by G. VLASTOS, *op. cit.*, p. 32.

72. Cf. THEODORET., *op. cit.*, IV 11.

73. Cf. G. ROEPER, Emendationsversuche zu Hippolyti philosophumena, *Philologus,* 7, 1852, pp. 619- 620.

74. Cf. ECPHANT., F3 Diels.

75. Cf. PHILOL., B1 Diels.

76. Cf. ECPHANT., F3 Diels.

77. Cf. EMP., A47 Diels. As a matter of fact, according to Hippolytus (cf. *supra* and n. 1), πᾶν was a term used by Ecphantus.

the void to be infinite in extent[78].

In order to provide evidence in favour of the Pythagorean theory concerning the structure of the cosmos[79] Ecphantus held that the cosmos was made up of πλῆθος...ὡρισμένον[80] of *indivisible bodies* separated by void. As a matter of fact, M. Timpanaro Cardini[81] and J. Kerschensteiner[82] attempted to demonstrate that Ecphantus had never used the terms πλῆθος...ὡρισμένον. In our opinion, it deserves to be noted that for Ecphantus the terms πλῆθος ...ὡρισμένον were indissolubly linked to an idea representing the Pythagorean height of demonstrative Greek mathematics as asserted by Eudoxus' definition of *number* [83]. This being so, it is legitimate to argue that Ecphantus emphasized the importance of πλῆθος...ὡρισμένον of *indivisible bodies* separated by void in order to make it perfectly clear that compound bodies can grow by the aggregations of primary bodies which are limited in number and become entagled with one another. From this point of view it may be inferred that Hippolytus' statement on Ecphantus' theory of *indivisible bodies*, which is in part unintelligible because of corruptions in the text, has not been plausibly emended either by E. Bignone[84] or by any scholar whose name appears in the *apparatus criticus* of the Ecphantean fragments collected by H. Diels[85]. In other words, we maintain that the true reading of Hippolytus' text[86] is as follows: Ἔκφαντος...ἔφη...ἀδιαίρετα εἶναι σώματα...ἐξ ὧν τὰ αἰσθητὰ γίνεσθαι...εἶναι δὲ τὸ πλῆθος αὐτῶν ὡρισμένον κἀκ τούτου <τὴν> ἀπειρίαν <γίνεσθαι>[87]. From the philosophical perspective, the doctrine of *indivisible*

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78. Cf. ARIST., *Ph.* Δ6, 213 b 22- 27.

79. Cf. H.- L. NASTANSKY, Ekphantos, in J. MITTELSTRASS, *Enzyklopädie, Philosophie und Wissenschaftstheorie*, Vol. 1, Mannheim, Bibliographisches Institut, 1980, p. 533.

80. Cf. ECPHANT., F1 Diels.

81. Cf. M. TIMPANARO CARDINI, *op. cit.*, pp. 418- 419.

82. Cf. J. KERSCHENSTEINER, *Kosmos*, München, Beck, 1962, p. 213.

83. Cf. EUDOX., D66 Lasserre.

84. Cf. E. BIGNONE, *L'Aristotele perduto e la formazione filosofica di Epicuro*, Vol. 2, Firenze, La Nuova Italia, 1973[2], p. 438.

85. Cf. H. DIELS - W. KRANZ, *Die Fragmente der Vorsokratiker*, Vol. 1, Berlin, Weidmann, 1974[17], p. 442.

86. Cf. ECPHANT., F1 Diels.

87. In our opinion, Hippolytus realized that for Ecphantus the terms ἀπειρία and αἰσθητὰ were exactly equivalent. Indeed, according to Hippolytus (cf. ECPHANT., F1 Diels), Ecphantus held that τὰ αἰσθητὰ have arisen as a result of the existence of *indivisible bodies*. Now it is not merely implied but distinctly stated by Aristotle (cf. ARIST., *Metaph.*, A6, 987 b 27- 28) that for the Pythagoreans the terms αἰσθητὰ and πράγματα were exactly equivalent. Furthermore, it is worth recalling that, according to Aristotle (cf. EUDOX., D1 Lasserre), Eudoxus the Pythagorean (cf. DIOG. LAERT., *V. P.*, 8. 91) was considered an expert in the philosophy of Anaxagoras. This being so, we have reason to believe that Eudoxus stressed the point that for Anaxagoras and Archelaus the terms πράγματα and ἀπειρία were exactly equivalent (cf. ANAXAG., A57 Diels, and ARCHEL., A11 Diels). Taking into account that in a way Eudoxus exerted influence upon Ecphantus (cf. *supra* and n. 83), we maintain that for Ecphantus the terms ἀπειρία, πράγματα and αἰσθητὰ were exactly equivalent.

bodies is stated to have been taught by Ecphantus as if he were an adherent of Empedocles and Democritus[88].

Taking into account that mainland Greece played an important role in the transmission of philosophical ideas to Sicily during Ecphantus' lifetime[89], we are inclined to think that Ecphantus attempted to resolve some problems related to Pythagoreanism, drawing on his comprehensive knowledge not only of the writings of Democritus but also of those of Metrodorus. To our mind, Ecphantus probably held that experimental evidence can conclusively falsify any explanatory hypothesis resulting from an opinion got by guessing. This being so, we reckon that Ecphantus had a thorough knowledge not only of Metrodorus' reference to διὰ τῆς τέφρας ὑλιζόμενα[90] but also of Democritus' reference to μαρτύριον...τὸ περὶ τῆς τέφρας[91]. In other words, Ecphantus never disregarded the fact that Democritus did offer a renowned experiment using a vessel, which could contain as much ashes and water together as it could of each when poured in separately, as evidence for the existence of the void[92]. Building on Democritus and his Atomism, Ecphantus posited the existence of a plurality of *indivisible bodies* and thus he suggested a reduction of the structure of perceptible things to an ontology of *primary realities* (τά... πρῶτα σώματα)[93]. Moreover, Ecphantus concurred with Democritus in observing that the *primary realities* differ among themselves in size and shape[94]. In this connection we may note especially that Ecphantus declared the *primary realities* to be *indivisible bodies*[95] because he was keeping in mind that, according to Metrodorus, the *primary realities* of which the perceptible things consist are not only finite in smallness[96] but also invisible[97].

In our opinion, Ecphantus never disregarded the fact that for Democritus the *primary realities* are solid bodies (ναστά), which have the quality of being

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88. Cf. EMP., A44 Diels.

89. Cf. HERMOD., F1 Isnardi Parente.

90. Cf. METROD. CHIUS, A19 Diels.

91. Cf. J. SALEM, *Démocrite*, Paris, Vrin, 1996, pp. 54- 55.

92. Cf. ARIST., *Ph.*, Δ 6, 213 b 15.

93. Cf. H. DIELS- W. KRANZ, *Die Fragmente der Vorsokratiker*, Vol. 3, Berlin, Weidmann, 1975[15], p. 377.

94. Cf. IDEM, *loc.. cit.*, pp. 270- 271. Taking into account that, according to Hippolytus (cf. ECPHANT., F1 Diels), the term παραλλαγή was the exact equivalent of the term διαφορά, we consider that Hippolytus did not fail to imply that he drew upon Theophrastus, who had discussed Ecphantus'theory of the constitution of the cosmos (cf. Sir T.L. HEATH, *Aristarchus of Samos*, London, Oxford Univ. Press, 1913, p. 251). Indeed, Theophrastus was the first to declare the term παραλλαγή to be the exact equivalent of the term διαφορά (cf. H. G. LIDDELL - R. SCOTT, *A Greek-English Lexicon*, London, Oxford Univ. Press, 1940[9], p. 1316).

95. Cf. ECPHANT., F1 Diels.

96. Cf. DEMOCR., A49 Diels.

97. Cf. PL., *Ti.*, 43 a 3.

indivisible in view of the general laws governing the phenomena in question, and divisible in view of the fundamental truths on which geometry is founded[98]. In other words, it is legitimate to argue that Ecphantus declared the *primary realities* to be *indivisible bodies* in order to put special emphasis on the study of the general laws governing the phenomena in question, and thus he was known for having given up the Democritean term ναστά. Now ναστὰ are definitely stated to be related to ναστοὶ πλακοῦντες by Galen[99]. Far from receiving this statement with a slight feeling of disbelief, we maintain that for Ecphantus the way in which every ναστὸν is organized may be described as being similar to the structure of a piece of a well-kneaded honey-cake especially used as a sacred offering[100]. From this point of view it seems reasonable to infer that, according to Ecphantus' theory of *indivisible bodies,* the force holding the nucleus of an *indivisible body* together may be described as being *mutatis mutandis* not at all dissimilar to the force holding the mass of a piece of honey-cake together. This being so, it is permissible to notice that for Ecphantus the *indivisible bodies* differ among themselves in δύναμις[101], but the Ecphantean use of δύναμις, which «is probably derived from medicine»[102], has a great deal to do with the growth of modern physics[103]. To our mind, Ecphantus probably posited the existence of mesons, which «are believed to participate in the forces that hold nucleons together in the nucleus»[104].

According to Hippolytus, Ecphantus contended that the *indivisible bodies* are moved «not by weight nor impact (πληγῇ)[105] but by a divine power»[106]. Taking into account that for Cicero[107] the term *pondus* is the exact equivalent of the Epicurean term βάρος, whereas the term *plaga* is the exact equivalent of the Democritean term πληγή, we are inclined to think that Cicero never identified Ecphantus' theory of *indivisible bodies* with Democritus' and Epicurus' theory of *atoms* . On the other hand, it cannot be denied that Cicero tended to connect the term *pondus* with the term *declinatio,* which is the exact equivalent of the Epicurean term παρέγκλισις. As a matter of fact, we realize that Epicurus did

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98. Cf. R. SEIDE, Zum Problem des geometrischen Atomismus bei Demokrit, *Hermes,* 109, 1981, pp. 269- 270.

99. Cf. DEMOCR., A46 Diels.

100. Cf. AR., *Av.* 567.

101. Cf. ECPHANT., F1 Diels.

102. Cf. W.A. HEIDEL, The ἄναρμοι ὄγκοι of Heraclides and Asclepiades, *Transactions and Proceedings of the American Philological Association,* 40, 1909, p. 17.

103. Cf. P. TANNERY, *op. cit.,* p. 135.

104. Cf. A. ISAACS, *A Dictionary of Physics,* London, Oxford Univ. Press, 1996[3], p. 258.

105. In view of an explanatory note preserved by Simplicius (cf. DEMOCR., A47 Diels), we hold that the term πλαγῇς (cf. ECPHANT., F1 Diels) is an emendable one.

106. Cf. *ibid.,* F1 Diels. The translation is by W.K.C. GUTHRIE, *op. cit.,* p. 324.

107. Cf. DEMOCR., A47 Diels.

not consider Ecphantus' point of view before entertaining the conception of a minimal random movement, the *swerve,* which served to initiate irregular patterns of motion for blocking the danger of determinism[108]. It is also fair to mention that Ecphantus stressed the point that the *indivisible bodies* are not moved by external impact (κινεῖσθαι...μήτε πληγῇ)[109] because he found himself in opposition to Democritus, who had declared the ναστὰ to be moved by external impact (πληγῇ κινεῖσθαι)[110]. In our opinion, it is most probable that Ecphantus did not concur with Democritus in observing that each of the *primary realities* may be forcibly moved by another without having some natural motion[111]. With a view to block the danger of determinism[112], Ecphantus conceded that Democritus had disregarded the fact that the *indivisible bodies* are activated by a divine power (ὑπὸ θείας δυνάμεως), which is said to be similar to *mind* (νοῦς) and *soul* (ψυχή)[113].

E. Zeller[114] and W.K.C. Guthrie[115] assumed that Ecphantus had borrowed Anaxagoras' idea of νοῦς as primary motive cause, whereas E. Frank[116] and J. Kerschensteiner[117] admitted that Ecphantus had adopted from Plato the theory that νοῦς is a spiritual cosmogonic force. To our mind, it deserves to be noted that for Ecphantus, who advocated a version of Pythagoreanism, the term νοῦς was the exact equivalent of the term μονὰς[118] and the term μονὰς was the exact equivalent of the term ἑστία[119]. Now J.P. Dumont[120] affirms that Ecphantus presented a theory of ψυχὴ which is in almost every essential particular the counterpart of Plato's cosmological doctrines, whereas W. Theiler[121] asserts that Ecphantus' theory of ψυχὴ is noticeably the same as the one attributed by Aristotle to some Pythagoreans who had declared the *soul* to be identical with the power of making the particles in the air move. In our opinion, it deserves to

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108. Cf. E. Moutsopoulos, Le *clinamen,* source d'erreur?, in *Philosophie de la culture grecque,* Athènes, Académie d'Athènes, 1998, p. 201.

109. Cf. Ecphant., F1 Diels.

110. Cf. Democr., A47 Diels.

111. Cf. Leucipp., A16 Diels.

112. Cf. Democr., A66 Diels.

113. Cf. Ecphant., F1 Diels.

114. Cf. E. Zeller - R. Mondolfo, *op. cit.,* p. 627.

115. Cf. W.K.C. Guthrie, *op. cit.,* p. 325.

116. Cf. E. Frank, *Plato und die sogenannten Pythagoreer,* Darmstadt, Wissenschaftliche Buchgesellschaft, 1962², p. 382.

117. Cf. J. Kerschensteiner, *op. cit.,* p. 214.

118. Cf. Iamb., *Theol. Ar.,* 6, 4.

119. Cf. Plu., *Num.,* 11, 1.

120. Cf. J.P. Dumont- D. Delattre - J.L. Poirier, *Les Présocratiques,* Paris, Gallimard, 1988, p. 1382.

121. Cf. I.G. Kalogerakos, *Seele und Unsterblichkeit: Untersuchungen zur Vorsokratik bis Empedocles,* Stuttgart, Teubner, 1996, p. 116.

be noted that for Ecphantus the Pythagorean ἁρμονία is the link between the *soul* (ψυχή)[122] and «the first thing fitted together» (τὸ πρᾶτον ἁρμοσθέν)[123]. This being so, we concur with A. Rey[124] and J.L.E. Dreyer in observing that Ecphantus substituted for the Philolaic *central fire* «the fire in the interior of the Earth, which revealed itself in volcanic eruptions»[125]. In view of the scant information about Ecphantus' astronomical instruments[126], we consider that he did not realize that «the Earth's ionosphere...is created by the effect of ultraviolet and X-radiation from the Sun»[127]. From this point of view it seems reasonable to infer that it was assumed by Ecphantus, quite wrongly[128], that the Earth's ionosphere is created by the effect of radiation from the fire in the interior of the Earth.

In view of the above-mentioned sequence of arguments, we are indined to think that, according to Ecphantus, the radiation from the fire in the interior of the Earth interacts with matter, and thus the *indivisible bodies* are said to be moved ὑπὸ θείας δυνάμεως. This being so, we maintain that the true reading of Hippolytus' text is as follows: Ἔκφαντος... ἔφη... κινεῖσθαι... τὰ σώματα... ὑπὸ θείας δυ᾽νάμεως, ἣν νοῦν... προσαγορεύει. τού<τῳ> μὲν οὖν τὸν κόσμον <εἶκελον> εἶναι δεῖν...[129]. In the light of this quotation it may be observed that the term δεῖν has a great deal to do with Hicetas' ultimate attitude towards the truth of any reference to facts (τὸ πιστὸν ἐκ τῶν φαινομένων ἀθρεῖν)[130]. Taking into account that ἀθρεῖν means «to consider»[131], we have reason to

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122. Cf. PHILOL., A23 Diels.

123. Cf. *ibid.*, B7 Diels. The translation is by C.A. HUFFMAN, *Philolaus of Croton*, London, Cambridge Univ. Press, 1993, p. 229.

124. Cf. A. REY, *L'apogée de la science technique grecque*, Paris, Michel, 1946, p. 73.

125. Cf. J.L.E. DREYER, *History of the Planetary Systems from Thales to Kepler*, London, Cambridge Univ. Press, 1906, p. 51.

126. Cf. E. MOUTSOPOULOS, Philosophy and Technical Points related to the Theories of the Origin of the Universe (in Greek), in *Philosophical Questions*, Vol. 1, Athens, Tzounacos, 1971, p. 89.

127. Cf. J. MITTON, *op. cit.*, p. 198.

128. Cf. *ibid.*

129. It is generally admitted that the sentence τοῦ μὲν οὖν τὸν κόσμον εἰδέναι ἰδεῖν (cf. ECPHANT., F1 Diels) has not the quality of being an intelligible one, because of corruptions in the text. With a view to improve the text, G. ROEPER, *op. cit.*, p. 620, E. BIGNONE, *op. cit.*, p. 439, and J. KERSCHENSTEINER, *op. cit.*, p. 214, made alterations in the phrase τὸν κόσμον εἰδέναι ἰδεῖν. To our mind, the term εἴκελος, which sounds like a *lectio difficilior*, may be inserted between the terms κόσμον and εἶναι.

130. Cf. ARIST., *Cael.*, B13, 293 a 29- 30. In our opinion, it deserves to be noted that, according to Aristotle (cf. *ibid.*, 293 a 15- 29), the thinkers who seek explanations in conformity with the appearances, and do not try by violence to bring the appearances into line with abstract theory, agree that it is right to assign the central position to the Earth, and declare that there is no need to invent a counter- Earth. As a matter of fact, Hicetas (cf. *supra* and n. 19) was the first Pythagorean to produce evidence in support of such a view.

131. Cf. H.G. LIDDELL - R. SCOTT, *op. cit.*, p. 33.

believe that Ecphantus, who was a disciple of Hicetas, seriously entertained the conception of a rational cosmos. On the other hand, it is most probable that Ecphantus made use of the medical term εἴκελος[132], and not of the Platonic term εἰκών[133], in order to imply that he found fault with the ways in which it was attempted to prove that a divine but not omnipotent craftsman transformed the disorderly materials of the universe into a harmonious cosmos by creating images of the unchanging Forms. In our opinion, Ecphantus held that the cosmos has become spherical ὑπὸ μιᾶς δυνάμεως[134] because he regarded the merits of a spherical and not static universe[135] as asserted by Philolaus' account of the generation of the cosmos[136]. From this evidence we may conclude that in a way the Ecphantean δύναμις, which is invisible to the naked eye[137] but has much to do with the unity of the cosmos[138], represents Archytas' motive force[139].

As a matter of fact, Ecphantus' reference to δύναμις or θεία δύναμις[140] is indissolubly linked to Ecphantus' doctrine of divine providence[141], which contributed greatly to moral reflections[142] by explaining the unity of the cosmos[143] in terms of Order[144] and Purpose[145]. On the other hand, it is perhaps worth recalling that, according to E. Bignone, Lucretius criticized Ecphantus' doctrine of divine providence[146] for being quite inconsistent with the basic tenets of Democritean and Epicurean physics[147]. This being so, we have reason to believe that, far from identifying himself with Plato's doctrine of divine providence[148], Ecphantus modified Atomism into something more in keeping with the scientific requirements of Pythagoreanism. In other words, we

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132. Cf. P.D. APOSTOLIDIS, *A Comprehensive Dictionary of the Hippocratic Medicine* (in Greek), Athens, Gabriilidis, 1997, p. 226.

133. Cf. PL., *Ti.*, 29 b 1- 2.

134. Cf. ECPHANT., F1 Diels. In point of fact, it deserves to be noted that the emendation ὑπὸ θείας δυνάμεως is a pure conjecture, unsupported by positive evidence.

135. Cf. PHILOL., B7 Diels.

136. Cf. *ibid.*, B17 Diels.

137. Cf. G.T. SACELLARIOU, *Pythagoras* (in Greek), Athens, Drivopoulos, 1963, p. 366.

138. Cf. A.G. DALEZIOS, Ecphantus of Syracuse (in Greek), *Great Greek Encyclopedia,* Vol. 9, Athens, Phoenix, p. 852.

139. Cf. C.N. POLYCARPOU, Archytas' Approach to the One, *Diotima,* 28, 2000, pp. 22- 23.

140. Cf. *supra* and n. 128.

141. Cf. ECPHANT., F4 Diels.

142. Cf. A. DELATTE, *La vie de Pythagore de Diogéne Laërce,* Olms, Hildesheim, 1988², p. 208.

143. Cf. E. WELLMANN, Ekphantos, *Paulys Realencyclopädie der classischen Altertumswissenschaft,* Vol. 5, Stuttgart, Metzler, 1905, p. 2215.

144. Cf. M. FREDE, Ekphantos, *Der neue Pauly,* Vol. 3, Stuttgart, Metzler, 1997, p. 942.

145. Cf. K. FREEMAN, *The Pre-Socratic Philosophers,* London, Blackwell, 1946, p. 241.

146. Cf. E. BIGNONE, *op. cit.*, pp. 436- 437.

147. Cf. IDEM, *loc. cit.*, p. 450.

148. Cf. DIOG. LAERT., *V. P.*, 3. 24.

maintain that Ecphantus never attempted to bring his teaching into harmony with Democritus' conception of a universe ruled by φύσει τινι ἀλόγῳ[149] because he concurred with Philolaus in observing that ἁ ἄλογος φύσις is in some way connected with ψεῦδος[150], whereas ἁ τῶ ἀριθμῶ φύσις has nothing to do with ψεῦδος[151]. From this point of view it may be inferred that for Ecphantus, who aligned himself with Hicetas[152] and Archytas[153], the natural world is ordered in a matter consistent with the existence of mathematical relations proceeding from divine providence. With a view to lay special emphasis on Hicetas' theory of the Earth's axial rotation[154], Ecphantus , who attempted to modify Philolaus' account of the generation of the cosmos[155], located what is controlling in the fire in the interior of the Earth «which the demiurgic *god* set down under the sphere of the whole»[156].

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149. Cf. LEUCIPP., A22 Diels.
150. Cf. PHILLOL., B11 Diels.
151. Cf. *ibid.*
152. Cf. *supra* and n. 19.
153. Cf. K.D. GEORGOULIS, Greek Philosophy (in Greek), *The Helios Encyclopedia*, Vol. 7, Athens, Helios, p. 566.
154. Cf. *supra* and n. 39.
155. Cf. *supra* and n. 136.
156. Cf. PHILOL., A17 Diels. The translation is by C.A. HUFFMAN, *op. cit.*, p. 400.

Η ΘΕΩΡΙΑ ΤΟΥ ΕΚΦΑΝΤΟΥ ΠΕΡΙ ΤΗΣ ΣΥΣΤΑΣΕΩΣ ΤΟΥ ΚΟΣΜΟΥ

Περίληψη

Ὁ Ἔκφαντος ὁ Κροτωνιάτης, ὁ ὁποῖος ἐγεννήθη περὶ τὸ 395 π. Χ. καὶ ἀπέθανε περὶ τὸ 330 π. Χ., ὑπῆρξε διαπρεπὴς φιλόσοφος καὶ ἀστρονόμος. Μαθητὴς τοῦ Ἱκέτου καὶ ἐπιφανὲς μέλος τῆς Σχολῆς τῶν Συρακουσῶν, ὁ Ἔκφαντος ἀπεφάνθη ὅτι ὁ κόσμος σύγκειται ἐξ ὡρισμένου πλήθους ἀοράτων *ἀδιαιρέτων σωμάτων* τὰ ὁποῖα κινοῦνται ἐντὸς τοῦ κενοῦ χώρου. Πρὸς αἰτιολόγησι τῆς ἑνότητος ἑκάστου *ἀδιαιρέτου σώματος* ὁ Ἔκφαντος συνέλαβε ἀδρομερῶς τὴν ἔννοια τοῦ μεσονίου (*δύναμις*) ἐνῶ πρὸς αἰτιολόγησι τῆς κινήσεως ἑκάστου *ἀδιαιρέτου σώματος* ἐσφαλμένως ὑπέθεσε τὴν ὕπαρξι ἀκτινοβολίας προερχομένης ἐκ τοῦ ἐσωτέρου πυρὸς τῆς Γῆς (*θεία δύναμις*). Κατὰ τὸν Ἔκφαντον τὰ *ἀδιαίρετα σώματα* συναποτελοῦν τὸν διαστελλόμενον σφαιροειδῆ κόσμον ὁ ὁποῖος διέπεται ὑπὸ τῆς θείας προνοίας.