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Empedocles' Cosmic Cycle and the Pythagorean *Tetractys*

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Abstract: Empedocles posits six fundamental principles of the world: Love, Strife and the four elements (*rhizōmata*). On the cosmic level, he describes the interaction of the principles as an eternal recurrence of the same, *i.e.* as a cosmic cycle. The cycle is subject to a time-table the evidence for which was discovered by Marwan Rashed and has been edited by him in 2001 and 2014. The purpose of the present paper is to show that this timetable is based on the numerical ratios of the Pythagorean *tetractys*.

Keywords: Empedoclean Physics, Cosmic Cycle, Cosmic Time-Table, Pythagorean Number Philosophy, Tetractys, Byzantine Scholia on Aristotle

Pour Marwan Rashed
sine quo non

I Empedocles' six principles

In a considerable number of preserved fragments of Empedoclean poetry¹ the speaker presents himself as a human teacher who is orally expounding a *natural philosophy in verse form* to his chosen disciple Pausanias for whom the exposition is exclusively intended.² Quite unlike the divine epistolographer to be encountered in another set of Empedoclean fragments (“Katharmoi”), the physical

1 The fragments from and secondary sources on Empedocles' poetry will be quoted throughout from Mansfeld/Primavesi 2011.

2 Empedocles text 40 Mansfeld/Primavesi (Diog. Laert. VIII.60 = DK 31 B 1): ἦν δ' ὁ Πausανίας, ὡς φησιν Ἀρίστιππος καὶ Σάτυρος, ἐρώμενος αὐτοῦ, ᾧ δὴ καὶ τὰ Περὶ φύσεως προσηφώνηκεν οὕτως: Πausανίη, σὺ δὲ κλύθι, δαίφρονος Ἀγχίτου υἱέ.

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teacher, as a human being, depends on the inspiration of his muse,³ whom he calls *Calliope*.⁴ The natural philosophy in question attempts to reconcile two of the distinguishing characteristics ascribed to Being by Parmenides—that it *does not come to be* and *does not pass away*—with the empirically observable fact of the existence of *change*. The narrator posits six fundamental principles, the only entities which he recognizes as “being” in the strict sense of the word. These are the four elements (*rhizōmata*) fire, air, water, and earth,⁵ whose total mass never increases or decreases,⁶ as well as the two forces Love and Strife.⁷ The complex interaction of these six entities can be described as a system of three *functions*.

- 1) The function of Love is to combine *different* elements, or portions of different elements, into organic compounds (“living beings”).
- 2) The function of Strife is to dissolve combinations of different elements.
- 3) As soon as the elements are set free by Strife, their *own* function becomes apparent. It consists in enacting the attraction of *like to like* which is inherent in them.⁸ Unless prevented from doing so by Love, the four elements form, by themselves, four homogeneous concentric masses, each being located at the natural place of the element in question.

This system of three functions has been crucially misrepresented by Aristotle: Aristotle assumes that, according to Empedocles, Love combines (no matter what) and Strife dissolves (no matter what). For Aristotle finds fault with the fact that Love, by producing mixtures of different elements, is by necessity *dis-*

³ See Empedocles texts 43, 45, 67, and 187 Mansfeld/Primavesi.

⁴ Empedocles text 187 Mansfeld/Primavesi (DK 31 B 131), line 3: εὐχομένωι νῦν αὖτε παρίστασο, Καλλιόπεια.

⁵ Empedocles text 66b Mansfeld/Primavesi, *Physika* I.249: πῦρ καὶ ὕδωρ καὶ γαῖα καὶ αἰθέρος ἀπλετον ὕψος.

⁶ Empedocles text 66b Mansfeld/Primavesi, *Physika* I.261–264: καὶ πρὸς τοῖς οὐτ’ ἄρ τι ἐπιγίγνεται οὐδ’ ἀπολήγει· / εἴ τε γὰρ ἐφθεῖροντο διαμπερές, οὐκ ἂν ἔτ’ ἦσαν· / τοῦτο δ’ ἐπαυξήσκει τὸ πᾶν τί κε; καὶ πόθεν ἔλθόν; / πῆι δέ κε κάξαπόλοιτο, ἐπεὶ τῶνδ’ οὐδὲν ἐρήμον;

⁷ Empedocles text 57 Mansfeld/Primavesi (DK 31 B 16): ἧ γὰρ καὶ πάρος ἦν <τε> καὶ ἔσ<σε>ται, οὐδέ ποτ’, οἶω, / τούτων ἀμφοτέρων κενεώσεται ἀσπετος αἰών. Empedocles text 66b Mansfeld/Primavesi, *Physika* I, lines 250–257: Νεῖκός τ’ οὐλόμενον δίχα τῶν, ἀτάλαντον ἀπάντη, / καὶ Φιλότης ἐν τοῖσιν, ἴση μῆκός τε πλάτος τε· / τὴν σὺ νόωι δέρκει, μῆδ’ ὄμμασιν ἦσο τεθιπώς· / ἧτις καὶ θνητοῖσι νομίζεται ἔμφυτος ἄρθροις, / τῇ τε φίλα φρονέουσι καὶ ἄρθμια ἔργα τελοῦσι, / Γηθοσύνην καλέοντες ἐπώνυμον ἡδ’ Ἀφροδίτην· / τὴν οὐ τις μετὰ τοῖσιν ἐλισσομένην δεδάηκε / θνητὸς ἀνὴρ· σὺ δ’ ἄκουε λόγου στόλον οὐκ ἀπατηλόν.

⁸ Empedocles text 58 Mansfeld/Primavesi (DK 31 B 22), lines 1–3: ἄρθμια μὲν γὰρ <τ>αὐτα ἐαυτῶν πάντα μέρεσσιν, / ἡλέκτωρ τε χθών τε καὶ οὐρανὸς ἡδὲ θάλασσα, / ὅσσα φιν ἐν θνητοῖσιν ἀποπλαγχθέντα πέφυκεν. See further texts 59–61 and Müller (1965), pp. 27–65.

solving the homogeneous masses. As to Strife, Aristotle even goes so far as to ascribe to Empedocles the claim that Strife does not remain content to dissolve heterogeneous combinations, but actually produces the homogeneous masses by *combining* portions of one and the same element with each other. On that basis, Aristotle in *Metaphysics* A.4 charges Empedocles with a twofold self-contradiction: Empedocles would have to admit that Love does not only combine, as he claims, but also dissolves, and that Strife does not only dissolve, as he claims, but also combines.⁹ In fact, there is no such self-contradiction. For Empedocles has never claimed that *all* aggregations of elements, both the *heterogeneous* aggregations and the *homogeneous* ones, are brought about by Love and undone by Strife. What he claims is just this: Love produces *mixtures* of *different* elements, and these *mixtures* of *different* elements are then dissolved by Strife. So the fact that Love once in a while *destroys* homogeneous masses in order to produce mixture does not imply the slightest self-contradiction. Nor has Empedocles claimed that Strife, apart from dissolving Love's mixtures, undertakes the creative extra job of bringing together the homogeneous masses. Far from it: the homogeneous masses are produced by the elements themselves, by the attraction of like to like inherent in them. So a preliminary result seems to be this. Not only Love and Strife, but also the four Elements are directed each to one and only one clearly defined end. All six of them play a causal role: Love brings about the change from non-mixture to mixture, Strife from mixture to non-mixture. The elements tend to change the state of themselves towards homogeneous concentration.

Both the eternal existence and the ontological priority of the six principles are well illustrated by Empedocles' criticism of the popular notions of life and death. One might think that the combination of elements into organic compounds by Love and their subsequent dissolution by Strife involve a "coming-to-be" or a "passing away". But in fact, this is not the case, although everyday linguistic usage suggests that it is:¹⁰ the only thing about us mortals that truly *is* is the four

9 Empedocles text 62 Mansfeld/Primavesi (Aristot. *Metaph.* A.4 985^a23–29 = DK 31 A 37): πολλαχῶ γοῦν αὐτῷ ἢ μὲν φιλία διακρίνει τὸ δὲ νεῖκος συγκρίνει. ὅταν μὲν γὰρ εἰς τὰ στοιχεῖα διίστηται τὸ πᾶν ὑπὸ τοῦ νεῖκος, τότε τὸ πῦρ εἰς ἓν συγκρίνεται καὶ τῶν ἄλλων στοιχείων ἕκαστον· ὅταν δὲ πάλιν ὑπὸ τῆς φιλίας συνίωσιν εἰς τὸ ἓν, ἀναγκαῖον ἐξ ἑκάστου τὰ μόρια διακρίνεσθαι πάλιν.

10 Empedocles text 54 Mansfeld/Primavesi: a) (Plut. *Adv. Col.* 1113A = DK 31 B 10) τοσοῦτον <δ'> ἐδέησε τοῦ κινεῖν τὰ ὄντα καὶ μάχεσθαι τοῖς φαινομένοις, ὥστε μὴδὲ τὴν φωνὴν ἐκβαλεῖν ἐκ τῆς συνηθείας, ἀλλ' ὅσον εἰς τὰ πράγματα βλάπτουσαν ἀπάτην παρείχεν ἀφελὼν αὐθις ἀποδοῦναι τοῖς ὀνόμασι τὸ νενομισμένον ἐν τούτοις. – b) 1–5 (Plut. *Adv. Col.* 1113A–B = DK 31 B 9): οἱ δ' ὅτε μὲν κατὰ φῶτα μίγνεν φῶς αἰθέρι<ον βῆι> / ἢ κατὰ θηρῶν ἀγροτέρων γένος ἢ κατὰ θάμνων / ἢ κατ' οἰωνῶν, τό γε μὲν <καλέουσι> γενέσθαι. / εὖτε δ' ἀποκρινθῶσι, τὸ δ' αὖ δυσδαίμονα

elements.¹¹ While living beings are an extremely short-lived aggregate of those elements, the elements themselves neither arise¹² nor pass away; thus, if we *are* anything at all, we *are the divine elements*. As first shown by the Strasbourg Empedocles papyrus,¹³ the mortal teacher of the *Physika* expresses this quite aptly by occasionally passing over the transitory individuality of the isolated combinations altogether and speaking instead directly in the name of the four elements themselves: “Under Love’s dominion, we [= the elements] come together into the *Sphairos*”.¹⁴ This expression nicely illustrates the precarious status of what we would call individual beings within Empedocles’ cosmic cycle. They are truly secondary entities: the rich variety of organic combinations is a fascinating spectacle to observe,¹⁵ but their ontological status is entirely derivative; and this does not only hold for the composition of their bodies, but also for the mechanisms of their sense perceptions and the contents of their thoughts.

Empedocles explains sense perception and cognition by the attraction of like to like and by positing that every potential object of perception or cognition gives off a kind of elemental discharge¹⁶ that gravitates toward the portions of the same element in us, which it reaches through pores specifically tailored to each particular element.¹⁷ Thus, perception and cognition occur in keeping with the principle of “like *with* like”¹⁸ which is clearly derived from the basic function of

πότμον. / ἤι θέμις, <οὐ> καλέουσι· νόμῳ δ’ ἐπίφημι καὶ αὐτός. – c) (Plut. *Adv. Col.* 1113b = DK 31 B 10) ... φῶτας μὲν καὶ θῆρας καὶ θάμνους καὶ οἰωνοὺς ὁ Ἐμπεδοκλῆς οὐκ ἀνήρηκεν, ἃ γέ φησι μίγνυνμένων τῶν στοιχείων ἀποτελεῖσθαι, τοὺς δὲ τῇ συγκρίσει ταύτη καὶ διακρίσει, φῶσιν’ τινὰ καὶ ,πότμον δυσδαίμονα’ καὶ ,θάνατον ἀλοίτην’ ἐπικατηγοροῦντας ἢ σφάλλονται διδάξας οὐκ ἀφείλετο τὸ χρῆσθαι ταῖς εἰθισμέναις φωναῖς περὶ αὐτῶν.

11 Empedocles text 66b Mansfeld/Primavesi, *Physika* I.265–266: ἀλλ’ αὐτ’ ἐστὶν ταῦτα, δι’ ἀλλήλων γε θέοντα / γίγνεται ἄλλοτε ἄλλα καὶ ἡνεκὲς αἰὲν ὁμοῖα.

12 Empedocles text 50 Mansfeld/Primavesi (Hesych. α 442 Latte, s. v. ἀγέννητα = DK 31 B 7): ἀγέννητα· στοιχεῖα. παρ’ Ἐμπεδοκλεῖ.

13 First edited by Martin/Primavesi 1999; see also Primavesi 2008.

14 Empedocles text 66b Mansfeld/Primavesi, *Physika* I.267: [... συνερχό]μεθ’ εἰς ἓνα κόσμον. See also *ibid.*, lines 287 [οὐ δὴ πω] μεσάτους τ[ι ἐσε]ρχόμεθ’ ἐν μ[όνον εἶναι.] and line 303 ἄλλοτε μὲν Φιλότητι συνερχόμεθ’ εἰς ἓν ἅπαντα. See further Primavesi (2013), p. 718.

15 Empedocles text 69b Mansfeld/Primavesi (DK 31 B 35), line 17: θαῦμα ἰδέσθαι.

16 Empedocles text 101 Mansfeld/Primavesi (Plut. *Quaest. nat.* 916d = DK 31 B 89): σκόπει δὴ, κατ’ Ἐμπεδοκλέα ἔγνους, ὅτι πάντων εἰσὶν ἀπορροαί, ὅσ’ ἐγένοντο ...’ οὐ γὰρ ζῶων μόνον οὐδὲ φυτῶν οὐδὲ γῆς καὶ θαλάττης, ἀλλὰ καὶ λίθων ἅπεισιν ἐνδελεχῶς πολλὰ ρεύματα καὶ χαλκοῦ καὶ σιδήρου.

17 See texts 102–104 Mansfeld/Primavesi.

18 Empedocles text 121b Mansfeld/Primavesi (DK 31 B 109): γαίη μὲν γὰρ γαῖαν ὁπώπαμεν, ὕδατι δ’ ὕδωρ, / αἰθέρι δ’ αἰθέρα διον, ἀτὰρ πυρὶ πῦρ αἰδηλον, / στοργὴν δὲ στοργῇ, νεῖκος δὲ τε νεῖκεῖ λυγρῶ.

like to like. A fine example is provided by Empedocles' explanation of the process of seeing, since it is particularly well documented.¹⁹ The eye contains within itself both fire (which is light) and water (which is dark). It is also covered with membranes (that is, the cornea) that are made up of air and earth and equipped with pores that are permeable to fire as well as with others that are permeable to water. In keeping with the attraction of like to like, the fire and water secretions of the object of perception, which are responsible for the perception of light and dark respectively, enter the eye through the corresponding pores and reach the fire or water present within it.²⁰ This process only continues, however, until a balance has been established between the concentration of a given element inside the eye and its concentration outside.²¹ Thus, the process of seeing can be explained as one in which the eye takes in whichever element is underrepresented within it. Living beings whose eyes are naturally filled with a small amount of fire and a large amount of water are capable of taking in a large amount of outer fire and a small amount of outer water, and can therefore see better in the light than in the dark. The opposite is true of living beings whose eyes contain a small amount of water and a large amount of fire. In order to avoid being overfilled, the eye regularly discharges the excess fire or water that has accumulated in the process of seeing. For example, the fire that has entered it in the daylight thanks to a given difference in concentration is released again in the darkness of night, because at that time the difference in concentration is reversed: it is this noctur-

19 See further Primavesi 2013, 700–702 with references.

20 Empedocles text 105 Mansfeld/Primavesi (Theophr. *Sens.* 7/2 = *Doxographi* p. 500,23–29 Diels = DK 31 A 86): *πειράται δὲ καὶ τὴν ὄψιν λέγειν, ποία τίς ἐστι· καὶ φησι τὸ μὲν ἐντὸς αὐτῆς εἶναι πῦρ, τὸ δὲ περὶ αὐτὸ γῆν καὶ ἀέρα, δι' ὧν διέναι λεπτόν ὃν καθάπερ τὸ ἐν τοῖς λαμπτήρσι φῶς. τοὺς δὲ πόρους ἐναλλάξ κείσθαι τοῦ τε πυρός καὶ τοῦ ὕδατος, ὧν τοῖς μὲν τοῦ πυρός τὰ λευκά, τοῖς δὲ τοῦ ὕδατος τὰ μέλανα γνωρίζειν· ἐναρμόττειν γὰρ ἑκατέροις ἑκάτερα. φέρεσθαι δὲ τὰ χρώματα πρὸς τὴν ὄψιν διὰ τὴν ἀπορροήν.*

21 Empedocles text 107 Mansfeld/Primavesi (Theophr. *Sens.* 8; *Doxographi* p. 500,29–501,11 Diels = DK 31 A 86): *συγχεῖσθαι δ' οὐχ ὁμοίως <τὰς ὄψεις, ἀλλὰ τὰς μὲν ἐκ ἐλάττονος πυρός καὶ πλείονος ὕδατος>, τὰς δ' ἐκ τῶν ἀντικειμένων, καὶ ταῖς μὲν ἐν μέσῳ, ταῖς δ' ἐκτὸς εἶναι τὸ πῦρ· διὸ καὶ τῶν ζώων τὰ μὲν ἐν ἡμέρᾳ, τὰ δὲ νύκτωρ μᾶλλον ὀξυωπεῖν· ὅσα μὲν πυρός ἐλάττον ἔχει, μεθ' ἡμέραν· ἐπανισοῦσθαι γὰρ αὐτοῖς τὸ ἐντὸς φῶς ὑπὸ τοῦ ἐκτὸς· ὅσα δὲ τοῦ ἐναντίου, νύκτωρ· ἐπαναπληροῦσθαι γὰρ καὶ τούτοις τὸ ἐνδεές· ἐν δὲ τοῖς ἐναντίοις <ἐναντίως> ἑκάτερον. ἀμβλυωπεῖν μὲν γὰρ καὶ οἷς ὑπερέχει τὸ πῦρ· ἐπαυξηθὲν <γὰρ> ἔτι μεθ' ἡμέραν ἐπιπλάττειν καὶ καταλαμβάνειν τοὺς τοῦ ὕδατος πόρους· οἷς δὲ τὸ ὕδωρ, ταῦτ' οὗτο γίνεσθαι νύκτωρ· καταλαμβάνεσθαι γὰρ τὸ πῦρ ὑπὸ τοῦ ὕδατος, – ἕως ἄν τοῖς μὲν ὑπὸ τοῦ ἔξωθεν φωτός ἀποκριθῇ τὸ ὕδωρ, τοῖς δ' ὑπὸ τοῦ ὕδατος τὸ πῦρ. ἑκατέρων γὰρ ἴσιν εἶναι τὸ ἐναντίον. ἄριστα δὲ κεκράσθαι καὶ βελτίστην εἶναι τὴν ἐξ ἀμφοῖν ἴσων συγχευμένην. καὶ περὶ μὲν ὀψεως σχεδὸν ταῦτα λέγει.*

nal discharge, certainly not the process of vision itself, which is illustrated by the famous lantern analogy.²²

II The cosmic cycle

According to Empedocles, it is impossible to provide a satisfactory account of all states and events in the history of the universe by assuming a *globally stable* interaction of the six principles. The world's course is determined, rather, by a regular alternation between a period of increasing Love, which leads towards *total mixture* of the four elements, and a period of increasing Strife, which leads towards *total separation* of the four elements.²³ The *Physica* may have contained more than one description of this *cosmic cycle*,²⁴ each of which would have added new details to the account. It has in any case been possible to reconstruct one substantial account of the cycle by combining the fragments of an ancient papyrus copy of the *Physica* with a series of quotations in Simplicius clearly coming from the same part of the first book.²⁵

Throughout the cycle, Love is consistently depicted as inside, whereas Strife is consistently depicted as outside. What changes in the relationship between Love and Strife is merely the way the cosmos, which is filled with the four elements and is more or less spherical in shape,²⁶ is *divided up* between them. In the phase of increasing mixture, Love starts out from the centre and occupies a larger and larger portion of the cosmos in a process of centrifugal expansion,

²² Empedocles text 111 Mansfeld/Primavesi (DK 31 B 84), emended on the basis of cod. Vat. 1339 (P) and cod. Berol. Phill. 1507 (B^o): ὥς δ' ὅτε τις πρόοδον νοέων ὠπλίσσατο λύχρον / – χειμερίην διὰ νύκτα πυρὸς σέλας αἰθομένοιο – / ἄψας παντοίων ἀνέμων λαμπτήρας ἀμολγούς, / οἱ τ' ἀνέμων μὲν πνεῦμα διασκιδνάσιν ἀέντων, / πῦρ δ' ἔξω διαθρώισκον, ὅσον ταναώτερον ἦεν, / λάμπεσκεν κατὰ βηλὸν ἀτειρέσιν ἀκτίνεσσιν· / ὥς δὲ τότε ἔν μὴνιγξιν ἐεργμένον ὠγύγιον πῦρ / λεπτήϊσιν χοάναις διεχέατο κύκλοπα κούρη· / αἶ δ' ὕδατος μὲν βένθος ἀπέστεγον ἀμφιπαιάντος, / πῦρ δ' ἔξω διέσκον, ὅσον ταναώτερον ἦεν.

²³ Empedocles text 66b Mansfeld/Primavesi, *Physika* I.232–233: δίπλ' ἐρέω· τοτὲ μὲν γὰρ ἔν ηὐξήθη μόνον εἶναι / ἐκ πλεόνων, τοτὲ δ' αὖ διέφυ πλεόν' ἐξ ἐνὸς εἶναι.

²⁴ Empedocles text 68b Mansfeld/Primavesi (DK 31 B 26), line 12: ταύτηι δ' αἰὲν ἔασιν ἀκίνητοι κατὰ κύκλον.

²⁵ See Primavesi (2008), Primavesi (2013), pp. 691–693, and Empedocles texts 66–88 Mansfeld/Primavesi.

²⁶ Empedocles text 127 Mansfeld/Primavesi (Aëtius II.31, 4 = DK 31 A 50): Ἐμπεδοκλῆς τοῦ ὕψους τοῦ ἀπὸ τῆς γῆς εἰς τὸν οὐρανόν, ἥ τις ἐστὶν ἀφ' ἡμῶν ἀνάτασις, πλείονα εἶναι τὴν κατὰ τὸ πλάτος διάστασιν. κατὰ τοῦτο τοῦ οὐρανοῦ μᾶλλον ἀναπεπταμένου διὰ τὸ ὥφ παραπλησίως τὸν κόσμον κεῖσθαι.

forcing Strife further and further toward the periphery.²⁷ Conversely, in the phase of increasing separation Strife starts out from the periphery and in a process of centripetal invasion penetrates further and further into the cosmos from all sides, compressing Love back into the centre.

Each process—that of increasing mixture and that of increasing separation—has a cosmic state of *divine* perfection as its goal. The process of mixture brought about by Love's expansion leads to a state of rest in which the four elements are completely mixed and combined into a spherical god, the *Sphairos*;²⁸ the latter is probably also referred to as Apollo.²⁹ Strife's centripetal invasion, by contrast, leads to a state in which the four elements have assembled themselves, by the inherent attraction of like to like, in four concentric masses with an earthly sphere at the centre, surrounded by the spherical shells of water, air, and fire; these masses rotate around each other at maximum speed. Like the *Sphairos* (Apollo), these four perfect masses are regarded as gods, which also justifies the attribution of the names of two divine couples to the four elements as such – Zeus (Fire) & Hera (Air), *Aidoneus/Hades* (Earth) & *Nestis* (Water).³⁰ Yet in the full sense of

27 Empedocles text 69b Mansfeld/Primavesi (DK 31 B 35), lines 7–17: τῶν δέ τε μισγομένων χεῖτ' ἔθνεα μυρία θνητῶν / πολλὰ δ' ἄμειχθ' ἔστηκε κεραιομένοισιν ἐναλλάξ, / ὅσ' ἔτι Νεῖκος ἔρυκε μετάρσιον· οὐ γὰρ ἀμεμφέως / τῶν πᾶν ἐξέστηκεν ἐπ' ἔσχατα τέρματα κύκλου, / ἀλλὰ τὰ μὲν τ' ἐνέμμινε μελέων τὰ δέ τ' ἐξεβεβήκει. / ὅσσην δ' αἰὲν ὑπεκπροθέοι, τόσην αἰὲν ἐπήμει / ἡπιόφρων Φιλότῆτος ἀμεμφέος ἄμβροτος ὀρμή / αἴψα δὲ θνήτ' ἐφύοντο, τὰ πρὶν μάθον ἀθάνατ' εἶναι, / ζῳρά τε τὰ πρὶν ἄκρητα διαλλάξαντα κελεύθους. / τῶν δέ τε μισγομένων χεῖτ' ἔθνεα μυρία θνητῶν, / παντοίαις ιδέησιν ἀρηρότα, θαῦμα ἰδέσθαι.

28 See Empedocles texts 72–76 Mansfeld/Primavesi.

29 Empedocles text 192b Mansfeld/Primavesi (Ammonius *In int.* p. 249,1–10 Busse; the text of the embedded Empedoclean quotation [DK 31 B 134] is here corrected after Olympiod. *In Gorg.* 4.3, Cod. Marc. Gr. Z. 196 [=743] *in margine*): διὰ ταῦτα δὲ καὶ ὁ Ἀκραγαντίνος σοφὸς ἐπιπραπίσας τοὺς περὶ θεῶν ὡς ἀνθρωποειδῶν ὄντων παρὰ τοῖς ποιηταῖς λεγομένους μύθους, ἐπήγαγε—προηγουμένως μὲν περὶ Ἀπόλλωνος, περὶ οὗ ἦν αὐτῷ προσεχῶς ὁ λόγος, κατὰ δὲ τὸν αὐτὸν τρόπον καὶ περὶ τοῦ θεοῦ παντὸς ἀπλῶς ἀποφαίνομενος— οὕτε γὰρ ἀνδρομέη κεφαλῇ κατὰ γυῖα κέκασται, / οὐ χέρες, οὐ θοὰ γοῦν', οὐ μῆδεα λαχνήεντα, / ἀλλὰ φρὴν ἱερὴ καὶ ἀθέσφατος ἔπλετο μῦθον, / φροντίσι κόσμον ἅπαντα καταΐσσοις θοῇσιν. See further Primavesi (2006a).

30 Empedocles text 49b Mansfeld/Primavesi (DK 31 B 6): τέσσαρα γὰρ πάντων ριζώματα πρῶτον ἄκουε · Ζεὺς ἀργῆς Ἥρη τε φερέσβιος ἡδ' Αἰδωνεύς / Νηστὶς θ', ἥ δακρύοις τέγγει κρούνωμα βρότειον. The identification of Zeus with fire is put beyond reasonable doubt by the epithet ἀργῆς. For the couple *Aidōneus* (= Earth) & *Nēstis* (= Water) see Heyne (1776), p. IX, n.* to p. VIII (continued): „Mir deucht die Auflösung folgende zu seyn: Aidoneus ist die Erde, und Nestis das Wasser, beyde aber sind als unterirdische Wesen, oder Gottheiten, betrachtet, eben das, was sonst Pluto und Proserpina; das Wasser fließt ja unter der Erde. Als Proserpina benetzt sie das Auge der Sterblichen (den sterblichen Quell, versteht sich, der Thränen,) mit Thränen; indem sie auf die Menschen das harte Schicksal des Todes eindringen läßt“.

the word, the elements are “gods” only during their full separation; in the remaining parts of the cycle, by contrast, their divine individuality is compromised and diminished. This holds for the phase of increasing mixture presided over by Love and for that of increasing separation presided over by Strife; it is no accident that in these periods the elements are referred to merely as *daimones* (δαίμονες) rather than *theoi* (θεοί).³¹ *A fortiori*, the same holds also for the period of total unity and rest, i.e. for the *Sphairos*, the single god who has, as it were, swallowed the four gods.

Both Empedocles’ cosmology and his biology are based on the structure of the cosmic cycle and are only comprehensible in relation to it. While we will consider his biology in connexion with the cosmic timetable, the relationship between cosmic cycle and cosmology may be briefly illustrated, in advance, by Empedocles’ remarkable theory of the *sun*.³² Within the cosmic cycle, fire’s ascent to the periphery of the cosmos at the height of Strife’s dominion, which at the present stage of the history of the universe still lies ahead of us, culminates in the formation of a fiery spherical shell that surrounds the entire atmosphere. This fundamental assumption seems to be the basis for Empedocles’ hypothesis that what we know as the sun is in fact a mere reflection of the fire that *already* covers an entire half of the firmament, the half that faces away from us during the day. This fire first illuminates the half of the firmament that is covered with air and visible to us in the daytime, which then reflects it onto the earth, which in turn, like a lens, reflects it back on the visible heaven in the form of a equally visible disk. The fire, by contrast, which covers the other half of the firmament is not visible to us. The path of this disk in the heavens may then be explained by the rotation of the firmament, which naturally also involves the latter’s fiery half.

III The timetable of the cycle and the *tetractys*

Love’s expansion and Strife’s invasion take “equal times”,³³ the coming-to-be both of the *Sphairos* by Love and of “our world” by Strife occurs in accordance

³¹ Empedocles text 155 Mansfeld/Primavesi (DK 31 B 59): αὐτὰρ ἐπεὶ (φησί) κατὰ μείζον ἐμίσγετο δαίμονι δαίμων, / ὅτε τοῦ Νείκου ἐπεκράτει λοιπὸν ἡ Φιλότης / ταῦτά τε συμπίπτεσκον, ὅππῃ συνέκυρσεν ἕκαστα, / ἄλλα τε πρὸς τοῖς πολλὰ διηνεκῇ ἐξεγένοντο.

³² See Empedocles texts 129–135 Mansfeld/Primavesi.

³³ Empedocles text 94a Mansfeld/Primavesi (Aristot. *Phys.* VIII.1 252^a31–32): τὸ δὲ καὶ δι’ ἴσων χρόνων δεῖται λόγου τινός.

with a *timetable* of a fixed number of time units (*chronoi*).³⁴ A more detailed reconstruction of this cosmic timetable has been made possible by a set of Byzantine scholia (early 12th century) on Aristotle's natural philosophy. The preliminary reconstruction suggested by Rashed (2001) on the basis of the material which he had identified and edited by then³⁵ could be corrected in an important respect by Rashed (2014) thanks to his identification and edition of supplementary material. From the complete evidence now available Rashed has deduced the following basic structure of the timetable as attested by the Byzantine scholia:³⁶ Love's centrifugal expansion lasts *sixty* time units (*chronoi*), the *Sphairos* lasts *forty* time units, and Strife's centripetal invasion lasts again *sixty* time units; the latter is immediately followed by the next revolution of the cycle which starts with Love's expansion (**PLATE 1**). Rashed's deduction is entirely convincing,³⁷ and it will be taken for granted in the following argument.

At first sight, the figures 60—40—60 look fairly arbitrary. The natural starting point for any attempt at making sense of these figures is the well-known fact that in pre-Platonic philosophy the analysis of natural phenomena by means of numbers or numerical ratios is entirely restricted to the *Pythagoreans*.³⁸ If, then, a key for decoding the Byzantine timetable is at all available, it is likely to come from a source in which the cosmic cycle of Empedoclean physics is linked with Pythagorean number-philosophy. The one text which fills that bill is the pseudo-Pythagorean *Oath*, purportedly the Pythagoreans' vow of silence:³⁹

34 Empedocles text 91b Mansfeld/Primavesi (Georgios Pachymeres *In phys.*, Cod. Laur. 875; fol. 6^v, lines 3–15): 'Ἐμπεδοκλῆς δὲ καὶ Ἀναξαγόρας καθὼς ἐν καὶ πολλὰ τὰ στοιχεῖα ἔλεγον ὠμοφώνουν· ἐξέκρινον γὰρ καὶ οὗτοι τὰ ἄλλα ἐκ τοῦ μίγματος, ὁ μὲν Ἀναξαγόρας λέγων “ἦν ὁμοῦ χρήματα πάντα”, ὁ δ' Ἐμπεδοκλῆς (scil. ἐξέκρινε τὰ ἄλλα) ἐκ τοῦ Σφαίρου, ὃν ἐποίει ἡ τῶν στοιχείων φιλία, ἃ δὲ στοιχεῖα τὸ νεῖκος ἐξέκρινε καὶ διεχώριζε καὶ τὸν κόσμον ἐποίει. Διέφερον δὲ κατὰ τοῦτο, ὅτι ὁ μὲν Ἀναξαγόρας ἀπαξ ἔλεγε γίνεσθαι τὴν ἔκκρισιν, ὁ δ' Ἐμπεδοκλῆς κατὰ περίοδον χρόνων τοσώνδε ποτε μὲν τὸν Σφαῖρον ἐκ τῆς φιλίας γίνεσθαι, ποτὲ δὲ κόσμον ἐκ τοῦ νεῖκου (τὸν δὲ Σφαῖρον τοῦτον οἱ μὲν νεώτεροι ἐπὶ συγχύσεως παροιμιακῶς τιθέασιν, ἐκεῖνος δὲ καὶ θεὸν ἐδοξάζεν, ὡς ἐν ἄλλοις εὐρήκαμεν), καὶ ὅτι ὁ μὲν Ἀναξαγόρας ἀπειρα ἔλεγε τὰ ἐκκρινόμενα καὶ τὰ ὁμοιομερῆ καὶ τάναντία, ὁ δ' Ἐμπεδοκλῆς μόνα τὰ Δ' στοιχεῖα.

35 Rashed (2001); cf. Primavesi (2006b) and Empedocles texts 92–95 Mansfeld/Primavesi.

36 Rashed (2014), pp. 330–331.

37 This is shown by an analysis of the relevant evidence in Primavesi (forthcoming).

38 Aristot. *Metaph.* A.5 985^b23–26: 'Ἐν δὲ τούτοις καὶ πρὸ τούτων οἱ καλούμενοι Πυθαγόρειοι τῶν μαθημάτων ἀψάμενοι πρῶτοι ταῦτα προήγον, καὶ ἐντραφέντες ἐν αὐτοῖς τὰς τούτων ἀρχὰς τῶν ὄντων ἀρχὰς ᾗθησαν εἶναι πάντων.

39 Pythagoras *Iusiur.*, Thesleff (1965), p. 170,15–16 (= DK 58 B 15 = Pythagoras, ältere Pythagoreer Fr. 29 Mansfeld/Primavesi). See Delatte (1915), pp. 249–253; Zeller/Nestle (1920), p. 1025 n. 2; Burkert (1972), pp. 186–188; Zhmud (2012), pp. 300–303.

οὐ μὰ τὸν ἀμετέρῃ γενεᾷ παραδόντα τετρακτύν,
παγὰν ἀενάου φύσεως ῥιζώματ' ἔχουσιν.

1 οὐ] ναὶ Hippol. Ref. VI.23.4, *Carm. aur.* 47 | γενεᾷ Porph. V.P. 20, Iambl.
V.P. 162: κεφαλᾷ Sext. M 794; Hippol. I.c.; Stob. I.10.12; v.l. ap. Theo Smyrn.
94 Hiller: ψυχᾷ ps.-Plut. *Dox.* 877A; Sext. M 4.2; Theo I.c.

*No, I swear by him who gave the tetractys to our race,
the stream of everflowing nature which contains the elements.*

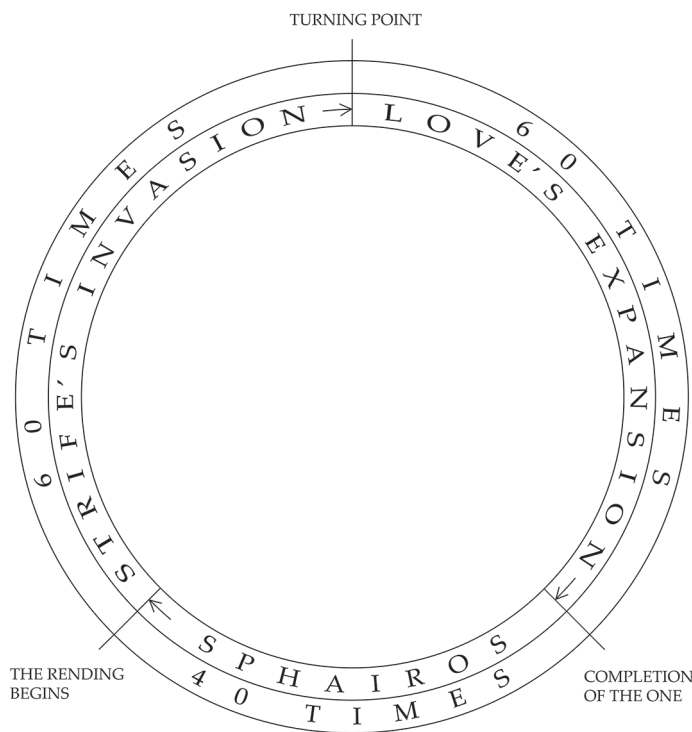
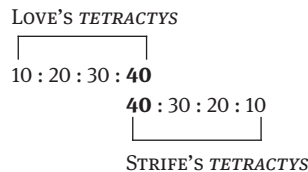


Plate 1: The basic structure of the cosmic time-table as deduced from the Florentine scholia by Rashed (2014)

In this text the Pythagorean *tetractys*, i.e. the sequence or sum of the first four natural numbers ($1 + 2 + 3 + 4 = 10$), is equated with the *stream* (πηγή)⁴⁰ of ever-flowing nature that contains the *elements* (ῥιζώματα). The use both of *pēgē* (πηγή) as referring to a “stream of life”⁴¹ and of *rhizōmata* (ῥιζώματα) in the sense of “elements”⁴² is clearly Empedoclean,⁴³ whereas the use of the word *physis* in the sense of “the entirety of living beings” is decidedly post-Empedoclean.⁴⁴ The combination of the Empedoclean *pēgē* and the equally Empedoclean *rhizōmata* with a post-Empedoclean *physis* shows that the author of the Pythagorean oath has taken over the two former terms from Empedocles' *Physica*, not the other way round.⁴⁵

It follows that the Pythagorean oath alludes to Empedoclean physics, and since *pēgē* in Empedocles refers to the stream of life in its entirety, the equation of the *tetractys* ($1 : 2 : 3 : 4$) with a *paga physeos* amounts to ascribing the numerical ratios of the *tetractys* to Empedocles' cosmic cycle. This ascription, in turn, sheds unexpected light on the cosmic timetable as transmitted by the Byzantine scholia. For its sequence of 60 times (Love's expansion) + 40 times (*Sphairos*) + 60 times (Strife's invasion) can now be decoded as an abridged version of a timetable consisting of *two tetractyes*, one increasing and one decreasing, which have the 40 times of the *Sphairos* in common. On this reading, the first 60 times-period (Love's expansion) consists of $10 + 20 + 30$ times, and the second 60 times-period (Strife's invasion) consists of $30 + 20 + 10$ times (**PLATE 2**):



⁴⁰ For πηγή = “stream” see LSJ 1996 s.v. πηγή I.1, with reference to Aesch. *Persians* 200–202: καὶ ταῦτα μὲν δὴ νυκτὸς εἰσιδεῖν λέγω / ἐπεὶ δ' ἀνέστην καὶ χεροῖν καλλιρρόου / ἔψαυσα πηγῆς, ξὺν θυηπόλῳ χερὶ / βωμὸν προσέστην ... The queen touches the waters of River Choaspes with her hands in order to purify herself from a nightmare, but she is unlikely to travel, for that purpose, to the *source* of the Choaspes in the mountains.

⁴¹ Empedocles text 67b Mansfeld/Primavesi (DK 31 B 23), lines 9–10: οὕτω μὲν σ' ἀπάτη φρένα καινύτω ἄλλοθεν εἶναι / θνητῶν, ὅσσα γε δῆλα γεγά<κ>ασιν ἄσπετα, πηγῇν.

⁴² Empedocles text 49b Mansfeld/Primavesi (DK 31 B 6), line 1: τέσσαρα γὰρ πάντων ῥιζώματα πρῶτον ἄκουε.

⁴³ This fact was pointed out by Kranz (1938), p. 438.

⁴⁴ Burkert (1972), p. 186 with n. 155; see also Patzer (1993), pp. 275–277.

⁴⁵ The relative chronology was established by Burkert (1972), p. 186.

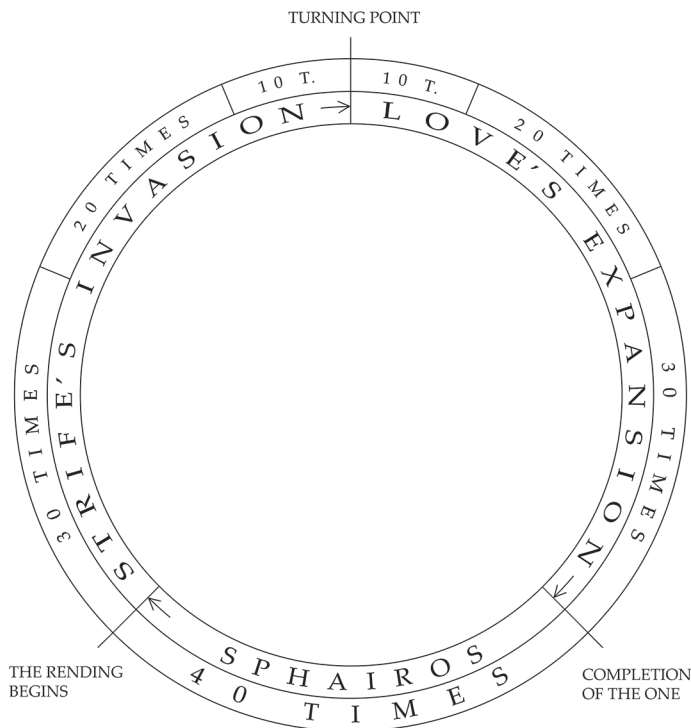


Plate 2: The subdivision of the cosmic time-table in accordance with the proportions of the double tetractys

It is true that in this timetable the numbers of the standard *tetractys* of the Pythagoreans have been multiplied by ten.⁴⁶ This fact, however, does not affect the basic numerical ratios (1 : 2 : 3 : 4). In order to see the underlying reason for the multiplication we must realize that the *abstract term* “time unit” (= *chronos*) is quite unlikely to have served as a time-unit already in the ultimate source of the scholia; this source will have referred rather to a *specific* time-unit. Empedoclean usage clearly suggests to identify the original time-unit in question with an *aiōn*, i.e. with the maximum life span of a human being,⁴⁷ since Empedocles

⁴⁶ Cf. Empedocles text 94b Mansfeld/Primavesi (Scholium D Rashed, commenting upon Aristotle *Phys.* VIII.1 252^a31 τὸ δὲ καὶ δι' ἴσων χρόνων): πρὸς ἰ. This might allude to the multiplication by ten.

⁴⁷ See Empedocles text 30 Mansfeld/Primavesi (DK 31 B 129), 5–6: ῥεῖ ὁ γε τῶν ὄντων πάντων λεύσσεσκεν ἕκαστα / καὶ τε δέκ' ἀνθρώπων καὶ τ' εἴκοσιν αἰώνευσσιν (where the original ἕκαστα

did not use any other sufficiently extended time-unit. In connection with *this* time-unit, however, the numbers of the original *tetractys*, 1, 2, 3, and 4, would have been altogether unsuitable for constructing a time-table of the history of the universe: Strife's expansion, for instance, which contains the whole of human history, must certainly take more than just six human lifetimes. The assumption that the abstract *chronoi* (as mentioned in the scholia) go back to original *aiōnes* gains further support from the fact that this assumption can also account for the replacement of the original time-unit by the abstract term *chronos*. For the immediate source of the scholia is to be located in a neo-Platonic context, since in Scholium A the *Sphairos* is anachronistically called "intelligible world-order" (διανοητὸς διάκοσμος).⁴⁸ In such a context, however, the employment of *aiōn* as a specific time-unit would have seemed to be precluded by Plato's well-known contrast between *aiōn* (eternity abiding in the One) and *chronos* (image of eternity, moving according to number).⁴⁹ Even a proven expert like Simplicius is capable of misinterpreting an Empedoclean occurrence of *aiōn* (in the sense of "individual live-span") as meaning "eternity".⁵⁰ We may conclude that if, in a neo-Platonic context, the Empedoclean time-unit *aiōn* was correctly understood at all, it was liable to be replaced, for clarity's sake, by the abstract term *chronos*.

It remains to be seen whether the *tripartite temporal subdivision* of both Love's expansion and Strife's invasion as featuring in the above reconstruction is likely to be authentic, i.e. whether it is supported by the main body of fragments and indirect sources on Empedocles' cosmic cycle. The first thing to be examined in this context is the relationship between the cosmic cycle and Empedocles' *biology*, in particular his theory of the four zoogonical stages.⁵¹

has been restored instead of the minority reading ἑκάστων); text 66b Mansfeld/Primavesi, *Physika* I.276–277: [παῦροι δ' αἰῶνες πρότεροι ... / [πρὶν] τούτων μεταβῆναι ...

48 Empedocles text 92b Mansfeld/Primavesi (= Scholium A Rashed, Cod. Laurentianus F, fol. 91^r, 5), on Aristot. *Phys.* VIII.1 250^b28 (ὅταν ἡ φιλία ἐκ πολλῶν ποιῇ τὸ ἓν): τὸν σφαῖρον τὸν διανοητὸν διάκοσμον. For the re-interpretation of Empedocles' cosmic cycle by Platonist authors see Primavesi (2013), pp. 725–726 with further references.

49 Plato *Timaeus* 37D5–7 (Burnet): εἰκὼ δ' ἐπενόει κινητὸν τινα αἰῶνος ποιῆσαι, καὶ διακοσμῶν ἅμα οὐρανὸν ποιεῖ μένοντος αἰῶνος ἐν ἐνὶ κατ' ἀριθμὸν ἰοῦσαν αἰώνιον εἰκόνα, τοῦτον δὲ δὴ χρόνον ὠνομάκαμεν.

50 Simplicius *In De cael.* 141,7–9 Heiberg commenting on Empedocles Fr. 66b Mansfeld/Primavesi, *Physika* I.242 (= DK 31 B 17, 11): ὥστε τὰ ἀπὸ τοῦ νοητοῦ κόσμου διὰ τοῦ Νείκου διακριθέντα ἀντὶ τοῦ αἰωνίως εἶναι γίνονται μὲν καὶ „οὐ σφισιν ἔμπεδος αἰών“, αἰδίως δὲ ἀνακυκλοῦνται.

51 Cf. Primavesi (2013), pp. 709–713.

Generally speaking, the cosmic cycle is characterized by a “twofold arising and a twofold passing away of mortal beings”;⁵² one arising and one passing away accompany the universal process of fusion, while the other arising and the other passing away accompany the universal process of separation.⁵³ For the proper understanding of this doctrine, it is important to realize that by “mortal beings” (θνητά) Empedocles means only the short-lived heterogeneous combinations of elements, in explicit contrast to the *long-lived gods* (*theoi dolichaiōnes*) of Empedoclean physics⁵⁴ as for instance the divine *Sphairos*, whose dominion is now reported to last forty time-units. Thus, Empedocles’ allusion to the twofold arising and twofold passing away of mortal beings implies that a production and a dissolution of short-lived combinations takes place in each of the transitional phases of the cosmic cycle—not only during the transition from the four masses to the *Sphairos* (Love’s expansion) but also during the transition from the *Sphairos* to the four masses (Strife’s invasion). It may be noted that on either side of the cycle the production of the combinations is the work of Love and their destruction the work of Strife: Empedocles’ basic assumption is that Love forms particular combinations of the elements both in the phase of increasing fusion, when it is gradually gaining strength, as well as in that of increasing separation, although it is getting weaker and weaker.

The vital point with regard to our Pythagorizing timetable is the theory of four zoogonic stages as attested by ps.-Plutarch.⁵⁵ As we will presently see, the first two zoogonic stages take place during Love’s expansion, whereas the third and the fourth stage occur during Strife’s invasion.⁵⁶ This observation will yield already *two* out of the three stages required by the timetable for Love’s expansion as for Strife’s invasion.

⁵² Empedocles text 66b Mansfeld/Primavesi, *Physika* I.234: δοιὴ δὲ θνητῶν γένεσις, δοιὴ δ’ ἀπόλειψις.

⁵³ Empedocles text 66b Mansfeld/Primavesi, *Physika* I.235–6: τὴν μὲν γὰρ πάντων ξύνοδος τίκτει τ’ ὀλέκει τε, / ἢ δὲ πάλιν διαφυομένων θρεφθεῖσα διέπτει.

⁵⁴ Empedocles text 66b Mansfeld/Primavesi, *Physika* I.272 and 320: καί τε θεοὶ δολιχαίωνες τιμῆσι φέριστοι.

⁵⁵ Empedocles text 151 Mansfeld/Primavesi (Aëtius V.19, 5a = DK 31 A 72): Ἐμπεδοκλῆς τὰς πρώτας γενέσεις τῶν ζώων καὶ φυτῶν μηδαμῶς ὀλοκλήρους γενέσθαι, ἀσυμφυέσι δὲ τοῖς μορίοις διεzeugméνας, τὰς δὲ δευτέρας συμφυομένων τῶν μερῶν εἰδωλοφανεῖς, τὰς δὲ τρίτας τῶν ὀλοφυῶν, τὰς δὲ τετάρτας οὐκέτι ἐκ τῶν στοιχείων, οἷον ἐκ γῆς καὶ ὕδατος, ἀλλὰ δι’ ἀλλήλων ἤδη, τοῖς μὲν πυκνωθείσης <τῆς> τροφῆς, τοῖς δὲ καὶ τῆς εὐμορφίας τῶν γυναικῶν ἐπερεθισμὸν τοῦ σπερματικοῦ κινήματος ἐμποιήσας.

⁵⁶ Dümmmler (1889), pp. 216–247; Bignone (1916), p. 584; O’Brien (1969), pp. 196–236; Primavesi (2013), pp. 711–713.

In the first stage, isolated body parts arise and wander about unconnected: temples without a neck, arms without shoulders, eyes without a brow.⁵⁷ In the second, Love's strength has increased to the point where it is capable to combine the individual limbs of the first stage to form more or less monstrous combinations⁵⁸ the composition of which is dictated entirely by chance.⁵⁹ The *direction* indicated by the transition from the first to the second stage clearly shows that both fall in the phase of increasing mixture, i.e. of Love's expansion that leads from the four separate masses to the *Sphairos*.

Writing of Empedocles' chance combinations, Aristotle commented—by way of a remarkable if purely hypothetical thought experiment—that one could imagine the survival or demise of these chance combinations as governed by the principle of the “survival of the fit”.⁶⁰ Charles Darwin approvingly referred to this thought experiment without noticing its Empedoclean basis;⁶¹ yet more careful readers of Aristotle felt entitled, precisely by Darwin's reference, to regard Empedocles as the ancient Darwin.⁶² But this was unfounded, as Eduard

57 Empedocles text 153b Mansfeld/Primavesi (DK 31 B 57): ἤι πολλὰί μὲν κόρσαι ἀναύχενες ἐβλάστησαν, / γυμνοὶ δ' ἐπλάζοντο βραχίονες εὐνίδες ὤμων, / ὄμματά τ' οἷ' ἐπλανᾶτο πενητεῦοντα μετώπων. Text 154 Simplic. *In De cael.* p. 587,18–19 + 24–26 (DK 31 B 58) ἐν ταῦτῃ οὖν τῇ καταστάσει “μουνομελῇ” ἔτι τὰ “γυῖα” ἀπὸ τῆς τοῦ Νείκου διακρίσεως ὄντα “ἐπλανᾶτο” τῆς πρὸς ἄλλα μίξεως ἐφίεμενα ... ἐπὶ τῆς Φιλότῃτος οὖν ὁ Ἐμπεδοκλῆς ἐκεῖνα εἶπεν, οὐχ ὡς ἐπικρατούσης ἥδη τῆς Φιλότῃτος, ἀλλ' ὡς μελλούσης ἐπικρατεῖν, ἔτι δὲ τὰ ἄμικτα καὶ μονόγυια δηλούσης.

58 Empedocles text 156 Mansfeld/Primavesi (Plut. *Adv. Col.* 1123b = DK 31 B 60): εἰλίποδ' ἀκριτόχευρα ...; text 157a (DK 31 B 61): πολλὰ μὲν ἀμφιπρόσωπα καὶ ἀμφίστερνα φύεσθαι, / βουγενῇ ἀνδρόπρωρα· τὰ δ' ἔμπαλιν ἐξανατέλλειν / ἀνδροφυῇ βούκρανα, μεμειγμένα, τῇ μὲν ἀπ' ἀνδρῶν / τῇ δὲ γυναικοφυῇ σκιεροῖς ἡσκημένα γυίοις.

59 Empedocles text 155 Mansfeld/Primavesi (DK 31 B 59): αὐτὰρ ἐπεὶ (φησί) κατὰ μείζον ἐμίσητο δαίμονι δαίμων, / ὅτε τοῦ Νείκου ἐπεκράτει λοιπὸν ἡ Φιλότῃς / ταῦτά τε συμπίπτεσκον, ὅπῃ συνέκυρσεν ἕκαστα, / ἄλλα τε πρὸς τοῖς πολλὰ διηνεκῇ ἐξεγένοντο.

60 Empedocles text 157b Mansfeld/Primavesi (Aristot. *Phys.* II.8 198^b16–32): ἔχει δ' ἀπορίαν τί κωλύει τὴν φύσιν μὴ ἔνεκά του ποιεῖν μὴ δ' ὅτι βέλτιον, ἀλλ' ὥσπερ ὕει ὁ Ζεὺς, οὐχ ὅπως τὸν σῖτον αὐξήσῃ, ἀλλ' ἐξ ἀνάγκης· τὸ γὰρ ἀναχθὲν ψυχηθῆναι δεῖ, καὶ τὸ ψυχθὲν ὕδωρ γενόμενον κατελθεῖν· τὸ δ' αὐξάνεσθαι τούτου γενομένου τὸν σῖτον συμβαίνει. ὁμοίως δὲ καὶ εἴ τῳ ἀπόλλυται ὁ σῖτος ἐν τῇ ἄλῳ, οὐ τούτου ἔνεκα ὕει ὅπως ἀπόληται, ἀλλὰ τοῦτο συμβέβηκεν. ὥστε τί κωλύει οὕτω καὶ τὰ μέρη ἔχειν ἐν τῇ φύσει, οἷον τοὺς ὀδόντας ἐξ ἀνάγκης ἀνατεῖλαι τοὺς μὲν ἐμπροσθίους ὀξεῖς, ἐπιτηδεῖους πρὸς τὸ διαρεῖν, τοὺς δὲ γομφίους πλατεῖς καὶ χρησίμους πρὸς τὸ λεαίνειν τὴν τροφήν, ἐπεὶ οὐ τούτου ἔνεκα γενέσθαι, ἀλλὰ συμπεσεῖν. ὁμοίως δὲ καὶ περὶ τῶν ἄλλων μερῶν, ἐν ὅσοις δοκεῖ ὑπάρχειν τὸ ἔνεκά του. ὅπου μὲν οὖν ἅπαντα συνέβη ὥσπερ κἂν εἰ ἔνεκά του ἐγένετο, ταῦτα μὲν ἐσώθη ἀπὸ τοῦ αὐτομάτου συστάντα ἐπιτηδείως· ὅσα δὲ μὴ οὕτως, ἀπώλετο καὶ ἀπόλλυται, καθάπερ Ἐμπεδοκλῆς λέγει τὰ βουγενῇ ἀνδρόπρωρα.

61 Darwin (1866), p. xiii, n.*.

62 See further Primavesi (2010).

Zeller pointed out:⁶³ no continuous evolution leads from the chance combinations of the second stage to the species of the present fourth stage of zoogony, as we will now see.

The third zoogonic stage takes place when fire quickly rises up from the earth⁶⁴ and deposits uniform, unarticulated, mute, ungendered living beings on the earth's surface.⁶⁵ This stage is followed by the fourth, which corresponds to our present: life now reproduces itself by passing through living beings of the same kind. Every living thing, or its seed, comes from another individual of the same species: mammals bear young, birds lay eggs, trees produce fruit.⁶⁶ The most spectacular ruse by which Love opposes the activity of Strife is the *sexual reproduction* of ephemeral combinations, that is, mortal beings,⁶⁷ a process in which the offspring's genetic inheritance comes in equal parts from the father and the mother.⁶⁸

It is again the *direction* indicated by the transition from one zoogonic stage to the other which will enable us to clarify the position of the third and the fourth stage within the cosmic cycle. By a lucky coincidence, a comprehensive description of the relevant transition was brought to light in the original wording by the Strasbourg papyrus. We now know that the transition is triggered by Strife at that point of the separation of the elements when fire, in its ascent, has reached the periphery of the cosmos; at this very moment Strife demonstrates its increas-

⁶³ Zeller (1879).

⁶⁴ Empedocles text 86 Mansfeld/Primavesi (DK 31 B 51): 'Εμπεδοκλῆς "καρπαλίμως δ' ἀνόπαιον", ἐπὶ τοῦ πυρός.

⁶⁵ Empedocles text 164 Mansfeld/Primavesi (DK 31 B 62): νῦν δ' ἄγ', ὅπως ἀνδρῶν τε πολυκλαύτων τε γυναικῶν / ἐννυχίους ὄρηκας ἀνήγαγε κρινόμενον πῦρ, / τῶνδε κλύ'. οὐ γὰρ μῦθος ἀπόσκοπος οὐδ' ἀδαήμων. / οὐλοφυεῖς μὲν πρῶτα τύποι χθονὸς ἐξανέτελλον, / ἀμφοτέρων ὕδατός τε καὶ εἶδος αἶσαν ἔχοντες. / τοὺς μὲν πῦρ ἀνέπεμπε θέλον πρὸς ὁμοῖον ἰκέσθαι, / οὔτε τί πω μελέων ἐρατὸν δέμας ἐμφαίνοντας / οὔτ' ἐνοπήν οἶόν τ' ἐπιχώριον ἀνδράσι γυῖον.

⁶⁶ See Empedocles text 167 Mansfeld/Primavesi (Aristot. *De gen. an.* I.23 731^a1–5 = DK 31 B 79): ἐν δὲ τοῖς φυτοῖς ... οὐ κεχώριται τὸ θῆλυ τοῦ ἄρρενος, διὸ καὶ γεννᾷ αὐτὰ ἐξ αὐτῶν, καὶ προῖεται οὐ γονήν, ἀλλὰ κύημα τὰ καλούμενα σπέρματα. καὶ τοῦτο καλῶς λέγει 'Εμπεδοκλῆς ποιήσας· οὕτω δ' ὥιστοκεῖ μακρὰ δένδρεα πρῶτον ἐλαίης.

⁶⁷ Empedocles text 66b Mansfeld/Primavesi, *Physika* I.253–255: ἦτις καὶ θνητοῖσι νομίζεται ἔμψυτος ἄρθροις, / τῇ τε φίλα φρονέουσι καὶ ἄρθμα ἔργα τελοῦσι, / Γηθοσύνην καλέοντες ἐπώνυμον ἢ δ' Ἀφροδίτην, and *Physika* I.302–304: τοῦτο μὲν ἂν βροτέων μελέων ἀριδεῖκετον ὄγκον· / ἄλλοτε μὲν Φιλότῃτι συνερχόμεθ' εἰς ἓν ἅπαντα / γυῖα τὰ σῶμα λέλογχε, βίου θηλούντος ἐν ἀκμῇ.

⁶⁸ Empedocles text 169 Mansfeld/Primavesi (Aristot. *De gen. an.* I.18 722^b8–13 = DK 31 B 63): διὸ καὶ 'Εμπεδοκλῆς ἔοικεν, εἴπερ οὕτω λεκτέον, μάλιστα λέγειν ὁμολογούμενα τούτῳ τῷ λόγῳ· ... φησὶ γὰρ ἐν τῷ ἄρρενι καὶ τῷ θήλει οἶον σύμβολον ἐνεῖναι, ὅλον δ' ἀπ' οὐδετέρου ἀπιέναι, 'ἀλλὰ διέσπασται μελέων φύσις· ἢ μὲν ἐν ἀνδρός, ...'.

ing strength by violently splitting the uniform, unarticulated beings of the third stage into halves, male and female. So when the sun rises for the first time, the living beings, which have been mute up to this point, produce their first sound, the cry of pain with which they react to their division;⁶⁹ and from now on they carry within themselves the desire for sexual (re)union.⁷⁰ Thus, the transition from the third to the fourth stage is brought about by splitting the whole-natured beings of the third stage into halves; and both stages are caused by a continuous *centrifugal* movement of fire. Both features, when taken together, leave no doubt that the sequence of these two stages forms part of the process of increasing separation which leads from the *Sphairos* back to the four separate masses.

It seems clear by now that both the period of Love's expansion and the period of Strife's invasion include a zoogony and that either zoogony consists of *two* zoogonic stages. Yet our Pythagorizing timetable does not suggest just a *bipartition* of Love's expansion and Strife's invasion, respectively, but a *tripartition*. Faced with this situation, we will *not* resuscitate the suggestion, once made by Denis O'Brien, to add two further zoogonic stages to the four attested ones.⁷¹ The combined evidence of the indirect tradition and of the Strasbourg papyrus rather shows that both Love's expansion and Strife's invasion involve, in addition to their respective zoogonic stages, one *abiotic* stage each, which is characterized by the absence of individual living beings. The two abiotic stages in question immediately precede and follow the turning point of the cosmic cycle, i.e. the transition from Strife's invasion to Love's expansion.

Strife's invasion comes to a natural end when Strife, closing in from all sides, has compressed Love into a single point, the "centre of the whirlwind",⁷² that is,

69 Empedocles text 87 Mansfeld/Primavesi, lines 11–17: [... ὁππότ]ε δὴ συνετύγχανε φ[λογ]μὸς ἀτειρής / [θητῶν ἡνεκέ]ως ἀνάγων π[ο]λυπήμ[ον]α κρᾶσιν, / [δὴ τότε πολλὰ ζῶι]α φυτάλμια τεκνώθ[η]σαν / [οὐλομελῆ, τῶν ν]ῦν ἔτι λείψανα δέρκεται ἥως. / ὅπποτ[ε δ'] ἡλέκτωρ ἀρθ[ή]εις τόπον ἐσχάτι[ον β]ῆ / δὴ τόθ' ἕκαστα διετημήθη κλαγ[γ]ήι καὶ αὐτῇ / θεσπε[σί]ηι. The point of lines 15–17 was first perceived by Marwan Rashed. See further Empedocles text 168 Mansfeld/Primavesi.

70 Empedocles text 172 Mansfeld/Primavesi (Plut. *Quaest. nat.* 917c = DK 31 B 64): τὸ συντρέφεσθαι καὶ συναγελάζεσθαι τὰ θήλεα τοῖς ἄρρεσιν ἀνάμνησιν ποιεῖ τῶν ἀφροδισίων καὶ συνεκκαλεῖται τὴν ὄρεξιν, ὡς ἐπ' ἀνθρώπων Ἐμπεδοκλῆς ἐποίησε· τῷ δ' ἐπὶ καὶ πόθος εἶσι δι' ὄψιος ἀμμυμνήσκων. Both the splitting in halves and its erotic consequences were famously employed by Plato in the *Symposium* (190d–191a).

71 O'Brien (1969), pp. 218–227.

72 Empedocles text 66b Mansfeld/Primavesi, *Physika* I.288–289: [Ἀλλ' ὅτ]ε δὴ Νεῖκός [τ' ἀνυ] πέρβατα βέν[θε] ἵκηται / δ[ι]νή[ς], ἐν δὲ μέσ[τ]ηι Φ[ι]λότ[η]ς στροφά[λ]ιγγι γένηται, ...; Empedocles

the centre of the earth. At this very moment, the complete separation of the four elements is achieved: thanks to their innate attraction of like to like, the elements have now formed four pure, concentric masses. And at the same moment, Love's expansion begins.⁷³ We are explicitly told, however, that Love's expansion does *not immediately* bring about new organic compounds of different elements: Love needs some time in order to make the elements willing to form compounds with each other, for instance by gradually reducing the speed of their rotation and by assimilating them to each other.⁷⁴ But *when* the first compounds are formed, the elements suddenly *become mortal*, whereas before they *had learnt to be immortal* (ἀθάνατα).⁷⁵ This preceding experience of "learning to be immortal" cannot have been based just on the eternal existence of the elements as such, since *this* feature remains unaffected by the fact that the elements must now form living compounds again, so that there would be no contrast. The reference must be, rather, to the four divine pure masses which have come to be at the turning point of the cycle and which are "immortal" in the sense of being free of mixture and dissolution. Even this qualified use of the term "immortal", however, implies that the elements must have existed in the form of four pure masses at least for *some time*: If the total separation were "not a condition that can endure", as O'Brien maintained,⁷⁶ it could scarcely count as a state of immortality, since a merely instantaneous freedom of mixture and dissolution is neither a very meaningful concept, nor a state which the elements can have *learned* to be in. We conclude that the *first* of the three stages of Love's expansion is the life-time of the four divine pure masses, and that these divine masses are, like the *Sphairos*, to be reckoned among the *long-lived gods* (*theoi dolichaïones*) of Empedoclean physics.⁷⁷

A second abiotic stage will occur towards the end of Strife's invasion, immediately before the turning point of the cycle. This abiotic stage, previously known only from Plutarch's vivid description of the "dissolution of the world-order" (*dia-*

text 69b Mansfeld/Primavesi (DK 31 B 35), lines 3–4, Mansfeld/Primavesi: ... ἐπεὶ Νεῖκος μὲν ἐνέρτατα βένθε' ἵκηται / δίνης, ἐν δὲ μέσῃ Φιλότης στροφάλιγγι γένηται, ...

73 Empedocles text 66b Mansfeld/Primavesi, *Physika* I.290 and text 69b Mansfeld/Primavesi (DK 31 B 35), line 5: ἐν τῇ δὴ τάδε πάντα συνέρχεται ἐν μόνον εἶναι.

74 Empedocles text 69b Mansfeld/Primavesi (DK 31 B 35), line 6: οὐκ ἄφαρ, ἀλλὰ θελημὰ συνιστάμεν' ἄλλοθεν ἄλλα. Empedocles text 58 Mansfeld/Primavesi (DK 31 B 22), lines 4–5: ὥς δ' αὖτως ὅσα κῆρσιν ἐπαρκέα μᾶλλον ἔασιν, / ἀλλήλοισι ἔστερκεται ὁμοιωθέντ' Ἀφροδίτῃ.

75 Empedocles text 69b Mansfeld/Primavesi (DK 31 B 35), lines 14–15: αἶψα δὲ θνήτ' ἐφύοντο, τὰ πρὶν μάθον ἀθάνατ' εἶναι, / ζωρά τε τὰ πρὶν ἄκρητα διαλλάξαντα κελεύθους.

76 O'Brien (1969), p. 78.

77 Empedocles text 66b Mansfeld/Primavesi, *Physika* I.272 and 320: καὶ τε θεοὶ δολιχαίωνες τιμῇσι φέριστοι.

lysis kosmou),⁷⁸ has been illustrated by the Strasbourg papyrus in a very detailed way. At the end of the present fourth zoogonic stage all living beings then extant will be torn apiece by the agents of Strife (the *Harpies*); and their limbs will be subject to putrefaction (*sēpsis*).⁷⁹ The portions of elements set free by the *sēpsis* of the limbs will join their respective cosmic masses, while the speed at which these masses rotate around each other is ever increasing until the end of Strife's invasion.⁸⁰ We conclude that the *third* of the three stages of Strife's invasion is the *sēpsis* of the limbs and the movement of the remaining portions of single elements towards the completion of the four masses.

All in all, then, the cosmic cycle would seem to be subdivided into the following seven phases which are clearly *compatible* with the scheme of the double *tetractys* (PLATE 3):

78 Empedocles text 88 Mansfeld/Primavesi (Plut. *De facie* 926D–927A = fr. 26a Bignone): ὥσθ' ὅρα καὶ σκόπει, δαιμόνιε, μὴ μεθιστὰς καὶ ἀπάγων ἕκαστον, ὅπου πέφυκεν εἶναι, διάλυσιν τινα κόσμου φιλοσοφῆς καὶ τὸ νεῖκος ἐπάγῃς τὸ Ἐμπεδοκλέους τοῖς πράγμασι, μάλλον δὲ τοὺς παλαιοὺς κινήσας Τίτᾶνας ἐπὶ τὴν φύσιν καὶ Γίγαντας καὶ τὴν μυθικὴν ἐκείνην καὶ φοβερὰν ἀκοσμίαν καὶ πλημμέλειαν ἐπιδεῖν ποθῆς, χωρὶς τὸ βαρὺ πᾶν καὶ χωρὶς ... τὸ κοῦφον· ἐνθ' οὗτ' ἡλείοιο δεδίσκεται ἀγλαὸν εἶδος, / οὐδὲ μὲν οὐδ' αἷς λάσιον δέμας, οὐδὲ θάλασσα, ὥς φησιν Ἐμπεδοκλῆς, οὐ γῆ θερμότητος μετεῖχεν, οὐχ ὕδωρ πνεύματος, οὐκ ἄνω τι τῶν βαρέων, οὐ κάτω τι τῶν κούφων· ἀλλ' ἄκρατοι καὶ ἄστοργοι καὶ μονάδες αἱ τῶν ὄλων ἀρχαί, μὴ προσιέμεναι σύγκρισιν ἑτέρου πρὸς ἕτερον μηδὲ κοινωνίαν, ἀλλὰ φεύγουσαι καὶ ἀποστρεφόμεναι καὶ φερόμεναι φορὰς ἰδίας καὶ αὐθάδεις οὕτως εἶχον ὥς ἔχει πᾶν οὗ θεὸς ἄπεστι κατὰ Πλάτωνα (*Timaios* 53B), τουτέστιν, ὥς ἔχει τὰ σώματα νοῦ καὶ ψυχῆς ἀπολιπούσης, ἄχρις οὗ τὸ ἡμερτὸν ἦκεν ἐπὶ τὴν φύσιν ἐκ προνοίας, Φιλοτήτος ἐγγενομένης καὶ Ἀφροδίτης καὶ Ἔρωτος, ὥς Ἐμπεδοκλῆς λέγει καὶ Παρμενίδης καὶ Ἡσίοδος ...

79 Empedocles text 87 Mansfeld/Primavesi, lines 1–3: [ἄν]διχ' ἀπ' ἀλλήλων[ν] πεσέ[ει]ν καὶ π[ότ]μον ἐπισπεῖν / [πό]λλ' ἀεκαζόμεν[ο]ισιν ἀ[να]γκα[ί]ης ὕπο λυγρῆς / [ση]πομένους. Φιλίην δ' ἐ[ρατ]ὴν [ήμι]ν νυν ἔχουσιν / [Ἄρ]πυιαι θανάτοιο πάλοις [ῆδη] παρέσ[ου]νται.

80 Empedocles text 66b Mansfeld/Primavesi, *Physika* I.273–287: [ἐ]ν τῇ δ' αἴσσουντα [διαμ]ερὲς οὐδ[αμὰ] λήγει / [π]υκνῆσιν δίνησι[ν] ... / 275 [ν]ωλεμές, οὐδὲ πο[τ'] ... / [παῦρ]οι δ' αἰῶνες πρότεροι / [πρίν] τούτων μεταβῆνα[ι] ... / [πά]ντηι δ' αἴσσουν[τ]α διαμ[ε]ρὲς οὐδαμὰ λήγει / [οὔ]τε γὰρ ἡέλιος Τ[ιτ]ὴν ο[ὔτ'] ἄπλετος αἰθήρ / 280 [ὁρ]μῇ<ι> τῇδε γέμον[τε] ... / [οὔ]τε τι τῶν ἄλλων ... / [ἀλ]λὰ μεταλλάσσον[τ'] αἴσσει κύκλωι [ἅπαντα.] / [ἄλλο]τε μὲν γὰρ γαί' [ἀβ]άτη θέει ἡελ[ίου] τε / [σφαίρα,] τόσην δὴ καί [ν]υν ἐπ' ἀνδράσι τ[ι]μέν ἔστιν· / 285 [ὥς δ' αἴ]τως τάδε [π]άντα δι' ἀλλήλων [γε]δραμόντα,] / [κᾶλλο]ς τ' ἄλλ' [ἔσχη]κε τόπους πλαγ[χθέντ'] ἰδίους τε· / [οὔ] δὴ πω] μεσάτους τ[ι] ἐσε[ρχόμεθ'] ἐν μ[όνον] εἶναι.]

A) Love's expansion	{	Initial abiotic phase:	four divine pure masses	10 times
		1 st zoogonic stage:	single limbs	20 times
		2 nd zoogonic stage:	chance combinations	30 times
B) <i>SPHAIROS</i>				
C) Strife's invasion	{	3 rd zoogonic stage:	whole-natured beings	30 times
		4 th zoogonic stage:	sexual reproduction	20 times
		Final abiotic phase:	<i>sēpsis</i> + completion of 4 masses	10 times

The increasing duration of the stages of Love's *tetractys* corresponds to the decreasing speed of the overall movement during Love's expansion, from the rotation of the four masses at maximum speed to the immobility of the *Sphairos*, whereas the decreasing duration of the stages of Strife's *tetractys* corresponds to the increasing speed of the overall movement during Strife's invasion, from the immobility of the *Sphairos* to the rotation of the four masses at maximum speed.

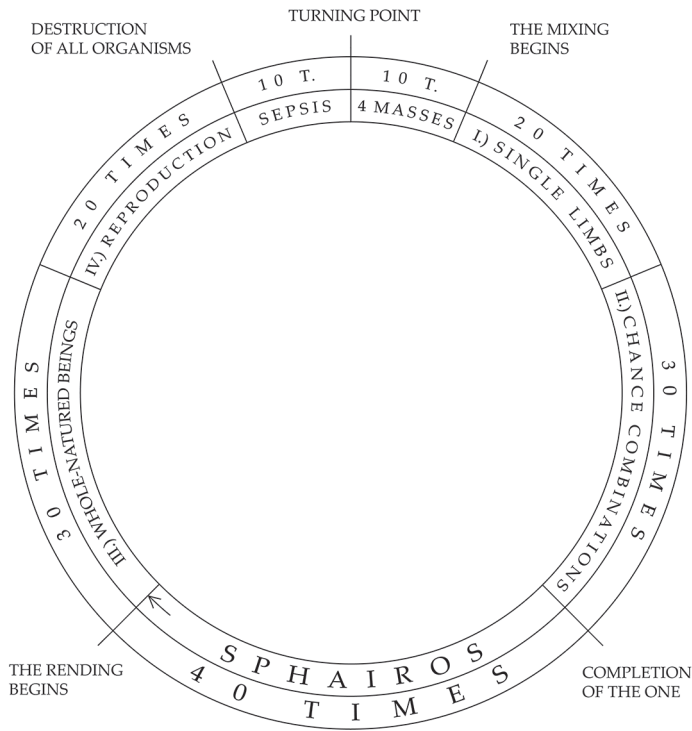


Plate 3: The seven phases of the cosmic cycle in accordance with the proportions of the double tetractys

It seems even possible to take one further step and to show that the assumption of the Pythagorizing timetable is not only *compatible* with the structure of the cosmic cycle, but that it is even a necessary condition for making sense of the one extant reference to the cosmic timetable by Empedocles himself.

After the formation of the *Sphairos* and for the duration of its reign, both Love, which fills the *Sphairos*, and Strife, which surrounds it as an external covering, enjoy a *period of rest*.⁸¹ The rest period of Love and Strife—the dominion of the *Sphairos*—comes to an end when Strife, the strength of whose limbs has been restored during the period of rest, invades the *Sphairos* from without and destroys it.⁸² The period of rest, i.e. the life-span of the *Sphairos*, is characterized as having been fixed “in exchange” by an oath sworn by Love and by Strife.⁸³

*But after great strife had grown in its limbs
and risen to its honours, when the time was being completed
which they have defined in exchange by means of a broad oath, ...*

αὐτὰρ ἐπεὶ μέγα Νεῖκος ἐνὶ μμελέεσσιν ἐθρέφθη
ἐς τιμὰς τ' ἀνόρουσε (scil. τὸ Νεῖκος) τελειομένοιο χρόνοιο,
ὅς σφιν ἀμοιβαῖος πλατέος παρ' ἐλήλαται ὄρκου ...

The obvious question is: “in exchange for what?” One should expect that two gifts exchanged by Love and Strife are each of equal value.⁸⁴ Yet it seems quite implausible to assume that Strife has granted the *Sphairos* to Love in return for the rest of the cosmic cycle (so that the duration of the *Sphairos* would have to match the duration of all other periods of the cycle), as suggested by O'Brien 1969.⁸⁵ For this would imply, as O'Brien himself admits, that not only Strife's invasion but also Love's expansion belongs, “in a sense”, to Strife.⁸⁶

⁸¹ Empedocles text 92c, Mansfeld/Primavesi (Scholium B Rashed, commenting upon Aristotle *Phys.* VIII.1 250^b29 ἐν τοῖς μεταξὺ χρόνοις): πανομένης γὰρ καὶ τῆς φυλίας μετὰ τοὺς ξ χρόνους, οὐκ εὐθὺς ἦρξατο ποιεῖν ἀπόσπασιν τὸ νεῖκος, ἀλλ' ἡρέμει.

⁸² Empedocles text 78 Mansfeld/Primavesi (DK 31 B 31): πάντα γὰρ ἐξείης πελεμίζετο γυῖα θεοῖο ...

⁸³ Empedocles text 77 Mansfeld/Primavesi (DK 31 B 30).

⁸⁴ O'Brien (1969), p. 83.

⁸⁵ O'Brien (1969), p. 83.

⁸⁶ O'Brien (1969), p. 80: “The purpose of the present analysis is to explain how movement dominated by Love *as well as* movement dominated by Strife *both* in a sense ‘belong’ to Strife, as the author of movement and plurality”. See also O'Brien (1969), p. 77: “Any separation and any movement will have ‘belonged’ to Strife in the way that the Sphere ‘belongs’ to Love”.

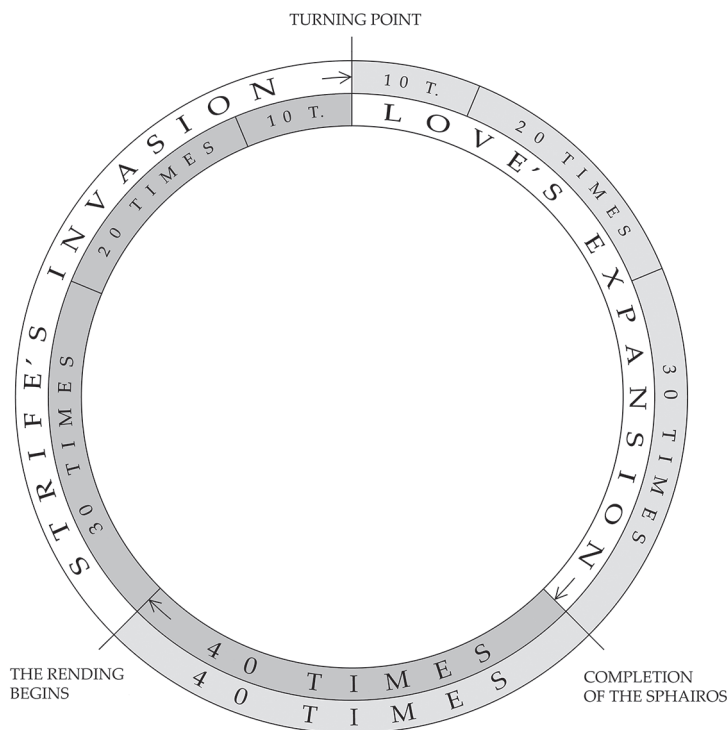


Plate 4: The 40 Times of the *Sphairos* as embedded both in the tetractys of Love and in that of Strife

A far more convincing solution becomes available as soon as we assume that the cosmic cycle is structured along the lines of a double *tetractys*. Both Love and Strife have sworn to each other to observe faithfully the timetable of their respective *tetractys* (which shows, by the way, that even the Pythagorean link between “oath” and *tetractys* seems to be inspired by Empedocles, although the *function* of the Pythagorean oath is totally different from that of the divine oath in Empedocles). Now on our Pythagorizing reconstruction of the timetable, the life time of the *Sphairos* belongs to both the *tetractys* of Love and the *tetractys* of Strife, so that the Empedoclean oath implies, in particular, that Love and Strife have granted *each other* to cease fire during a common period of rest, i.e. during the life span of the *Sphairos*. Physically speaking, these forty time units are, of course, just *one* period of time, but from a legal point of view we are dealing, rather, with two temporally coextensive periods of time: one belonging to the *tetractys* of Love, and the other belonging to the *tetractys* of Strife, one granted by Love to

Strife and the other granted by Strife to Love. *This reciprocity is meant when the Empedoclean teacher reports that Love and Strife have defined the lifetime of the Sphairos “in exchange” (PLATE 4).*

It seems to follow that the Pythagorizing timetable is already presupposed by the three relevant if enigmatic lines of Empedocles' own composition. By way of comparison, we may refer to the numerical formulae by means of which Empedocles accounts for homoeomeric mixtures⁸⁷ as, for instance, blood and muscles (1 part of earth, 1 part of fire, 1 part of water, 1 part of earth),⁸⁸ bones (2 parts of earth, 2 parts of water, 4 parts of fire),⁸⁹ and sinews (1 part of fire, 1 part of earth, 2 parts of water):⁹⁰ all of these formulae remain within the compass of the Pythagorean *tetractys*.

Our general conclusion will be this: the system of the three functions in Empedoclean physics stands in need of an important modification. While it remains true that the cosmic cycle is governed to a considerable extent by the interaction of the six principles, it is no less noteworthy that the timetable of the cycle is structured in accordance with Pythagorean number philosophy.

⁸⁷ Aristotle *Metaph.* A.10 993^a17–27.

⁸⁸ Empedocles text 98 Mansfeld/Primavesi (DK 31 B 98).

⁸⁹ Empedocles texts 100 und 97 Mansfeld/Primavesi (DK 31 B 96 und A 78).

⁹⁰ Empedocles text 97 Mansfeld/Primavesi (DK 31 A 78).

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