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Oenopides of Chius: A survey of the modern literature with a collection of the ancient testimonia

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A survey of the modern literature with a collection of the ancient testimonia*

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Astronomer and mathematician, active in the second half of the 5th c. B.C.E., some testimonies about physical theories.

Reports on Oenopides are collected in section 41 of Diels–Kranz, *Die Fragmente der Vorsokratiker*, 8th edition, vol. I, 393–395.[1]

Some of the fragments in the Diels–Kranz collection have been contested. It has been suggested that apart from the Oenopides of Chius of the 5th c. B.C.E. there must have been at least another later Oenopides. As the name Oenopides features already in Homer,[2] there is nothing inherently impossible in the suggestion that there could have been more than one important figure in Antiquity with this name. I will discuss these suggestions one by one in detail below. The upshot of these discussions will be that although some of the testimonies may raise doubts – and indeed, at least one of them, fr. 12, raises serious doubts –, every one of them may nevertheless have been intended as a report about the 5th c. B.C.E. Oenopides.

The section in Diels–Kranz is not divided into A and B fragments. Apart from the one or two gnomic sayings attributed to Oenopides (fr. 4, and perhaps its sequel in the *Florilegium Monacense*), the Greek phrase quoted and then translated into Latin by Macrobius in the *Saturnalia* (I 17. 31 = fr. 7) and the terminological point provided by

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1 Texts from the Diels–Kranz collection are referred to simply as 'fr. [fragment number]' in this survey article. A somewhat fuller collection of testimonia is provided in the second half of this fascicle, texts from that collection are referred to as 'Testimony [testimony number]'.

2 *Iliad* V 707, see also Strabo XIII 1. 50, 11 and XIII 3. 1, 19, where Strabo quotes with the name Oenopides lines 443–444 of *Iliad* XIV, where our manuscripts read Ἠνοπίδης.

Proclus (*In Eucl.,* p. 283, 8–10 Friedlein = fr. 13), the testimonies in later authors do not purport to be providing the actual words of Oenopides. Neither the gnomic sayings, nor Macrobius are likely to get the phrase ascribed to Oenopides from anything Oenopides wrote: in the case of the gnomic sayings this is inherently implausible,[3] whereas Macrobius could just as well take from a doxographical source the Greek clause he exhibits and translates. This means that the single instance where we have compelling evidence about the wording Oenopides used is Proclus' remark that Oenopides used the phrase κατὰ γνώμονα for 'perpendicular' in the description of the construction of perpendiculars he gave. This terminological detail most likely reached Proclus through the intermediary of Eudemus' *History of geometry*.

There is no ancient vita of Oenopides. Oenopides' date can be fixed from Proclus' list of geometers after Pythagoras, where he is mentioned after Anaxagoras, and before his younger contemporary, Hippocrates of Chius (*In Eucl.,* p. 65, 21 – p. 66, 7 Friedlein = fr. 1, part of Eudemus fr. 133 Wehrli).

Proclus also mentions an Oenopides at *In Eucl.,* p. 80, 15–20 Friedlein (= fr. 12) as the originator of a succession of scholars. In further generations of this succession Andron and Zenodotus are mentioned, moreover Proclus reports on the way Zenodotus distinguished between theorems and problems. We cannot take it for granted that these two later figures, Andron and Zenodotus, about whom Proclus does not give any further detail elsewhere, are mathematicians,[4] and apart from the fact that Proclus mentions Hellenistic authors in the vicinity of this testimony, we have practically no indication for the dates of Zenodotus and Andron.[5] Hence the chrono-

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[3] I owe this point to Leonid Zhmud (in private communication, e-mail of 23 April 2006), who suggested to me that a gnomic saying like fr. 4 makes no sense in a culture which is not sufficiently bookish yet. (Some similar consideration may have been responsible for von Fritz's – erroneous – report at his "Oinopides", cols. 2271f., where he instead of fr. 7 mentions this testimony as one which Zeller assigned to a later, Stoic, Oenopides; see further n. 5 and n. 30 below.)

Such an anachronism, however, is no reason for contesting the ascription of this saying to Oenopides. Indeed, I would submit that the one or two gnomic sayings under Oenopides' name attest – and the fact that he was referred to in a pseudo-Platonic dialogue also suggests – that Oenopides was recognised as a stock example of intellectual achievement to an extent which is sufficient for attracting gnomic witticisms.

[4] If they were, this passage is one of the not too many instances that speak about a mathematical school. For the possible import of the scarce testimonies about mathematical schools in the ancient record see Netz, *The shaping of deduction in Greek mathematics*, Chapter 7 (The historical setting), Section 2 (Demography), esp. 291–292, Netz, "Greek mathematicians: A group picture", esp. 215–216, and Zhmud, *The origin of the history of science*, 283–286.

[5] Zhmud, *The origin of the history of science*, 178–179 (with n. 54; cf. also 260 n. 134) argued that Zenodotus and Andron belonged to the Hellenistic era (because they were engaged in a discussion about the status of problems and theorems), and furthermore that the Oenopides mentioned here must also have been a later figure, most probably the Stoic philosopher Zeller assigned some of the testimonies to (see n. 30).

To this consideration one could further add what Leonid Zhmud suggested to me (in private communicaton, e-mail of 24 April 2006), that the (very few) scientific schools of the Hellenistic period were not called successions (*diadochai*), in contrast to the philosophical and medical schools. This observation could then corroborate that Proclus speaks here about members of a

logically underspecified priority between this Oenopides and them does not allow for further conclusions about the dates of this Oenopides.

Aside from this dating and his native island, Chius, no further details are known about Oenopides' life. The most suggestive detail about Oenopides in the sparse material is in the setting of the opening lines of the pseudo-Platonic *Rival lovers*, 132A–B. Here Socrates gives a snapshot of two Athenian youths in the gymnasium of Dionysius, apparently discussing something which is connected either to Anaxagoras or to Oenopides, as they are drawing circles and produce inclinations by their hand gestures. The story certainly does not require that Oenopides should have been active at Athens, as Anaxagoras was. Nevertheless, it clearly indicates a strong intellectual presence at Athens.[6]

Hellenistic philosophical school, one which our Oenopides could not possibly have originated several hundred years earlier.

In face of this, a straightforward solution would be to postulate a later Oenopides, as Zhmud does. The other, more cumbersome suggestion could be that this passage is a testimony about a mathematical or a philosophical school (with whatever tenuous links to claim Oenopides as a founding figure, cf. the 'portrait' and herma of Parmenides in the context of a medical school at Elea in the Augustan Age), adding that if the testimony is about members of a mathematical school, for some reason the philosophical/medical terminology of successions is deployed for this school.

One consideration in favour of this second, more cumbersome option is that it is practically certain that Proclus, providing us with this testimony about (an) Oenopides 14 pages after including the 5th c. B.C.E. Oenopides of Chius in the list of geometers, makes no sign of being aware that he would be talking about a different Oenopides here. Hence if we postulate another Oenopides, we do so in the face of Proclus' testimony.

Be that as it may, the most important point to stress about this testimony is that even if it were about later members of a school originating (in whatever tenuous sense) from Oenopides of Chius, it does not provide any shred of evidence about Oenopides' mathematical achievements (*pace* von Fritz, "Oinopides", cols. 2267–2271 [pp. 157–161 in the reprint]).

6 The life of Democritus, in Diogenes Laertius IX 37 and 41, also situates Oenopides in a similar manner. According to chapter 41 Democritus in his *Lesser World-order* declared that he was forty years younger than Anaxagoras. This is followed by the dates of his birth, proposed by Apollodorus and Thrasyllus (the ancient editor of Democritus' works), the latter making him a contemporary of Archelaus, the disciple of Anaxagoras, and of the circle of Oenopides. The report is rounded off by the claim that Democritus mentioned also him – i.e. besides Anaxagoras (and perhaps Archelaus) also Oenopides. This, then, would constitute a lineage, between Oenopides and Democritus on the one hand, and, at second remove, between Anaxagoras and Democritus on the other. We are in no position to tell whether the Democritean writing referred to here is genuine or spurious, so the detail situating Democritus in the intellectual ambience of Anaxagoras and of Oenopides may be a fabrication of ancient biographers.

Furthermore, in Diogenes Laertius IX 37 Thrasyllus is reported to submit that the unnamed interlocutor of Socrates in the *Rival lovers*, 'different from the disciples associated with Anaxagoras and Oenopides' (or, with Marcovich's emendation, 'different from the youngsters discussing about Anaxagoras and Oenopides') should be Democritus himself, provided the dialogue is a genuine work by Plato. But a later author could just as well have included Democritus as an interlocutor in a pseudo-Platonic *Rival lovers.* Accordingly, Thrasyllus' claim should be taken to suggest that the identification depends on some crucial information which should have been evident to Plato, but may not have been available to a later author. Such a piece of information could

Doctrines. The historiographical note in *Catalogus codicum astrologorum graecorum* T. VIII pars 3, p. 95, 12–14 (part of Testimony 1a) submits that Oenopides was the first to write, in a sufficiently theoretical manner, on astronomy (πρῶτος δὲ παρ᾽ Ἕλλησιν ὁ Χῖος Οἰνοπίδης τὰς ἀστρολογικὰς μεθόδους ἐξήνεγκε εἰς γραφήν). Although this may well only be a later guess here, from the several discoveries attributed to him, even as a guess it remains a sound one. The astronomical discoveries must have featured in a work or in works by Oenopides, setting some fundamental assumptions for the astronomers and philosophers of the next generation, and we know of no previous works with similar credentials. As no titles are reported for Oenopides, in what follows the testimonies will be grouped thematically.

A. Oenopides as the discoverer of the obliquity of the zodiacal circle. Evidence going back to Eudemus – as transmitted to us by Theo of Smyrna, through the intermediary of Dercyllides, p. 198, 14–16 Hiller (= Eudemus fr. 145 Wehrli) – mentions Oenopides as a first discoverer of the encircling – or with Diels' emendation, of the obliquity – of the Zodiac or of the zodiacal circle.[7] Two further testimonies elaborate on this: Aëtius', in II 12. 2, that the obliquity was discoverd by Pythagoras, but Oenopides appropriated and published it as his own insight, and Diodorus Siculus', in I 98. 3, that Oenopides learnt his astronomical doctrines, and among them, the obliquity of the circle of the Sun, from the Egyptian priests.

The wording of these testimonies lacks precision on the crucial issue of what the discovery of the encircling of the Zodiac, or of the obliquity of the zodiacal circle could amount to. It is certain that the sources attribute to Oenopides something more than the introduction of zodiacal constellations. The introduction of some of these constellations is attested before Oenopides' time,[8] moreover the testimonies attribute something more specific than a (perhaps complete) enumeration of zodiacal constellations: Oenopides is credited with the discovery of the way the Zodiac or the zodiacal circle is related to the diurnal rotation of the celestial bodies. But the introduction of such an oblique zodiacal circle can be taken to refer to different conceptual innovations: minimally, it can refer to the description of the motion of the Sun (and of the Moon, and of the other planets) through breaking these motions up into a diurnal component, identical to the revolution of the fixed stars, plus, for each of them, an additional zodiacal component[9] of its own.[10] Or it can refer to something

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easily have been the remarks in the (genuine or spurious) Democritean writing linking Democritus to Oenopides and Anaxagoras, provided Thrasyllus supposed that this writing had been in circulation in Democritus' (and Plato's) lifetime, but then later it was not readily available.

7 Note that the expression 'zodiacal circle' can refer both to the zodiacal band (see Theo of Smyrna, p. 133, 17–20 Hiller), and to the circle of the ecliptic (see p. 130, 15–21 Hiller), although the technically more precise expression for the latter is 'the circle through the middle of the zodiacal signs' (ὁ διὰ μέσων [or διὰ μέσου] τῶν ζῳδίων [κύκλος], see e.g. p. 133, 21 or p. 181, 14f. Hiller).

8 Pliny, *Naturalis historia* II 31 (= Cleostratus B 2 Diels–Kranz) submits that Cleostratus referred to the zodiacal signs Aries and Sagittarius.

9 Here, and in what follows I employ the following terminological convention: by the *zodiacal motion* of a planet I refer to that by and large West-to-East motion which combined with the diurnal East-

technically more sophisticated than that: e.g. the zodiacal motion of the planets can be further analysed into a motion exactly along the great circle of the ecliptic, and some further components; or the introduction of the Zodiac can be taken to refer to the specific description of the ecliptic in terms of twelve 30-degree signs. This latter notion – most probably borrowed by the Greeks from Mesopotamian astronomy – is also connected to the recognition of the zodiacal motion of the Sun, the Moon and the planets.[11]

Before addressing this issue we have to assess the value of these testimonies, as it has been called into question by Bowen, claiming that they may have been occasioned by "the casual reference to Oenopides in Plato's *Amatores*".[12] This suggestion, however, raises more problems than it might solve, as it is by no means clear why a casual reference to Anaxagoras and Oenopides could have occasioned the reports that Oenopides – and not the somewhat earlier Anaxagoras – was responsible for the introduction of the notion of a zodiacal motion, or of some more sophisticated conceptual tool, like that of the specific description of the ecliptic in terms of twelve 30-degree signs, connected to this zodiacal motion.[13] Hence it is not reasonable to

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to-West revolution of the fixed stars gives as a result the apparent celestial motion of the planet. In the case of the Sun I will occasionally refer to this zodiacal motion as the *ecliptical motion* of the Sun.

10 Such a conceptual innovation would presuppose that before Oenopides' introduction of the notion of such a zodiacal motion planetary motions had been interpreted in what could be called models of retardation (plus North-South deviation). In such a model, as Burkert aptly put it, planetary motions are accounted for by highlighting the fact that the planets are "'getting left behind' by the fixed stars in the all-embracing cosmic revolution", Burkert, *Lore and science*, 332. (For an ancient author criticizing an account of planetary motions in terms of retardation, see Geminus, *Introduction* XII 14–23.)

As I use the same conceptual framework here as the one Burkert employs at *Lore and science,* 332–335, I need to stress that the conclusions Burkert reaches there are markedly different from the thesis I argue for. Most importantly, against Burkert's contention I shall submit on p. 6 below that in Anaximander's celestial setup the oblique circles do not represent the annual and the monthly motions of the Sun and the Moon, respectively. As a consequence, the course of development I chart will be significantly different from Burkert's assessment of the course of the understanding of the basics of celestial theory.

Moreover, one should note that Burkert's discussion is marred by some philological blunders: there is no testimony to the effect that Oenopides was a student of Anaxagoras (*pace* Burkert, *Lore and science,* 333, the error comes most probably from a hasty reading of Diogenes Laertius IX 41, in fr. 3, there Democritus is situated in the intellectual ambience of Oenopides and of Archelaus, the student of Anaxagoras), and it is a mistake to claim that the Euripidean phrase 'the contrary course of stars' in fr. 861 Nauck would refer to the zodiacal motion of the planets (*pace* Burkert, *Lore and science,* 332 n. 47 and 333), indeed, elsewhere, Burkert enumerates those other passages in Euripides where the Thyestean meal occasions the reversal of the overall sidereal motion, and not just that of the ecliptical motion of the Sun (see Burkert, *Lore and science,* 322 n. 116).

11 I am grateful to David Brown for urging on me these clarifications.

12 Bowen, "Oenopides", 357.

13 Cf. Aëtius II 16. 1 (= Anaxagoras A 78 Diels–Kranz), claiming that according to Anaxagoras all the stars move from East to West – i.e. none of them possesses a zodiacal motion contrarywise to the diurnal celestial revolution.

suppose that the doxographical testimonies would be an extrapolation from the opening scene of a pseudo-Platonic dialogue, which may well have been later than Eudemus.[14]

What exactly can be attributed to Oenopides depends on what our assessment of the level of astronomical knowledge prior to Oenopides is.

Against Oenopides' priority as the first to break up the motion of the planets – Sun and Moon included – as comprising of an East-to-West component, the same as the motion of the fixed stars, and another, much slower contrarywise one, within the celestial band of the Zodiac, it has often been claimed that the obliquity of the Zodiac had been already introduced by Anaximander.[15] But the testimony of Pliny, *Naturalis historia* II 31 (= Anaximander A 5 Diels–Kranz) probably rests on a misunderstanding of Anaximander's celestial system. Most probably the tilt of the wheels of the Sun and the Moon mentioned in Aëtius II 25. 1 (= Anaximander A 22 Diels–Kranz) refers to the fact that the celestial rings are at a tilt to the horizon, i.e. to the surface of the flat Earth, and in default of specific information which would also set these rings at a tilt to the diurnal celestial revolution, it is easier to suppose that the plane of the tilt of these rings corresponds to the plane of the daily motion of the Sun and the Moon (and also of the other celestial luminaries).[16]

Oenopides' priority, then, can be called into question in favour of Pythagoras and the early Pythagoreans. The issue cannot be decided with certainty: the claims of later authors cannot be accepted at face value, as they attribute to Pythagoras not only the discovery of the zodiacal motion, but some further fundamental insights of later celestial theory as well.[17] This leaves us with Aëtius' testimony about Alcmaeon (Aëtius II 16. 2 [in the [Plutarch] version] or 2–3 [in the Stobaeus version, this version is printed as Alcmaeon A 4 Diels–Kranz]), that he – like some unidentified mathematicians – attributed a West-to-East motion to the planets, contrary to the diurnal celestial rotation.[18] Those who want to attribute the discovery of a zodiacal component motion to Oenopides should reject or qualify this testimony as well.

If, however, one accepts this testimony of Aëtius about Alcmaeon, and the testimonies of the astronomical authors about the early Pythagoreans are taken *cum grano salis*, as overstating their case about the discovery of the zodiacal motion of the planets in a rash and anachronistic idiom, one should accept one of two options.

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14 Cf. Heath, *A history of Greek mathematics*, vol. I, 174, where in a cautionary remark, after submitting that the discussion at the beginning of the *Rival lovers* must have been about the obliquity of the ecliptic, Heath adds "[i]t would probably be unsafe to conclude that Anaxagoras was also credited with the same discovery, […]".

15 So Burkert, *Lore and science*, in the first two sentences of 306 n. 38, (referring also to Cleostratus, about Cleostratus see n. 8 above). See also Diels, "Anaximandros von Milet", 72 (reprinted in Diels, *Kleine Schriften zur Geschichte der antiken Philosophie*, p. 8).

16 See Couprie, "The visualization of Anaximander's astronomy".

17 See Burkert, *Lore and science,* 325 n. 10 for references to some of the relevant testimonies.

18 Note that if the recognition of the zodiacal motion of the planets is acknowledged at latest for Alcmaeon, the assertions of Parmenides B 10, 4 and, more importantly, of B 14 about the motion of the Moon will be most naturally taken as referring to the zodiacal motion of the Moon.

Either one should allow that Eudemus for some reason disregarded Alcmaeon and other early Pythagoreans in favour of Oenopides. Alternatively, one could attribute the introduction of some further point, or the discovery of some further crucial detail to Oenopides. If one had to come up with a suggestion, one further point Oenopides can very well be credited with is the use of a geometrical framework for the formulation of the analysis of planetary motions into the diurnal East-to-West revolution of the fixed stars and the additional zodiacal component of planetary motions.[19]

In addition, von Fritz argued that Theo's report from Dercyllides is disorganized to the extent that we might with great plausibility attribute to Oenopides both of the discoveries mentioned in the paragraph at p. 199, 2–8 Hiller, and attributed there to 'the rest [of the astronomers]' – that the axis of the ecliptical revolution is at an angle to the axis of the diurnal revolution, and that this angle is 24°, i.e. the poles of these revolutions are at a distance from each other which is the side of the fifteen-angled regular polygon.[20] In support of von Fritz's claim one could argue that the first one of these discoveries is just a precise formulation, in a mathematical idiom, of the obliquity of the ecliptic, an insight that has to be attributed to Oenopides, if we suppose that he used a geometrical framework to set forth how the diurnal and the ecliptical components of the motions of the Sun are related to each other. Hence, if the first of the discoveries of 'the rest [of the astronomers]' turns out to be one which belongs to Oenopides, then the closely related second one can also be ascribed to him.

But a disorganized testimony, which on this reading starts out with attibuting something to Oenopides at p. 198, 14f. Hiller,[21] then turns to Thales, Anaximander and Anaximenes, and then, after these, attributes two insights to 'the rest [of the astronomers]' which should have been attributed to Oenopides, should not inspire much confidence. Hence, the ascription to Oenopides of the discovery of the value 24° for the obliquity of the ecliptic will inevitably remain contested, see e.g. Heath, *Aristarchus of Samos*, 131: "at all events he cannot be credited with the estimate 24°, which held its own till the time of Eratosthenes […]".[22]

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19 I owe this suggestion to David Brown.

20 See von Fritz, "Oinopides", cols. 2260–2261 (p. 151 in the reprint).

21 These lines are included as the first item in fr. 7.

22 Closely related to this debate about the Oenopidean provenance of the value 24° for the obliquity of the ecliptic is the further contention that Euclid IV 16, the inscription of the regular fifteen-angled polygon into a circle, goes back to Oenopides. (For: [tentatively accepting also the discovery of the value 24°] von Fritz, "Oinopides", col. 2261 [p. 151 in the reprint]; against: [rejecting the discovery of that value] Heath, *The thirteen books of Euclid's Elements,* vol. II, 111.)

This contention rests on the presupposition that Oenopides found the value 24° for the obliquity of the ecliptic, and that the only way to specify this value available to him was to speak about the side of a fifteen-angled regular polygon, as the division of angles into degrees had not been introduced yet. This means that once the crucial first presupposition is admitted, it will be easy to see why it would have been a natural task for Oenopides to provide the geometrical construction of the side of the fifteen-angled regular polygon in a circle.

Two things need to be stressed here. First, the argument above rests exclusively on the disputed claim that Oenopides found this value for the obliquity of the ecliptic, and cannot call on any further testimonies. In particular, although Proclus, *In Eucl.,* p. 269, 8–18 Friedlein, mentions

It is also unlikely that, on the basis of the testimonies included in fr. 7, we should credit Oenopides with the introduction of the technically more sophisticated notion of the Zodiac as the description of the ecliptic in terms of twelve 30-degree signs, as the key innovation in the application of that conceptual tool is not the recognition of the obliquity or of the encircling of this circle or circular band, nor the fact that the motion of each planet has a zodiacal component, but the degree of precision implied by the introduction of twelve equal segments along the ecliptic (or within the zodiacal band).[23]

B. Milky Way. Aristotle in the *Meteorology* (I 8, 345a13–18) mentions two Pythagorean theories for the Milky Way. The second of these – that the Milky Way is the former course of the Sun – is attested by Achilles, *Is.*, p. 55, 18–24 Maass as Oenopides' account.[24] It is not clear whether Oenopides adopted this account from

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IV 16 as a construction that Euclid included because it is useful for astronomy, and this passage could be compared to *In Eucl.*, p. 283, 7–10 (= fr. 13), the similar wording of the two passages cannot give independent support for the ascription of IV 16 to Oenopides. This is so, because the claim about IV 16 occurs in a discussion of Eucl. I 7: that theorem, Proclus submits – referring to unnamed earlier authorities – can be used to show that three subsequent eclipses cannot be separated by the same time interval, and hence it is useful for astronomy (p. 268, 19 – p. 269, 7 Friedlein). This assertion about I 7 is apparently later than Oenopides. After these lines about I 7, Proclus formulates the more general claim, that Euclid included quite a few other theorems and constructions which are useful for astronomy (p. 269, 8–10 Friedlein), and cites as an evident example Eucl. IV 16, without referring to any authorities (p. 269, 11–14 Friedlein). This, then, shows that in Proclus' discussion there is no exclusive link between his claims about IV 16 and I 12 (= fr. 13), so Proclus' testimony about Oenopides' motivations in propounding a construction of perpendiculars should not be used to assign the construction in IV 16 to Oenopides. (Cf. also n. 38 below, where I argue that Proclus' claim that Oenopides' construction of perpendiculars was carried out with an eye to the special needs of setting up astronomical instruments apparently rests on a rather forced interpretation of the crucial expression 'according to the *gnômôn*' or '*gnômôn*-wise' – κατὰ γνώμονα.)

Moreover, we should keep in mind that Proclus' testimony does not submit that the construction of the regular fifteen-angled polygon was *discovered* because that construction became expedient for astronomy. All it says is that, no matter how the construction had been discovered, it was included in Euclid's *Elements*, because it is useful for astronomy. (For an account detaching the discovery of the construction of the regular fifteen-angled polygon from the intruduction of the traditional value for the obliquity of the ecliptic see e.g. Szabó, *Das geozentrische Weltbild*, 127–128. Note, however, that according to Szabó's contention the introduction of the value 24° would not only be later than, but would actually *presuppose* the construction of the regular fifteen-angled polygon, which is surely not mandatory.)

[23] Similarly, these testimonies do not allow us to ascribe to Oenopides a more sophisticated analysis of the zodiacal motion of the planets into a revolution exactly along the great circle of the ecliptic plus some further component motions.

[24] Unless the opening scene of the *Rival lovers* uses Anaxagoras' and Oenopides' names as general vignettes – in which case almost anything astronomical could be connected to them, and these lines should not have any specific reference –, the discussion related there, as Guthrie, *A history of Greek philosophy*, vol. II, 305 n. 3, suggests, could be about such a fundamental sea-change in the celestial domain according to Anaxagoras and Oenopides. In Anaxagoras' case, however, the

Pythagoreans of a prior generation; or Aristotle took Oenopides as one of the Pythagoreans; or some later Pythagoreans, before Aristotle's time adopted his account. Note that if Oenopides adopted this account from earlier Pythagoreans, then these early Pythagoreans had doubtless employed the notion of the ecliptical motion of the Sun before him. This is so, because the explanation of the Milky Way that it is the *former* course of the Sun, as traced among the fixed stars, suggests that whoever proposed this explanation did have to contrast this former course of the Sun to its *present* orbit among the fixed stars, i.e. to the ecliptical circle along which the Sun performs its annual revolution. This means that in this case we should opt for an understanding of the claims that Oenopides discovered the obliquity of the zodiacal circle according to which he was responsible for the introduction of some crucially important further technical detail.

Achilles' testimony not only links the explanation of the Milky Way to Oenopides, it also adds a further flourish to Aristotle's description, that the Sun changed course in disgust upon the meal of Thyestes. A similar view, about the origin of the contrarywise revolution of the planets on account of the Thyestean meal is ascribed to the 'play of the myths' in chapter 6 of the first anonymous introduction from scholia to Aratus' *Phaenomena* at p. 98, 5–7 Maass. This, however, does not exclude that the view originated with Oenopides: one could compare to it Oenopides' other theological flourish, that Apollo deserves the epithet *Loxias* on account of the obliquity (*loxos*) of the ecliptic, in his capacity as solar divinity.[25]

C. Oenopides' great year is reported to consist of 59 solar years by Aëtius II 32. 2 and Aelianus, *Varia historia* X 7. It is obvious to suppose that this is motivated by trying to find a common multiple for the length of the year and for the 29-and-a-half-day-long synodic month. Accordingly, this great year contains at least 365 * 59 days, i.e. at least 365 * 2 = 730 synodic months of 29 and a half days. If Oenopides' solar year was longer than 365 days, an additional day could be added to some of the the 29-day-long ('hollow') months, or even a whole additional month could be inserted into the great year. This latter option, however, would make Oenopides' great year at least 365 * 59 + 29 days long, producing – as a minimum – a solar year of almost 365 and a half days, which is almost certainly too long. Hence the easiest supposition is that Oenopides' great year contained 730 synodic months[26] (unlike Philolaus' great year,

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change is not just in the annual course of the Sun, rather as Diogenes Laertius II 9 (= Anaxagoras A 1 Diels–Kranz) and Aëtius II 8. 1 (= Anaxagoras A 67 Diels–Kranz) attest, the whole diurnal revolution of the sky receives a tilt, after which its axis is no longer directly above our head.

25 Macrobius, *Sat.* I 17. 31; Cornutus 32, p. 67, 15–16 Lang; again a variant of this view is attributed to τινές in chapter 5 of the same anonymous introduction from scholia at p. 96, 10–13 Maass.

26 Censorinus 19. 2 adds further precision to this, claiming that Oenopides' natural year consisted of $365+\frac{22}{59}$ days. This would make the 59 year period 21,557 days long, in excellent agreement with the lenghth of 730 synodic months, but producing an error of more than a week in the solar year by the end of the great year period. Tannery's suggestion ("La grande année d'Aristarque de Samos", 359), that Oenopides must have consulted long-term calendrical reports, and could easily

which for numerological considerations subtracts a month, making the great year $9^3 = 729$ months, see Censorinus 18. 8 and 19. 2 [= Philolaus A 22 Diels–Kranz]).

All these considerations place Oenopides' great year among those calendar schemes which were introduced to accommodate for the motions of the Sun and the Moon, like the octaeteris intercalation cycles and the cycles of Meton, Eudoxus and Callippus.[27] Tannery argued conclusively against the idea that Oenopides' great year would also be meant to accommodate for the motions of the other planets, like the 'complete year' at Plato, *Timaeus*, 39D.[28]

D. Material principles. Oenopides features in the lists of Sextus, *P.H.* III 30 (= fr. 5), *Adv. Math.* IX 361, and [Galen], *Phil. hist.* 18 – among other thinkers who posited two material principles – as positing fire and air. How these two principles are supposed to be operative in the world is not reported.[29]

E. World-soul. Aëtius I 7. 17 (= fr. 6) reports that according to Diogenes (of Apollonia, the Presocratic philosopher, or of Babylon, the Stoic), to Cleanthes and to Oenopides the soul of the cosmos is god. The world-soul of the Stoics and of Diogenes of Apollonia, if he is the Diogenes referred to here, is pneuma and air, respectively, i.e. these are supreme manifestations of the active elements of the Stoics, or of Diogenes' material principle. The status of what Aëtius and his sources regard as Oenopides' divine world-soul might be analogous: it may consitute the most powerful manifestation of the two fundamental principles, air and fire, endowed with exceptional cognitive capacities. Accordingly, even if Aëtius' report about such a divine entity is

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have read off these reconds that 730 consecutive synodic months comprise of 21,557 days, is a completely gratuitous supposition. Moreover, it is important to note that there is a trivial slip in the account Neugebauer, *A history of ancient mathematical astronomy*, Part Two, 619, takes over from Aaboe – de Solla Price, "Qualitative measurement in antiquity", 5: in order to reach 21,557 days it is not sufficient to make (over and above the $59 * 12 = 708$ regular months of the 59 year period, containing alternately 29 and 30 days) the 22 additional (intercalary) months 'full', i.e. 30 days long. Another 11 of the original 354 hollow (i.e. 29-day-long) months also have to be made full. As there is no trivial way to arrive at the value supplied by Censorinus, the excellent fit with the length of the synodic month should be suspect. Hence Gerald J. Toomer's suggestion (private communication, reported in Bulmer-Thomas, "Oenopides of Chios", 180) gains credibility: the figure quoted by Censorinus is most probably the result of later computation, starting out from the fundamental Babylonian parameter for the mean synodic month, $29+\frac{31}{60}+\frac{50}{3600}+\frac{8}{216000}+\frac{20}{12960000}$ days, adopted also by Hipparchus. (For this parameter see Ptolemy, *Syntaxis mathematica* IV 2, p. 270, 19 – p. 271, 12 and Neugebauer, *A history of ancient mathematical astronomy*, Part One, 309–312.)

[27] For these intercalation cycles see Neugebauer, *A history of ancient mathematical astronomy*, Part Two, 615–624.

[28] Tannery, "La grande année d'Aristarque de Samos", 362–363.

[29] Zhmud, *The origin of the history of science*, 261–262, disputes the veracity of this testimony, pointing out that it is of late origin, but he does not assign it to the (or a) later Oenopides, because the testimony unmistakably speaks about our Oenopides of Chius.

accepted for Oenopides of Chius,[30] we are not entitled to infer that Oenopides (or, for that matter, Diogenes of Apollonia) must have propounded that the cosmos is an ensouled living being.

F. The flood of the Nile. Different testimonies attribute two significantly different accounts of the flood of the Nile to Oenopides. The common element of these accounts is that both submit that wells and springs are more abundant in the summer than in the winter – hence the summer floods of rivers, in that respect then the Nile is not exceptional. What is exceptional about the Nile is that in winter, when its sources are less abundant, the Nile – unlike the rivers elsewhere – is not swelled by winter downpour of rains. Hence the Nile has only a single, summer flooding season.

Beyond this common presupposition the two accounts give opposite explanations why the springs of the Nile are abundant in the summer and defective in the winter. Diodorus Siculus I 41. 1 (= fr. 11) and Seneca, *Quaestiones naturales* IVA 2. 26 report that Oenopides' explanation starts out from the observation that waters in wells are warm in winter and cold in summer.[31] As a result of this 'thermic inversion', in winter the sources of all the rivers, the Nile also being among them, lose a large portion of their water, because the water is warm then, whereas no water of the water supply is lost from the cold well or spring in the summer. (The most similar explanation to this in the medieval Latin version of [Aristotle]'s *De inundacione Nili* [fr. 248 Rose] is the anonymous one mentioned at p. 196, 19–26 Rose, this is the passage which has

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30 Zeller, *Die Philosophie der Griechen,* vol. III. 1 (4th edition), 48 n. 2 (on p. 50) submits that this doctrine – and the etymological flourish at Macrobius I 17. 31 (in fr. 7) – have to be ascribed to another, Stoic, Oenopides. (This suggestion occurred first in the 2nd edition of Zeller's *Die Philosophie der Griechen*, vol. III. 1, 42 n. 2, on p. 43.) Zhmud, *The origin of the history of science,* 179 n. 54 and 260 n. 134, accepts Zeller's suggestion that fr. 6 ascribes a Stoic idea to a Stoic Oenopides.

Although it cannot be excluded in principle that some of the testimonies would refer to a later Oenopides, the testimony of Macrobius in fr. 7 is beyond dispute intended to be about Oenopides of Chius, whereas fr. 6 certainly does not make the introduction of such a later Oenopides mandatory (cf. von Fritz, "Oinopides", cols. 2271f., who rejects Zeller's introduction of the Stoic Oenopides; on fr. 12 see n. 5 above).

31 This observation plays an important role in Hippocrates, *De aere aquis locis* 7. 10 (3. 1 and 24. 3 refer to the converse of this doctrine, that waters close to the surface of the earth are warm in summer and cold in winter). Hippocrates, *De natura pueri* 24–26 gives a sophisticated explanation for the phenomenon, which is used as an analogue of the development of the heat responsible for the formation of the embrio. Later the thermic inversion of the interior of earth (and, as a consequence, of underground water) became the stock doctrine of the Peripatetics, see Aristotle, *Meteorology* I 12, 348b2–5, Theophrastus, *On fire* 16 and Theophrastus fr. 173 Fortenbaugh–Huby–Sharples–Gutas = Plutarch, *Natural explanations,* 915B (see Sharples' commentary on this fragment in Commentary vol. 3.1, 122–123, for a discussion of the doctrine and for further relevant passages; Gemelli-Marciano, "Ein neues Zeugnis zu Oinopides", 82 n. 11, observed that the fragment contains some Greek phrases which recur in Latin translation in the testimony about Oenopides in Seneca), and Strato fr. 89 Wehrli = Seneca, *Naturales quaestiones* VI 13. 2–4. (Note, however, that the doctrine was not exclusively Peripatetic, Cicero, *De natura deorum* I 25 reports a similar doctrine about Cleanthes.)

been indicated from the 4th edition of the *Vorsokratiker* as the excerpt of the Aristotelian testimony which is the ultimate source of Diodorus' and Seneca's report.)

The other account starts out from exactly the opposite presupposition: the Anonymus Florentinus, *On the flood of the Nile*, section 6 and Joannes Tzetzes, *Exegesis in Homeri Iliada* A 427, p. 119, 25–29 Lolos submit that the springs of the Nile are contracted in the winter, but then the water supply of these springs is expanded in the summer, because then the springs themselves are warm. (The most similar explanation to this in the *De inundacione Nili* is the anonymous one mentioned at p. 195, 1–2, 4–8 and 10–13 Rose: this is the passage which – erroneously – had been indicated in the first three editions of the *Vorsokratiker* as the excerpt of the Aristotelian testimony which is the ultimate source of Diodorus' and Seneca's report.)[32]

Between these two alternative accounts, some preference could be given to the first one, as Gemelli-Marciano argues.[33] Apparently, the first alternative is not only more sophisticated – which could be a reason to suspect that it is later –, but it is also more closely related to contemporary and to slightly later explanations of natural phenomena than the other, more rudimentary account.

But even if one cannot be confident about some details of Oenopides' account of the flood of the Nile, the most important thing about these testimonies is that they

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[32] Apart from these two accounts, a scholium to the *Argonautica* of Apollonius Rhodius (Δ 269–271a), with Diels' conjecture, would introduce yet a third variant explanation for the flood of the Nile. This third account is apparently different from the two above in that it does not refer to the volume of the yield of the sources of the Nile in the different seasons. Instead, it speaks about the change of the soil, that it is loosened in summer. This loosening of the soil, the scholium submits, makes the soil emit water in the summer. This account could be combined with both of the accounts above, provided what is meant is that this loosening of the soil is responsible for the abundance of water in wells, springs, and most particularly, for the seasonal abundance of the sources of the Nile.

For a connection between internal heat or coldness of the earth, and the consistency of the soil along similar lines see Hippocrates, *De natura pueri* 24. 1 and 25. 1–2. At 25. 1–2 Hippocrates submits that the loosening of the soil by the external heat in summer is responsible for the internal coldness of the earth, and whereas 24. 1 refers to an opposite process – that of the internal warming of the earth due to the fact that precipitation water compacts the soil in winter. (Cf. also Cicero's testimony about Cleanthes in *De natura deorum* I 25.) Two points, however, should be noted about the account in *De natura pueri*. First, *De natura pueri* establishes the connection between the consistency of the soil and the internal heat and coldness of the earth by referring in 24. 1 to the winter rains – and on either account attributed to Oenopides (and in actual fact) there are no such winter rains in Egypt (or in the region of the sources of the Nile – this region, incidentally, is normally *not* referred to as Egypt in ancient sources). Second, contrary to the first account above, Hippocrates submits that the thermic inversion of the interior of the earth has as a consequence that springs are more abundant in winter than in summer (see 24. 3–4).

If, on the other hand, the process which the account of the scholium specifies as the cause of the summer floods occurs everywhere in Egypt (and not specifically at the sources of the Nile, which lie outside Egypt), the account will be in essentials identical to Ephorus' explanation for the flood of the Nile. (For some passages on Ephorus see the apparatus of the scholium, which I relegated to an Appendix to Testimony 11.)

[33] Gemelli-Marciano, "Ein neues Zeugnis zu Oinopides", 84.

attest that Oenopides propounded such an account. Accordingly, his work or works were not narrowly mathematical and astronomical.

G. Geometrical constructions. Proclus reports about two constructions – Eucl. I 12 (drawing a perpendicular to a straight line from a given point) and Eucl. I 23 (drawing a straight line with a given angle at a given point on a straight line) – that they go back to Oenopides. For the latter case, at Proclus, *In Eucl.*, p. 333, 5–6 Friedlein, Proclus invokes the authority of Eudemus (fr. 138 Wehrli), whereas in the former case, at *In Eucl.*, p. 283, 7–10 Friedlein, he comments on Oenopides' mathematical terminology, hence he evidently uses a compendium containing such technicalities: this report, then, also might go back to Eudemus, who consulted a writing of Oenopides.

These tasks, however, can be effected with the help of set squares or angle-measuring devices directly, without recourse to construction. Therefore, the testimony should mean that Oenopides was the first to provide constructions for drawing perpendiculars and angles, and these could be sufficiently similar to the ones found in the geometry of Eudemus' time.[34]

This means that even though the extent of Oenopides' mathematical achievements may have been rather meagre[35] – after all it was Hippocrates of Chius, and not Oenopides, who was credited with compiling the first Elements in geometry[36] –, Oenopides should be credited with results which at least in some loose sense conformed to standards of Euclidean geometry.[37]

The import of these 'Euclidean' constructions needs cautious assessment. In particular, the remarks of Knorr should be taken into consideration, that even if there are such 'Euclidean' results attested for Oenopides, one should be wary of ascribing to him a "consciously formal geometric effort".[38]

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[34] This *direct* testimony should be contrasted to the ones Eudemus bases on circumstantial evidence, e.g. the one where Eudemus claims from Thales' alleged procedure to measure the distance of the ships at sea that he must have known Theorem 26 of Book I of Euclid's *Elements* (Proclus, *In Eucl.*, p. 352, 14–18 Friedlein = Eudemus fr. 134 Wehrli). Indeed, geometrical constructions Eudemus ascribes to earlier mathematicians necessarily involved drawing perpendiculars and straight lines at given angles.

[35] I trust this is an instance where we are entitled to use an *argumentum e silentio:* Oenopides' work(s) may have contained some further passages which we would recognize as geometrical proofs or constructions, but it could not have contained anything much more impressive than these constructions (and, perhaps, the construction of the regular fifteen-angled polygon, for a discussion of that issue, see n. 22 above), otherwise Eudemus, and then some of the later authors drawing on him, would have mentioned some of those more impressive details as well.

[36] See Proclus, *In Eucl.*, p. 66, 7–8 Friedlein (part of Eudemus fr. 133 Wehrli).

[37] See Mueller, "Greek arithmetic, geometry and harmonics: Thales to Plato", 308; Heath, *A history of Greek mathematics,* vol. I, 175; von Fritz, "Oinopides", cols. 2265f. (pp. 154f. of the reprint).

[38] Knorr, *The ancient tradition of geometric problems*, 16. Knorr partly rests his case on the allegedly astronomical context of Oenopides' geometrical constructions. The testimony for this astronomical context of Oenopides' constructions is provided by Proclus' assertion, at *In Eucl.*, p. 283, 7–8 Friedlein, that Oenopides occupied himself with the task of setting a perpendicular to a given straight line because he considered this useful for astronomy. Proclus goes on to support this claim by the

Needless to say, much depends in this debate on what one takes to be a 'consciously formal geometric effort'. Knorr's caution is well placed, because these two 'Euclidean' constructions cannot constitute the requisite evidence that Oenopides programmatically, in all of his constructions, abandoned the use of non-'Euclidean' means, or that he would have drawn a sharp line between 'Euclidean' constructions and non-'Euclidean' ones. Even so, two important considerations speak in favour of assigning some 'consciously formal geometric effort' to Oenopides. One is that perpendiculars can be set and angles can be copied in a trivial and obvious manner, without recourse to constructions by ruler and compass. Hence the very fact that Oenopides constructed a perpendicular in a way more or less in conformity with the construction in the Euclidean *Elements* suggests that he thereby *avoided* the use of a set-square,[39] and for this he must have had some underlying considerations.[40]

Moreover, the fact that Oenopides' younger contemporary, Hippocrates of Chius, is credited with compiling the first Elements, whereas Oenopides is credited with these 'Euclidean' results, suggests that Hippocrates, in compiling his Elements could draw upon these (and possibly on other) Oenopidean constructions that started out

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terminological point in the immediately following clause, that Oenopides "calls 'perpendicular' (κάθετος) in the archaic manner 'according to the *gnômôn*' (κατὰ γνώμονα), because the gnomon is also at a right angle to the horizon" (Proclus, *In Eucl.*, p. 283, 8–10 Friedlein). *Gnômôn*, however, means not only the pointer of the sun-dial, but the set-square as well (for this usage see e.g. Theognis 543, and cf. the usage which calls *gnômôn* the shape which added to e.g. a square supplements it into another larger square, surely on account of the fact that such a shape is similar to a set-square – see Aristotle, *Categories* 14, 15a30 and *Physics* III 4, 203a10–15, and Euclid, Book II, Def. 2). This, then, suggests that Oenopides' usage may just as well mean that the perpendicular is 'according to the set-square' (so von Fritz, "Oinopides", cols. 2265f. [p. 155 of the reprint], Burkert, *Lore and science*, 424 n. 129, and Franciosi, *Le origini scientifiche dell'astronomia greca*, 93–95, cf. also 52), in which case the exclusively astronomical context of this geometrical construction is just a guess on Proclus' part. (For Proclus' similar claim about Euclid I 7 and IV 16 see n. 22 above.)

[39] Producing some more or less 'Euclidean' constructions does not necessarily imply that Oenopides also used another fundamental intellectual tool of Greek mathematics, the lettered diagram. Accordingly, Netz submits that Oenopides' "roll or rolls may have belonged to the […] genre [of] a text, accompanied by figures (without, of course, letters as labels)" ("Eudemus of Rhodes, Hippocrates of Chios and the earliest form of a Greek mathematical text", 273). This pronouncement is dependent on Netz's contention that in Eudemus' testimony about Hippocrates of Chius' quadrature of lunules (as reported in Simplicius' Commentary on the *Physics*) that layer of the text has to be assigned to Hippocrates which does not contain lettered diagrams, whereas those parts of the text which had been previously assumed to go back to Hippocrates should be the result of Eudemus' "manipulat[ing] his original source, by transforming it into what he saw as the canonical form of mathematics" (257). This argument, then, would make the use of lettered diagrams a fundamental innovation which occurred some time after Hippocrates of Chius.

In this note I can only register, without going into the details of a lengthy discussion, that Netz's contention about Hippocrates and Eudemus should be queried on several points. If, as a result of such a discussion, the use of lettered diagrams turns out to be attested for Hippocrates, there should be no reason to suppose that Oenopides' constructions must have been presented without lettered diagrams.

[40] Note that it is unlikely that these considerations would have been practical: set-squares are sturdy instruments, and it is easy to check whether a set-square is properly set or not.

from a restricted set of admissible moves. Hence we have no reason to suppose that Hippocrates' considerations in compiling his Elements would have been completely alien to those of his predecessor.

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Testimonia

This collection of testimonia indicates all the instances when a person named Oenopides is mentioned in an ancient author, with the exception of those passages mentioning an Oenopides (or an Enopides) which certainly have nothing to do with Oenopides of Chius. These are: *Iliad* V 707 (Οἰνοπίδης), *Iliad* XIV 443–444 (Ἠνοπίδης) and Strabo's quotes of these latter lines at XIII 1. 50, 11 and XIII 3. 1, 19 (with the form Οἰνοπίδης). The lexicographical entries, in the Suda (s.v. Ἠνοπίδην), and in [Zonaras], *Lexicon* (s.v. Ἠνοπίδης) do not contain any specific information, all they indicate is that Ἠνοπίδης is a proper name.

The items in this collection follow the order and numbering of the fragments in the Oenopides section (section 41, on pp. 393–395 of volume I) of Hermann Diels – Walther Kranz, *Die Fragmente der Vorsokratiker*, 8th edition (Berlin: Weidmann 1956), a reprint of the pages of the 5th edition (Berlin: Weidmann 1934). I also indicate in parentheses in the case of each individual testimony the edition where the passage is actually taken from. In some cases I also specify some other edition which has been consulted in compiling the apparatus.

Apart from minor changes – e. g. in punctuation, in the usage of capital letters, or in changing iota adscripts into iota subscripts – the apparatus lists where I deviate from the text of the edition which I used as the source of the testimony. Where this is necessary, a separate section of the apparatus indicates what material is present in different editions of the *Vorsokratiker*, and what portions of text have been added here. In these sections I refer with the abbreviation D.–K. to the consensus of all the editions of the *Vorsokratiker*. Unless otherwise indicated, readings adopted by Diels were also accepted by Kranz.

1 Proclus, *In primum Euclidis Elementorum librum commentarii* (ed. Friedlein) p. 65, 21 – p. 66, 8 = Eudemus fr. 133 Wehrli, lines 21–27

μετὰ δὲ τοῦτον [*sc.* Pythagoras] Ἀναξαγόρας ὁ Κλαζο-
66, 1 μένιος πολλῶν ἐφήψατο τῶν κατὰ γεωμετρίαν καὶ
Οἰνοπίδης ὁ Χῖος, ὀλίγῳ νεώτερος ὢν Ἀναξαγόρου,
ὧν καὶ ὁ Πλάτων ἐν τοῖς Ἀντερασταῖς ἐμνημόνευσεν
ὡς ἐπὶ τοῖς μαθήμασι δόξαν λαβόντων. ἐφ᾽ οἷς Ἱππο-
5 κράτης ὁ Χῖος ὁ τὸν τοῦ μηνίσκου τετραγωνισμὸν
εὑρών, καὶ Θεόδωρος ὁ Κυρηναῖος ἐγένοντο περὶ
γεωμετρίαν ἐπιφανεῖς. πρῶτος γὰρ ὁ Ἱπποκράτης τῶν
μνημονευομένων καὶ στοιχεῖα συνέγραψεν.

66, 1 τῶν om. G, A | 2 After Χῖος: ὁ τὸν τοῦ μηνίσκου τετραγωνισμὸν εὑρών, καὶ Θεόδωρος ὁ Κυρηναῖος G, deleted by C | τοῦ Ἀναξαγόρου G, A

D.–K. stops mid-sentence at the end of p. 66, 2.

Cf. also the rather careless summary (where Plato is erroneously listed as a geometer) at [Hero], *Definitiones* 136. 1, 6–8: καὶ μετὰ τοῦτον [*sc.* Pythagoras] Ἀναξαγόρας καὶ ὁ Πλάτων καὶ Οἰνοπίδης ὁ Χῖος καὶ Θεόδωρος ὁ Κυρηναῖος καὶ Ἱπποκράτης πρὸ τοῦ Πλάτωνος. (Cf. also Testimony 7 and [Hero] in the apparatus of Testimony 7 below.)

After him [*viz*. after Pythagoras] Anaxagoras of Clazomenae set himself to many issues in geometry, and also Oenopides, being a little younger than Anaxagoras – they are mentioned by Plato in the *Rival lovers* as ones who gained much acclaim in mathematics. After them Hippocrates of Chius, who found the quadrature of the lunule, and Theodorus of Cyrene became famous in geometry. For Hippocrates was the first among the ones mentioned who also put together an Elements.

1a *Vita Ptolemaei* from Paris cod. gr. 2425 (ed. Fr. Cumont [from the transcript of H. Lebègue]) in: *Catalogus codicum astrologorum graecorum*, T. VIII pars 3 (ed. P. Boudreaux) Bruxelles: Lamertin 1912, p. 95, 8–19 (some further information to the critical apparatus can be gleaned from the description of the codex in T. VIII pars 4 (ed. † P. Boudreaux – Fr. Cumont) Bruxelles: Lamertin 1921, p. 38)

Περὶ τοῦ Πτολεμαίου ἐν ποίῳ καιρῷ ἦν

Οὗτος ὁ Πτολεμαῖος κατὰ τοὺς Ἀδριανοῦ μὲν ἤνθησε χρόνους, διήρκεσε δὲ καὶ μέχρι Μάρκου τοῦ Ἀντωνίνου, ἐν ᾧ χρόνῳ καὶ Γαληνὸς ἰατρικῇ διεφαίνετο καὶ Ἡρωδιανὸς ὁ γραμματικὸς καὶ Ἑρμογένης ὁ περὶ τέχνης γράψας ῥητορικῆς· πρῶτος δὲ παρ᾽ Ἕλλησιν ὁ Χῖος Οἰνοπίδης τὰς ἀστρολογικὰς μεθόδους ἐξήνεγκεν εἰς γραφήν, ἐγνωρίζετο δὲ κατὰ τὰ τέλη τοῦ Πελοποννησιακοῦ πολέμου καθ᾽ ὃν καιρὸν καὶ Γοργίας ἦν ὁ ῥήτωρ καὶ Ζήνων ὁ Ἐλεάτης καὶ Ἡρόδοτος, ὡς ἔνιοί φασιν, ὁ ἱστορικὸς ὁ Ἁλικαρνασσεύς· μετὰ δὲ τὸν Οἰνοπίδην Εὔδοξος ἐπὶ ἀστρολογίᾳ δόξαν ἤνεγκεν οὐ μικράν, συνακμάσας Πλάτωνι τῷ φιλοσόφῳ καὶ Κτησίᾳ τῷ Κνιδίῳ ἰατρικήν τε ἀσκοῦντι καὶ ἱστορίαν ἀναγράφοντι.

8 Title in red ink, in a different hand, πτολομαίου (sic) | 9 πτωλεμαίος (sic) | ανδριανοὺ (sic) | 17 εὐδοξως | ἀστρολογίας | 18 κτισεία | 19 ἀνὰγράφοντει (sic)

A sentence from this testimony was first included in the 2nd edition of the *Vorsokratiker*. The text is quoted by Diels as *Vita Ptolemaei Neapolitana* (with minor changes of orthography) from a footnote in Erwin Rohde, "Γέγονε in den Biographica des Suidas: Beiträge zu einer Geschichte der litterarhistorischen Forschung der Griechen" (in his *Kleine Schriften*, Tübingen and Leipzig: J. C. B. Mohr [Paul Siebeck] 1901, vol. I, 123 n. 4),

who in turn takes it from a codex in Naples (Neapol. Codex II C, 33 fol. 561b). The sentence Rohde prints about Oenopides reads: ἐγνωρίζετο δὲ κατὰ τέλος τοῦ πελοποννησιακοῦ πολέμου, καθ᾽ ὃν καιρὸν καὶ γοργίας ὁ ῥήτωρ ἦν καὶ ζήνων ὁ ἐλαιάτης καὶ ἡρώδωτος ὡς ἔνιοί φασιν ὁ ἱστορικὸς ἁλικαρνασεύς.

About Ptolemy, at which time he lived.

This Ptolemy [*viz*. the astronomer] was in his prime in the times of Hadrian, but he lived into the reign of Marcus Antoninus, when in medical art Galen was famous, and the grammarian Herodian, and Hermogenes, who wrote about rhetoric. First among the Greeks Oenopides of Chius put forward the astronomical methods in writing. He became known around the end of the Peloponnesian war, at which time Gorgias, the rhetor lived, and Zeno of Elea, and Herodotus, as some say, the historian from Halicarnassus. After Oenopides, Eudoxus gained considerable fame in astronomy, his *floruit* was at the same time as that of Plato, the philosopher, and that of Ktesias of Cnidus, who practised medicine and wrote history.

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2 [Plato], *Amatores*, 132A–B (ed. Burnet)

132A Εἰς Διονυσίου τοῦ γραμματιστοῦ εἰσῆλθον, καὶ εἶδον
αὐτόθι τῶν τε νέων τοὺς ἐπιεικεστάτους δοκοῦντας εἶναι τὴν
ἰδέαν καὶ πατέρων εὐδοκίμων, καὶ τούτων ἐραστάς. ἐτυγ-
χανέτην οὖν δύο τῶν μειρακίων ἐρίζοντε, περὶ ὅτου δέ, οὐ
5 σφόδρα κατήκουον. ἐφαινέσθην μέντοι ἢ περὶ Ἀναξαγόρου
132B ἢ περὶ Οἰνοπίδου ἐρίζειν· κύκλους γοῦν γράφειν ἐφαινέσθην
καὶ ἐγκλίσεις τινὰς ἐμιμοῦντο τοῖν χεροῖν ἐπικλίνοντε
καὶ μάλ᾽ ἐσπουδακότε. κἀγώ – καθήμην γὰρ παρὰ τὸν ἐραστὴν
τοῦ ἑτέρου αὐτοῖν – κινήσας οὖν αὐτὸν τῷ ἀγκῶνι ἠρόμην
5 ὅτι ποτὲ οὕτως ἐσπουδακότε τὼ μειρακίω εἴτην, καὶ εἶπον·
Ἦ που μέγα τι καὶ καλόν ἐστι περὶ ὃ τοσαύτην σπουδὴν
πεποιημένω ἐστόν;
Ὁ δ᾽ εἶπε, Ποῖον, ἔφη, μέγα καὶ καλόν; ἀδολεσχοῦσι
μὲν οὖν οὗτοί γε περὶ τῶν μετεώρων καὶ φλυαροῦσι
10 φιλοσοφοῦντες.

B 1 γράφειν B γράφοντες T, W | ἐφαινέσθην B ἐφαίνεσθον from ἐφαίνοντο T | 6 μέγα τι B τι μέγα T | ὃ T ὅτου B | 9 γε T om. B

D.–K. contains the sentence in 132A5–B3.

I went into the school of Dionysius, and saw there some boys of most appealing looks, sons of respectable fathers, and their lovers. There happened to be two

youngsters disputing about something, but I did not hear exactly what they were arguing about. Apparently, they were in discussion either about Anaxagoras or about Oenopides: they seemed to be drawing circles, and were imitating inclinations by inclining their hands, giving very much attention to the exercise. I, setting myself by the lover of one of them, nudged him with my elbow, and asked what these youngsters were giving such attention to, saying "Is it some great and nice thing that these boys are giving such attention to?" "What great and nice thing?" – retorted he. "They are just wasting time about celestial stuff, and talk stupidities as they philosophize."

Diels suggests in the apparatus (first in the 2nd edition of the *Vorsokratiker*) that the word 'inclinations' (ἐγκλίσεις) refers to the slanting of the ecliptic.

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3 Diogenes Laertius IX 41 (ed. Marcovich)

Γέγονε δὲ [*sc.* Democritus] τοῖς χρόνοις, ὡς αὐτός φησιν ἐν τῷ Μικρῷ διακόσμῳ, νέος κατὰ πρεσβύτην Ἀναξαγόραν, ἔτεσιν αὐτοῦ νεώτερος τετταράκοντα. συντετάχθαι δέ φησι τὸν Μικρὸν διάκοσμον ἔτεσιν ὕστερον τῆς Ἰλίου ἁλώσεως τριάκοντα καὶ ἑπτακοσίοις. γεγόνοι δ᾽ ἄν, ὡς μὲν Ἀπολλόδωρος ἐν Χρονικοῖς, κατὰ τὴν ὀγδοηκοστὴν Ὀλυμπιάδα· ὡς δὲ Θράσυλλος ἐν τῷ ἐπιγραφομένῳ Τὰ πρὸ τῆς ἀναγνώσεως τῶν Δημοκρίτου βιβλίων, κατὰ τὸ τρίτον ἔτος τῆς ἑβδόμης καὶ ἑβδομηκοστῆς Ὀλυμπιάδος, ἐνιαυτῷ, φησί, πρεσβύτερος ὢν Σωκράτους. εἴη ἂν οὖν κατ᾽ Ἀρχέλαον τὸν Ἀναξαγόρου μαθητὴν καὶ τοὺς περὶ Οἰνοπίδην· καὶ γὰρ τούτου μέμνηται.

5 ὡς ὁ μὲν P | ἐν χρονικοῖς om. F | 6 θράσυλλος P, F θρασύλος B, D | 6–7 ἐν τῷ — βιβλίων om. F | 10 τούτου B, P, F, D τούτων Reiske, Marcovich

D.–K. gives only the last two clauses of IX 41.

Democritus, as he himself says in the *Lesser World-order*, was young when Anaxagoras was old, being forty years the younger. He says that he composed the *Lesser World-order* 730 years after the capture of Troy. According to Apollodorus in the *Chronics* he was born in the 80th olympiad. According to Thrasyllus in his *Introduction to the writings of Democritus*, in the third year of the 77th olympiad, and was one year older than Socrates. Thus, he was a contemporary of Archelaus, the student of Anaxagoras, and of the people around Oenopides – he [*viz.* Democritus] mentions him also.

Here 'the people around Oenopides' can be meant to refer to people following Oenopides on some issue of astronomy, cosmology, or mathematics etc. Cf., however, the use of the same

term in Diogenes Laertius IX 37, where I translate it with the phrase 'the disciples associated with Oenopides'.

*

Diogenes Laertius IX 37 (ed. Marcovich)

> Εἴπερ οἱ Ἀντερασταὶ Πλάτωνός εἰσι, φησὶ Θράσυλλος, οὗτος [*sc.* Democritus] ἂν εἴη ὁ παραγενόμενος ἀνώνυμος, τῶν περὶ Οἰνοπίδην καὶ Ἀναξαγόραν ἕτερος, ἐν τῇ πρὸς Σωκράτην ὁμιλίᾳ διαλεγόμενος περὶ φιλοσοφίας, ᾧ, φησίν, ὡς πεντάθλῳ ἔοικεν ὁ φιλόσοφος.
>
> 1 θράσυλλος B^2, P, F θρασύλος B^1, D | 2 τῶν: τὸν B | 3 <ἐριζόντων νεανιῶν> before ἕτερος (from *Amatores* 132A3–B1, see Testimony 2 above) Marcovich | σωκράτην B, P σωκράτη F, D | 4 ᾧ B, P, F ὧν D <ἐν> ᾧ Reiske | φησίν B, P, F, D ἔφη [*sc.* Socrates] Marcovich | ὁ φιλόσοφος ὡς πεντάθλω ἔοικεν F
>
> This testimony is not present in the Oenopides section of D.–K., but it is included in Democritus A 1.

If the *Rival lovers* is Plato's work – says Thrasyllus – he [*viz*. Democritus] is the anonymous character who happens to be there, who is different from the disciples associated with Oenopides and Anaxagoras, talking in the company of Socrates about philosophy, to whom, as he says, the philosopher appears to be similar to a pentathlete.

> Here 'the disciples associated with Oenopides and Anaxagoras' i.e. 'the people around Oenopides and Anaxagoras' probably refers either to the two boys at the beginning of the *Rival lovers*, or to some older people presumed to be present at the scene, or together, to these two boys and some older people. (Cf. also Marcovich's suggestion that the phrase should be emended into τῶν περὶ Οἰνοπίδην καὶ Ἀναξαγόραν <ἐριζόντων νεανιῶν> ἕτερος 'different from the youngsters who were discussing about Oenopides and Anaxagoras'.)

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4 *Gnomologium Vaticanum* from Codex Vaticanus gr. 743 (ed. Sternbach) no. 420

> **Οἰνοπίδου**· Οἰνοπίδης ὁρῶν μειράκιον πολλὰ βιβλία κτώμενον ἔφη· "μὴ τῇ κιβωτῷ, ἀλλὰ τῷ στήθει."
>
> 1 Οἰνοπίδου *in marg.* Vat. gr. 743 Σινοπίδου *in marg.* Vat. gr. 633 | Οἰνοπίδης: Σινοπίδης Vat. gr. 633 | μειράκιον: μειράκιον ἀπαίδευτον Diels (apparently through a lapse, from Damasc. no. 150, which is an apophthegm of Philistion's [or of Moschion's, as Meineke suggests, see vol. IV, p. XLI]) | πολλὰ βιβλία: βιβλία πολλὰ Vat. gr. 633 | βιβλία: βυβλία Ottob. 418 | κτώμενον: κτ plus an illegible character Vat. gr. 633 | 2 τῇ κιβωτῷ: τῷ κιβωτίῳ Damasc. no. 151 τῷ κιβωτῷ (sic) Diels μὴν κιβωτίον Ottob. 418 | τῷ στήθει: τὸ στήθη Ottob. 418 | κτώμενον ἔφη — τῷ στήθει: κτώμενον — τῷ στήθει ἔφη Mon. no. 222

This apophthegm features in quite a few collections of apophthegms. Among other manuscripts, Sternbach indicates the variant readings of the *Florilegium Monacense* in Codex Monacensis 8 (no. 222, vol. IV, p. 285 of the edition of Stobaeus' *Anthologium,* ed. Meineke, referred to here in the apparatus as Mon.) and of the collection of apophthegms in the Florentine codex (Codex Laurentianus 22, 8) containing Johannes Damascenus' *Parallela sacra* (II 13. 151, vol. IV, p. 227 of the same edition, referred to here in the apparatus as Damasc.).

Diels' deviations from the text of Sternbach suggest that he copied this testimony from Meineke's edition of the collection of apophthegms in the Florentine codex.

Oenopides, on seeing a youngster taking hold of many books, said "Not for your book-case, but for your heart!"

See also *Florilegium Monacense* no. 223 (ed. Meineke)

Ὁ αὐτὸς εἶπε "τὰ βιβλία τῶν μὲν μεμαθηκότων ὑπομνήματά εἰσι, τῶν δὲ ἀμαθῶν μνήματα."

1 εἶπε Mon. ἔλεγε Damasc. | μὲν μεμαθηκότων Mon. μεμαθηκότων μὲν Damasc. | ὑπομνήματά εἰσι Mon. ὑπομνήματα εἶναι Damasc.

D.–K. does not contain this apophthegm – most probably it is omitted, because the *Gnomologium Vaticanum* attributes it to Diocles of Carystus, as no. 264: Διοκλῆς ὁ ἰατρὸς λέγοντος αὐτῷ τινος βιβλίον ἠγορακέναι ἰατρικὸν καὶ μὴ προσδεῖσθαι διδασκαλίας εἶπε· "τὰ βιβλία τῶν μὲν μεμαθηκότων ὑπομνήματά ἐστι, τῶν δὲ ἀμαθῶν μνήματα."

This apophthegm follows immediately upon the previous Oenopides apophthegm, both in the *Florilegium Monacense*, as no. 223, and in the collection of apophthegms in the Florentine manuscript, as II 13. 152.

He also said: "Books are reminders for those who know, whereas they are just memorials for the ignorant."

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5 Sextus Empiricus, *Pyrrhoniae hypotyposes* III 30 (ed. Mutschmann)

[…] συντόμως δὲ καὶ περὶ τῶν ὑλικῶν καλουμένων ἀρχῶν λεκτέον. ὅτι τοίνυν αὗταί εἰσιν ἀκατάληπτοι, ῥᾴδιον συνιδεῖν ἐκ τῆς περὶ αὐτῶν γεγενημένης διαφωνίας παρὰ τοῖς δογματικοῖς. Φερεκύδης μὲν γὰρ ὁ Σύριος γῆν εἶπε τὴν πάντων εἶναι ἀρχήν, […], Ξενοφάνης δὲ ὁ Κολοφώνιος γῆν καὶ ὕδωρ, Οἰνοπίδης δὲ ὁ Χῖος πῦρ καὶ ἀέρα, […].

3 γὰρ om. E, A, B

D.–K. includes only the last clause, which speaks about Oenopides' principles.

The same clause about Oenopides occurs also at Sextus Empiricus, *Adversus mathematicos* IX 361 and [Galen], *Philosopha historia* 18.

We need to speak concisely also about the so-called material principles. That they cannot be grasped can be easily seen from the discord which occurred about them among the dogmatic thinkers. For Pherecydes of Syrus asserted that earth is the principle of everything, […] Xenophanes of Colophon [asserted] that earth and water [are the principles of everything], Oenopides of Chius [asserted] that fire and air [are the principles of everything], […].

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6 Aëtius I 7. 17 (*Doxographi graeci,* p. 302b15–16)

15 Διογένης καὶ Κλεάνθης καὶ
Οἰνοπίδης τὴν τοῦ κόσμου ψυχήν [*sc.* τὸν θεόν].

This text is from the Stobaeus version. The [Plutarch] version (at 302a5) contains only the last four words of the clause, thus there the doctrine is erroneously ascribed to Democritus, the subject of the preceding testimony.

D.–K. includes this text also in the section on Diogenes of Apollonia, as A 8.

According to Diogenes and Cleanthes and Oenopides the soul of the world [is the god].

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7 Theo Smyrnaeus, *De utilitate mathematicae ad Platonem legendum* (ed. Hiller) p. 198, 14–16 = Eudemus fr. 145 Wehrli

Εὔδημος ἱστορεῖ ἐν ταῖς Ἀστρολογίαις ὅτι Οἰνο-
15 πίδης εὗρε πρῶτος τὴν τοῦ ζῳδιακοῦ † διάζωσιν † καὶ τὴν
τοῦ μεγάλου ἐνιαυτοῦ περίστασιν.

15 διάζωσιν: λόξωσιν Diels

Cf. [Hero], *Definitiones* 138. 11, 1–4: Τίς τί εὗρεν ἐν μαθηματικοῖς; Εὔδημος ἱστορεῖ ἐν ταῖς Ἀστρολογίαις ὅτι Οἰνοπίδης εὗρε πρῶτος τὴν τοῦ ζωδιακοῦ διάζωσιν καὶ τὴν τοῦ μεγάλου ἐνιαυτοῦ περίστασιν. The chapter heading Τίς τί εὗρεν ἐν μαθηματικῇ; is found also in Theo's manuscripts. Hiller, however, excludes all chapter headings of the manuscripts as later interpolations, see p. VI of his edition of Theo.

Eudemus reports in the Astronomies that Oenopides found first the encircling [or, with Diels' emendation, the inclination] of the Zodiac, and the circuit of the Great Year.

*

Aëtius II 12. 2 (*Doxographi graeci,* p. 340b25 – p. 341b2 [in the Stobaeus version] or p. 340a21 – p. 341a2 [in the [Plutarch] version])

340b25 Πυθαγόρας πρῶτος ἐπινενοηκέναι
λέγεται τὴν λόξωσιν τοῦ ζῳδιακοῦ
341b1 κύκλου, ἥντινα Οἰνοπίδης ὁ Χῖος
ἐπίνοιαν ὡς ἰδίαν σφετερίζεται.

341b2 ἐπίνοιαν ὡς ἰδίαν Stobaeus ὡς ἰδίαν ἐπίνοιαν [Plutarch], at 341a2

D.–K. prints [Plutarch]'s word order, which is also followed in [Galen], *Philosopha historia* 55.

Pythagoras is said to have been the first to observe the inclination of the zodiacal circle, which observation then Oenopides appropriated as his own.

*

Diodorus Siculus, *Bibliotheca historica* I 98. 2–3 (ed. Bertrac)

2 Πυθαγόραν τε τὰ κατὰ τὸν ἱερὸν λόγον καὶ τὰ κατὰ γεωμετρίαν θεωρήματα καὶ τὰ περὶ τοὺς ἀριθμούς, ἔτι δὲ τὴν εἰς πᾶν ζῷον τῆς ψυχῆς μεταβολὴν μαθεῖν παρ᾽ Αἰγυπτίων. **3** ὑπολαμβάνουσι δὲ καὶ Δημόκριτον παρ᾽ αὐτοῖς ἔτη διατρῖψαι πέντε καὶ πολλὰ διδαχθῆναι τῶν
5 κατ᾽ ἀστρολογίαν. τόν τε Οἰνοπίδην ὁμοίως συνδιατρίψαντα τοῖς ἱερεῦσι καὶ ἀστρολόγοις μαθεῖν ἄλλα τε καὶ μάλιστα τὸν ἡλιακὸν κύκλον ὡς λοξὴν μὲν ἔχει τὴν πορείαν, ἐναντίαν δὲ τοῖς ἄλλοις ἄστροις τὴν φορὰν ποιεῖται.

1 first τὰ om. D^a | second τὰ om. V | 3 παρὰ Αἰγυπτίων Diels | 4 διατρῖψαι C, V, Eus. διατρέψαι D^a | 5 κατ᾽ V, Eus κατὰ C κατὰ τὴν D^a, Diels | 6 ἱερὸν added after τὸν by D^a | 8 τὴν φορὰν ποιεῖται (and the eight consecutive words of the next sentence) om. V.

D.–K. omits the phrase referring to the transmigration of souls from the report on Pythagoras.

Cf. I 96. 2 mentioning Oenopides on a similar list of people who visited Egypt. These passages of Diodorus are quoted by Eusebius, *Praeparatio evangelica* X 8. 14 and 3, respectively.

Pythagoras, too, he learnt from the Egyptians what is contained in the Sacred Account, and the propositions in geometry, and the ones about numbers, and further the alteration of soul into all living beings. It is supposed that Democritus also spent five years among them and learnt much of the astronomy. Oenopides, too, spent time together with the priests and astronomers, and learnt among other things foremost the circle of the Sun, that it proceeds obliquely, performing a contrary motion to the other stars.

Macrobius, *Saturnalia* I 17. 30–31 (ed. Willis)

Nunc ex aliis quoque huius dei nominibus eundem esse Apollinem et solem probemus.

(31) Λοξίας cognominatur, ut ait Oenopides, ὅτι ἐκπορεύεται τὸν λοξὸν κύκλον ἀπὸ δυσμῶν ἐπ᾽ ἀνατολὰς κινούμενος, id est quod obliquum circulum ab occasu ad orientem pergit.

1 diei **A′** | 3 Λοξίας *vulg.* luxios **Z** loxias *cett.* | 3 cognominatus **B** | cenopides **N** oenipides **P** noepides **A** | Greek text missing from **T**, **M**, **A**, only the letters OTI ΕΚΠΟΡΕΥΕΤ present in **R** | 3 ΕΚΤΙΟΡΕΥΕΤΑΙ **P** ΕΚΠΟΡΕΙΕΤΑΙ **B′** | ΛΟΖΟΝ **B**, **Z**, **V**, **F** | 4 ΚΙΚΑΟΝ **N**, **P** ΚΥΚΑΟΝ **D**, **F** ΚΙΚΛΟΝ **B**, **v**, **Z** ΚΙΚΛΝ **V′** | ΔΙCΜΩΝ **D**, **P′** | ΑΝΤΟΛΑC **B′**, **V**, **Z**, **F** | ΚΙΝΟΙΜΕΝΟC **N** ΚΥΝΟΥΜΕΝΟC **B**, **V**, **Z** | oblicum **M**

D.–K. contains only the text of section 31.

Cf. Cornutus, *Theologiae Graecae compendium* 32 (ed. Lang) p. 67, 14–16: λοξῶν δὲ καὶ περισκελῶν ὄντων τῶν χρησμῶν, οὓς δίδωσι, λοξίας ὠνόμασται[· ἢ ἀπὸ τῆς λοξότητος τῆς πορείας, ἣν ποιεῖται διὰ τοῦ ζῳδιακοῦ κύκλου].

Cf. also chapter 5 of the first anonymous introduction from scholia to Aratus' *Phaenomena*, at p. 96, 10–13 Maass: ὁ γοῦν ζῳδιακὸς καὶ λοξίας ὑπό τινων καλεῖται, ἐπειδὴ ἥλιος τὰς ὁδοὺς ἐν αὐτῷ πορεύεται λοξάς. ἐν δὲ τῷ ἡλίῳ ὁ Ἀπόλλων, ὃς καλεῖται Λοξίας ὑπὸ τῶν ποιητῶν, εἶναι πιστεύεται.

Now we should show also from the other names of this god that Apollo and the Sun are the same. He has the cognomen Loxias, as Oenopides says, "because in moving from West to East it completes the oblique [*loxos*] circle", that is, because it completes the oblique circle from West to East.

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8 Censorinus, *De die natali* 19. 2 (ed. Sallmann)

Oenopides [*sc.* annum naturalem dies habere prodidit] CCCLXV et dierum duum et viginti partem undesexagensimam.

1 venopides **C**, **P**, **V**, **R, O**, **Q**, **L**, ***H***, ***Mod.*** lucno- **I** vano- **U** oeno- **B**, **W** | 2 duorum **Q**, **I**, **L**, **U**, ***H***, *edd.* | unus LX^{mam} **O** sexagesimam ***H*** undesexagesimam *Diels*

Oenopides specified the natural year as having 365 and $\frac{22}{59}$ days.

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9 Claudius Aelianus, *Varia historia* X 7 (ed. Dilts)

Οἰνοπίδης ὁ Χῖος ἀστρολόγος ἀνέθηκεν ἐν Ὀλυμπίοις τὸ χαλκοῦν γραμματεῖον, ἐγγράψας ἐν αὐτῷ τὴν ἀστρολογίαν τῶν ἑνὸς δεόντων ἑξήκοντα ἐτῶν, φήσας τὸν μέγαν ἐνιαυτὸν εἶναι τοῦτον. Ὅτι Μέτων ὁ Λευκονοιεὺς ἀστρολόγος ἀνέστησε στήλας, καὶ τὰς τοῦ ἡλίου τροπὰς κατεγράψατο, καὶ τὸν μέγαν ἐνιαυτὸν ὡς ἔλεγεν εὗρε, καὶ ἔφατο αὐτὸν [ὡς ἔλεγεν] ἑνὸς δέοντα εἴκοσιν ἐτῶν.

3–6 Ὅτι — ἐτῶν om. V | 4 Λευκονοιεὺς Salmasius λάκων x Λευκονοεὺς Hercher (in Teubner ed.), Diels | 6 [ὡς ἔλεγεν] del. Faber

Oenopides of Chius set up the bronze tablet at the Olympic Games, having inscribed in it the astronomy of the fifty-nine years, saying that this is the great year. Then Meton from the Deme of Leuconoe, the astronomer, erected columns, described the solstices, and according to himself he found the great year, and asserted that it contains nineteen years.

*

Aëtius II 32. 2 (*Doxographi graeci*, p. 363b25 – p. 364b4)

363b25 τὸν δέ γε μέγαν ἐνιαυτὸν οἱ μὲν
ἐν τῇ ὀκταετηρίδι τίθενται, οἱ δὲ
ἐν τῇ ἐννεακαιδεκαετηρίδι, οἱ δ᾽ ἐν τοῖς
τετραπλασίοις ἔτεσιν, οἱ δὲ ἐν τοῖς
ἑξήκοντα <ἑνὸς δέουσιν>, ἐν οἷς Οἰνοπίδης
364b1 καὶ Πυθαγόρας. οἱ δ᾽ ἐν τῇ λεγομένῃ
κεφαλῇ τοῦ χρόνου· αὕτη δ᾽ ἐστὶ
τῶν ἑπτὰ πλανητῶν ἐπὶ ταὐτὰ σημεῖα
τῆς ἐξ ἀρχῆς φορᾶς ἐπάνοδος.

363b25 the word γε is missing in D.–K. | 29 <ἑνὸς δέουσιν> Diels (already suggested in the apparatus of the *Doxographi*, from the [Plutarch] version and from Aelianus) <ἑνὸς δέοντος> Heeren | 364b2 Κρόνου codd. χρόνου Bodnár κόσμου Kroll | 3 ταὐτὰ σημεῖα Kroll (followed by Diels, from the 2nd edition of the *Vorsokratiker*, in the 1st edition this sentence was not included), cf. Cicero, *De natura deorum* II 20. 51, Alcinous, *Epitome* 14. 6 ταύτας ἡμία F, P ταὐτῇ ἡμέρᾳ Heeren (followed by Diels in the *Doxographi*) | 4 ἀρχῆς Diels (from the 2nd edition of the *Vorsokratiker*, in the 1st edition this sentence was not included – Kranz from the 5th edition on prints a question mark in brackets after the word to express his reservations) ἄρκτου F, P (followed by Diels in the *Doxographi*)

Diels printed only the first sentence (363b25–364b1) in the 1st edition of the *Vorsokratiker*, the second sentence (364b1–4), which does not contain any information about Oenopides, was added in the 2nd edition.

Although I retain the page and line numbers of the *Doxographi,* in this instance I include quite a few changes: this text is based on the Stobaeus version, with the phrase ἑνὸς δέουσιν in 363b29 from the [Plutarch] version, and three conjectures in the last three lines. The apparatus combines the reports of the *Doxographi* and of the apparatus of the *Vorsokratiker*, adding a further conjecture of mine.

Some have put the great year in the eight-year cycle, some in the nineteen-year cycle, some in the cycle which is four times as long as this, some – Oenopides and Pythagoras among them – in the fifty-nine-year cycle. Some, furthermore, in the consummation of time – this is the return of the seven planets to the same signs of their initial motion.

Kroll suggested the emendation κόσμου in line 2, and referred to Hephaestion, *Apotelesmatica,* p. 3, 22ff. The phrase κεφαλὴ τοῦ κόσμου at p. 3, 29 and at p. 135, 16f., however, refers to the zodiacal sign Aries. This can have no application in this context: the zodiacal sign Aries is not identical to 'the return of the seven planets to the same signs of their initial motion', even if all the planets started out from, and return together at one point to this zodiacal sign. My emendation rests on the parallel passage in Plato, *Timaeus*, 39C5–D7, especially lines D3–7, where Timaeus submits that "the complete number of time fulfils the complete year when the respective speeds of all the eight revolutions reach their consummation (σχῇ κεφαλήν), as measured by the circle of the Same, which proceeds in a uniform fashion".

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10 Aristoteles, *Meteorologica* I 8, 345a13–18 (ed. Louis)

τῶν μὲν οὖν καλουμένων
Πυθαγορείων φασί τινες ὁδὸν εἶναι ταύτην [*sc.* τὸ γάλα] οἱ μὲν τῶν ἐκπε-
15 σόντων τινὸς ἀστέρων, κατὰ τὴν λεγομένην ἐπὶ Φαέθοντος
φθοράν, οἱ δὲ τὸν ἥλιον τοῦτον τὸν κύκλον φέρεσθαί ποτέ
φασιν· οἷον οὖν διακεκαῦσθαι τὸν τόπον τοῦτον ἤ τι τοιοῦτον
ἄλλο πεπονθέναι πάθος ὑπὸ τῆς φορᾶς αὐτοῦ.

14 μὲν: μὲν οὖν E | 15 ἄστρων E, W^e | 16 φοράν E^1, J, F, N | κύκλῳ A^e, M^e | ποτέ: ποτὲ μέν L^e | 17 τοῦτον τὸν τόπον J, F, A^e, M^e τοῦτον τὸν τρόπον H, N, L^e | 18 φορᾶς: φθορᾶς Diels | αὐτῶν J, E^1, W^e

Diels indicated this passage (first in the 2nd edition of the *Vorsokratiker*) also in the section on early Pythagoreanism, as B 37b. Moreover, after the passage from Achilles Tatius' *Isagoga excerpta* he included a reference, as a comparison, to Aëtius III 1. 2 (*Doxographi graeci,* 364a22–365a2 [in the [Plutarch] version] and 364b15–365b3 [in the Stobaeus version]). That passage of Aëtius was also included in the early Pythagorean section (from the 2nd edition of the *Vorsokratiker*) as B 37c: Τῶν Πυθαγορείων οἱ μὲν ἔφασαν ἀστέρος εἶναι διάκαυσιν ἐκπεσόντος μὲν ἀπὸ τῆς ἰδίας ἕδρας, δι᾽ οὗ δὲ περιέδραμε χωρίου κυκλοτερῶς αὐτὸ καταφλέξαντος [περιφλέξαντος in the Stobaeus version] ἐπὶ τοῦ κατὰ Φαέθοντα ἐμπρησμοῦ· οἱ δὲ τὸν ἡλιακὸν ταύτῃ φασὶ κατ᾽ ἀρχὰς γεγονέναι δρόμον.

Some of the so-called Pythagoreans say that this [the Milky Way] is the path of one of the stars which fell out at the demise of Phaethon, some others that at some time the Sun moved along this circle. I.e. this place burnt thoroughly out, or was exposed to some other affection because of its motion.

*

Achilles Tatius, *Isagoga excerpta* 24 (ed. Maass) p. 55, 18–21

ἕτεροι δέ φασιν, ὧν ἐστι καὶ Οἰνοπίδης ὁ Χῖος, ὅτι πρότερον διὰ τούτου [*sc.* τοῦ γαλαξίου] ἐφέρετο ὁ ἥλιος, διὰ δὲ τὰ Θυέστεια δεῖπνα ἀπεστράφη καὶ τὴν ἐναντίαν τούτῳ πεποίηται περιφοράν, ἣν νῦν περιγράφει ὁ ζῳδιακός.

18 ἐστι Diels ἐστιν Maass | οἰνωπίδης V, M (=*codd.*) | 19 κατὰ τ. *codd.* | 20 θυεστία *codd.*

Cf. chapter 6 of the first anonymous introduction from scholia to Aratus' *Phaenomena* at p. 98, 5–7 Maass: ὡς δὲ οἱ μῦθοι παίζουσιν, ἀπεστράφη ταῦτα τὰ ἄστρα <διὰ> τὰ Θυέστεια δεῖπνα καὶ <ἐν>έμεινε τῇ φορᾷ πλανώμενα, where the Thyestean meal is mentioned as the cause of the errant motion of all the planets. Cf. also Euripides fr. 861 Nauck, *Electra* 726ff., *Orestes* 1001ff. (quoted also by Philoponus in his commentary to the passage from the *Meteorology*, p. 101, 24 – p. 102, 23) and Plato, *Statesman*, 268E: in these texts the fundamental change of celestial revolutions occasioned by the Thyestean meal concerns not just the orbit of the Sun, or of the planets, but the overall East-West diurnal revolution of every celestial body.

Others, among them Oenopides, say that earlier the Sun moved through this [the Milky Way], but because of the feast of Thyestes he turned away and made the opposite revolution to this, which is now circumscribed by the Zodiac.

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11 Diodorus Siculus, *Bibliotheca historica* I 41. 1–2 (ed. Bertrac)

1 Οἰνοπίδης δὲ ὁ Χῖός φησι κατὰ μὲν τὴν θερινὴν ὥραν τὰ ὕδατα κατὰ τὴν γῆν εἶναι ψυχρά, τοῦ δὲ χειμῶνος τοὐναντίον θερμά, καὶ τοῦτο εὔδηλον ἐπὶ τῶν βαθέων φρεάτων γίνεσθαι· κατὰ μὲν γὰρ τὴν ἀκμὴν τοῦ χειμῶνος ἥκιστα τὸ ὕδωρ ἐν αὐτοῖς ὑπάρχειν ψυχρόν, κατὰ δὲ τὰ μέγιστα καύματα ψυχρότατον ἐξ αὐτῶν ὑγρὸν ἀναφέρεσθαι. **2** διὸ καὶ τὸν Νεῖλον εὐλόγως κατὰ μὲν τὸν χειμῶνα μικρὸν εἶναι καὶ συστέλλεσθαι, διὰ τὸ τὴν μὲν κατὰ γῆν θερμασίαν τὸ πολὺ τῆς ὑγρᾶς οὐσίας ἀναλίσκειν, ὄμβρους δὲ κατὰ τὴν Αἴγυπτον μὴ γίνεσθαι· κατὰ δὲ τὸ θέρος μηκέτι τῆς κατὰ γῆν ἀπαναλώσεως γινομένης ἐν τοῖς κατὰ βάθος τόποις πληροῦσθαι τὴν κατὰ φύσιν αὐτοῦ ῥύσιν ἀνεμποδίστως.

2 τοὐναντίον om. C, V, L | τοῦτο D^a, C, V τοῦτον L | εὔδηλον C, V, L εὐφάνερον D^a δῆλον Theophylactus Simocatta | 5 ὑγρὸν C, V, L ὑγρῶν D^a | 6 γὰρ added after μὲν L | 7–8 ὑγρᾶς οὐσίας D^a, C, L ὑγρᾷ V

Only this passage is printed in fr. 11 in D.–K., with a reference to the overview of the sources in parallel columns (sketching the structure of the doxographical testimonies on the flood of the Nile in the *De inundacione Nili*, in Diodorus Siculus, in Seneca, in the Anonymus Florentinus, in the *Scholia to the* Argonautica *of Apollonius Rhodius*, and in Aëtius) on p. 228 of the *Doxographi.* Moreover, Diels and Kranz indicated in each edition which passage of the *De inundacione Nili* they took as an excerpt of the Aristotelian testimony which had been the ultimate source of Diodorus (see below).

Kranz from the 5th edition on, besides referring to p. 228 of the *Doxographi*, singled out the passage in the *Scholia in Apollonii Rhodii Argonautica* for mention as one relevant for comparison (see below).

This testimony – with slight verbal variations – is also present in Theophylactus Simocatta, *Historiae* VII 17. 35–38.

Oenopides of Chius says that the waters in the earth are cold in the summer-time, and conversely, they are warm in winter, and this is clear in the case of deep wells. For the water in them is the least cold in the peak of winter, while in the greatest heat liquid comes up from them the coldest. And for this reason it is only to be expected that the Nile is small and contracted in the winter – due to the fact that the warmth of the earth dissolves the great part of the liquid stuff, and also because in Egypt no downpours occur –, whereas in the summer there is no more dissolution [of the liquid stuff] in the earth, and so in the deep places its natural flow swells without obstacle.

*

Seneca, *Naturales quaestiones* IVA 2. 26 (ed. Hine)

Oenopides Chius ait hieme calorem sub terris contineri: ideo et specus calidos esse et tepidiorem puteis aquam, itaque uenas interno calore siccari. sed in aliis terris augeri imbribus flumina, Nilum quia nullo imbre adiuuetur tenuari, deinde crescere per aestatem, quo tempore frigent interiora terrarum et redit rigor fontibus.

1 oenopides **P**, **υ** enopides **Z** onopides **R** | calorem sub terris **π** sub terris calorem **Z** | 2 calidos **Z**, $\mathbf{L^2}$, **υ** cauosos **ϱ** | aquam **Z**, $\mathbf{L^2}$ quam ϱ, $\mathbf{W^1}$ quas **U** | 3 augeri **Z**, $\mathbf{L^2}$, **υ** augent **ϱ**

This testimony is not present in D.–K., it is indicated only obliquely, through a reference to p. 228 of the *Doxographi*.

Oenopides of Chius says that in the winter heat is retained under the earth, as a consequence caves are warm and the water in wells is rather tepid, and so the

streams of water dry up due to the internal heat. But, he says, in other lands rains swell the rivers, whereas the Nile is diminished, as it is not assisted by downpours. Afterwards it surges in the summer, in which season the internal part of the earth is cold and the chill returns to the springs.

*

Anonymus Florentinus, *On the flood of the Nile*, Codex Laurentianus 56, 1 (= F, of the 13th–14th c.) fol. 12 v–13 r, 647 F 1 Jacoby, section 6

Οἰνοπίδης δὲ ὁ Χῖος λέγει τοῦ μὲν χειμῶνος τῶν ποταμῶν ἀναξηραίνεσθαι τὰς πηγάς, ἐν δὲ τῷ θέρει θερμαινομένας ῥεῖν. τοῦ μὲν οὖν ἀναπληροῦσθαι τὴν γινομένην ξηρασίαν τὸ αἴτιον τῶν οὐρανίων ὑδάτων ἐπιγινομένων τοῖς χειμῶσι συμβαίνει, τὸν δὲ Νεῖλον οὐχ ὑόμενον τότε ἐνδεῆ γινόμενον μὴ συναναπληροῦν, καὶ διὰ τοῦτο τοῦ χειμῶνος ἥσσονα αὐτὸν γίνεσθαι, τοῦ δὲ θέρους πλήρη.

1 μὲν om. F | τοῦ ποταμοῦ C | 4 ἐπιγενομένων F | 4–5 συμβαίνειν * * τότε (indicating a lacuna) C | 5 συναναπληροῦν F συναναφέρειν C συναναβαίνειν Schweighäuser

The Anonymus Florentinus, *On the flood of the Nile* occurs also in Codex Parisinus suppl. gr. 841 (= C, also of the 13th–14th c.), a codex of Athenaeus, at the very end of the excerpts of book II of the *Deipnosophistae*. It has been included in Meineke's edition of Athenaeus, the passage on Oenopides is at p. 131, 25–32 Meineke.

This testimony is not present in D.–K., it is indicated only obliquely, through a reference to p. 228 of the *Doxographi*.

Oenopides of Chius says that in the winter the springs of the rivers dry up, in the summer they [the springs] flow as they warm up. Due to the fact that in the winter waters are added from the sky, the resulting drought is replenished, but as the Nile is not exposed to rains, it is not replenished with them, and it is deficient then. For this reason it is smaller in the winter, and it is full in the summer.

*

Joannes Tzetzes, *Exegesis in Homeri Iliada* A 427 (ed. Lolos) p. 119, 25–29

ὁ Χῖος Οἰνοπίδης δὲ σὺν ἅμα Ἡροδότῳ
πηγάς φασι τὸν ποταμὸν ξηραίνεσθαι χειμῶνι,
τῷ δ᾽ ὀμβρίῳ ὕδατι τότε πληροῦσθαι μόνῳ,
τῷ θέρει θερομένας δὲ μᾶλλον ἀναβλύζειν,
ὁ Νεῖλος δ᾽ οὐ βρεχόμενος ἥττων ἐστὶ χειμῶνι.

27 ὀμβρίῳ sup. lin. C ὀβρίῳ C

This testimony, first published in 1981, is not present in D.–K.

Oenopides of Chius, together with Herodotus, says that the springs dry up the river during winter – it [the river] is swelled only by rain-water then. In the summer as they [the springs] are warmed up they gush forth more. But the Nile is smaller in the winter as it is not soaked by rain.

———————

Cf. the anonymous explanation of the floods of the Nile in the medieval Latin version of [Aristotle]'s *De inundacione Nili* (fr. 248 Rose) at p. 195, 1–2, 4–8 and 10–13 (646 F 1 Jacoby, section 6)

1 Reliquum autem modorum
eos qui non habent raciones verisimiles posterius dicemus.
[…]
hii autem [*sc.* aiunt]
5 calidiores existentes fontes per estatem superfluere, accedente
sole ad ursam: magis enim ferv<ore flu>ere quam
frigore. quorum utrumque mediocri dignum est considera-
tione: […]
10 qui
autem tantam suma<n>t addicionem aque propter fervorem,
irracionabile totaliter, quia non plus facit propter ferv<orem flu>ere
secundum tumorem maiorem eiusdem multitudinis.

1 reliqu<or>um *suggested in the apparatus by Jacoby* | 5 fontes *om.* **g** | superfluere: superfervere *Parisinus B. N. lat 6318* (= **P**) | 6 ferv<ore flu>ere *Rose* fluere **a** fervere *the other manuscripts* | 7 frigere **p** | mediocriter **a** | 10 qui: quod **p** | 11 suma<n>t *Jacoby* assumat **a** sumat *the other manuscripts* | 11 aque **a** aquae **P** aqua *the other manuscripts* | fervorem: fervere **g** | 12 ferv<orem flu>ere *Bodnár* fluere *Veneta* fervere *codd.* | 13 timorem **a**[1], **l**

Readings of the manuscript Parisinus B. N. lat 6318 (= **P**) are reported in D. Bonneau, "Liber Aristotelis De inundatione Nili: Texte – Traduction – Étude", *Études de papyrologie* 9 (1971), 1–33.

Diels in the first three editions of the *Vorsokratiker* submitted that Diodorus Siculus' report on Oenopides goes back – through Agatharchides – to a testimony of Aristotle, which is excerpted in these lines. (The same conviction is evidenced already in the representation of the tradition of the doxography of the flood of the Nile in the parallel colums of the *Doxographi*, on p. 228, see also pp. 226f.)

It remains that we shall say afterwards the ways that do not have probable grounds. […] whereas these [say] that the springs which are warmer in the summer flow over, as the Sun proceeds towards the Bear, for they flow more in heat than in frost. Both of these deserve only passing consideration: […] whereas those who presume that there is such a surplus of water because of the heat, [presume] something totally irrational, because it is not made to flow more on account of the heat with the greater swelling of the very same quantity.

With the emendation *reliqu<or>um* as suggested by Jacoby the translation of lines 1–2 is: 'We shall say afterwards those of the remaining ways that do not have probable grounds.'

An alternative conjecture for the last words of line 12 could be *fervorem* (instead of the *fervere* of the codices), with that the last clause of this account could be translated as 'because it is not made to be more on account of the heat with the greater swelling of the very same quantity'.

Cf. also *De inundacione Nili* (fr. 248 Rose) p. 196, 19–24 (646 F 1 Jacoby, section 9)

Reliquum autem duarum utramque dicere est. est enim
una quidem causa, quia terra superfervens existens hyeme,
eo quod in tali fundo fontes sint, Nili desiccatur aqua.
quod quidem et aliis accidit: puta in Frigia sunt putei,
qui in hyeme quidem sunt sicci, in estate autem replentur;
et in Olinthia Calcidice quidam putei plenissimi sunt estate.

20 est quidem hyeme existens **a** | 21 fundo **g** fondo **l**, **n** fluvio **a** | sint fontes nyli **a** fontes fiant nili **P** fontes sicut nili *the other manuscripts* | desiccantur **g** | 22 et *om.* **a**, **n** | frigia *Rose* f'sia **a** frisia *the other manuscripts* | 23 qui *om.* **g** | 24 in olinthia *Rose* in molinthia *codd.* in melinthia *Veneta* | Calcidice *suggested in the apparatus by Rose* Chalcidices *Gemelli-Marciano* Calcidonie *codd.*

Diels in the supplementary pages included in the 4th edition of the *Vorsokratiker* rejected his earlier suggestion, and indicated instead that the ultimate source which Diodorus Siculus' report on Oenopides goes back to (through Agatharchides) was a testimony of Aristotle which is excerpted in lines p. 196, 19–24 of the *De inundacione Nili*. In later editions of the *Vorsokratiker* Kranz retained this latter suggestion of Diels.

It remains to say that the cause is either of two things: namely one of the causes is that the earth which is warm in winter, for the reason that the springs are in such soil, the water of the Nile dries up. This happens also to other rivers. E.g. in Phrygia there are wells which are dry in the winter, whereas they swell in the summer. And in Olynthia of Chalcidice some wells swell most in the summer.

Appendix to 11

Scholia in Apollonii Rhodii Argonautica Δ 269–271a (ed. Wendel) = 647 F 3 Jacoby

περὶ τῆς τοῦ Νείλου ἀναδόσεως διάφοροι αἰτίαι παρὰ τοῖς παλαιοῖς ἐλέγοντο. […] Ἀρίστων δὲ ὁ Χῖος, ὅτι χειμῶνος ὢν ὑπὸ γῆν ὁ ἥλιος ἐκπέμπει τὸ ὕδωρ, τοῦ δὲ θέρους γινόμενος ὑπὲρ γῆν οὐκέτι διὰ τὸ μᾶλλον θερμαίνεσθαι αὐτήν· διὸ καὶ χαλωμένη ἡ γῆ πλεῖον ὕδωρ ἀναδίδωσιν.

2 ἀρίστων P ἀριστίας L (both P and L have the same readings, respectively, also in Schol. Δ 263–264b) Οἰνοπίδης Diels (*Doxographi*, p. 228 n. 5) | χῖος: χῖός φησιν H | εἰσπέμπει H, F | 3 γινόμενος *codd.* γενόμενος Wendel | καὶ χαλωμένη *codd.* κεχαραδρωμένη Wendel perhaps κεχαλασμένη? Bodnár

This testimony is indicated only obliquely, through a reference to p. 228 of the *Doxographi*.

Kranz (since the 5th edition of the *Vorsokratiker*) has included an explicit reference to this passage as one relevant for comparison, but he did not print the actual text of the passage.

The attribution to Oenopides would rest solely on Diels' conjecture. Diels rejected the reading of P, Aristo, because although we have Strabo's testimony (XVII 1. 5) about a Peripatetic Aristo, presumably the author of a book about the Nile, this Aristo, according to Diels is the same as the Aristo of Alexandria of the 1st c. B.C.E.

Diels' conjecture was contested by A. Gercke ("Aristo [55]", in: *Real-Encyclopädie* vol. II [Stuttgart: J. B. Metzler 1896], cols. 956–957), who submitted, apparently on the testimony of this scholium, that the Aristo Strabo refers to may be Chian, and that he needs to be distinguished from the other Peripatetic Aristo [54], of Alexandria, and by Albert Rehm ("Nilschwelle", in: *Real-Encyclopädie* vol. XVII [Stuttgart: J. B. Metzler 1937], cols. 575–576), who endorsed Gercke's introduction of this later Aristo. (Cf. also the judiciously cautious assessment of Paul Moraux, *Der Aristotelismus bei den Griechen von Andronikos bis Alexander von Aphrodisias,* vol. I: Die Renaissance des Aristotelismus im 1. Jh. v. Chr. [Berlin–New York: de Gruyter 1973], 181–182 and vol. II: Der Aristotelismus im I. und II. Jh. n. Chr. [Berlin–New York: de Gruyter 1984], 516–517, with further references in vol. I, 182 nn. 5 and 6.)

Note, furthermore, that Strabo's Aristo – no matter whether he is identical with the Peripatetic Aristo of Alexandria – can hardly be the authority referred to in this scholium. This is so, because – as Moraux submitted (*Der Aristotelismus bei den Griechen,* vol. II, 516–517) – Strabo's testimony almost certainly implies that the Aristo Strabo refers to endorsed Aristotle's explanation of the flood of the Nile (as reported by Strabo in XVII 1. 5, immediately before he mentions Aristo, cf. also [Aristotle], *De inundacione Nili*, p. 197, 1–18 Rose) – that it is caused by summer downpours of rain in Aithiopia (i.e. the Middle Nile Valley, or modern Nubia). This, in turn, implies that Strabo's Aristo most probably could not have propounded the explanation attributed to the Aristo (or Aristias) of this scholium.

The ancients named different causes about the flood of the Nile. […] Aristo [or Aristias, or Oenopides, depending on whether we follow P or L, or accept Diels' conjecture, respectively] of Chius that during winter the Sun being under the earth expels [= evaporates] the water, whereas during summer – when it is above the earth – it does not do so any longer, because it rather warms the earth. Because of this, the earth, being also loosened, emits more water.

Wendel suggested the conjecture κεχαραδρωμένη in line 3, and referred to Herodotus II 25. That passage, however, talks about those lands where a lot of rain water joins the rivers in winter, and on account of the abundance of water the earth is broken into clefts by mountain-streams, or where it is intersected by ravines. This does not apply to the Nile, whatever the verb of this sentence describes cannot be the outcome of the flow of water, rather, the text has to refer to a process which results in the emergence of the abundance of water. Hence I suggest that the reading of the codices can be retained, or perhaps a slight emendation (from καὶ χαλωμένη of the codices to κεχαλασμένη) can be introduced. If we accept this latter emendation, Wendel's other conjecture in the same line (from γινόμενος to γενόμενος) should also be slightly preferable to the reading of the codices.

On my suggestion, that the participle χαλωμένη should be retained, or the reading of the codices καὶ χαλωμένη should perhaps be emended into κεχαλασμένη, this account of the flood of the Nile – whoever it belonged to – is assimilated to that of Ephorus. (The testimony on Ephorus which is closest to the wording of this account on the reading of the codices is Aëtius IV 1. 6, in the [Plutarch] version: Ἔφορος ὁ ἱστοριογράφος κατὰ θέρος φησὶν ἀναχαλᾶσθαι τὴν ὅλην Αἴγυπτον καὶ οἱονεὶ ἐξιδροῦν τὸ πολὺ νᾶμα. On Ephorus see furthermore the testimony of this scholium to the *Argonautica* of Apollonius Rhodius, immediately following this report on Aristo, Aristias or Oenopides, and Diodorus I 39. 7ff.)

12 Proclus, *In primum Euclidis Elementorum librum commentarii* (ed. Friedlein) p. 80, 15–20

οἱ δὲ περὶ Ζηνόδοτον τὸν προσήκοντα μὲν τῇ Οἰνοπίδου διαδοχῇ, τῶν μαθητῶν δὲ Ἄνδρωνος, διώριζον τὸ θεώρημα τοῦ προβλήματος, ᾗ τὸ μὲν θεώρημα ζητεῖ, τί ἐστι τὸ σύμπτωμα τὸ κατηγορούμενον τῆς ἐν αὐτῷ ὕλης, τὸ δὲ πρόβλημα, τίνος ὄντος τί ἐστιν.

15 Ξενόδοτον G Zenodotus B Zenodotum Z | 17 διωρίζοντο M διώριζον τὸ M corrector διωρίζονται τὸ G διωρίζοντο τὸ C

In line 20 Friedlein's and Diels' τί ἐστιν presumably corresponds to the accentuation in the codices. Such a reading of the codices would be in accordance with Herodian's rule, stipulating that regardless of the meaning of the verb ἐστίν, it is accented enclitically unless (a) it is at the head of a sentence – including also the cases when it comes immediately after a conjunction like καί or εἰ –, or (b) is preceded by the negation οὐκ, by ὡς or by the pronoun τοῦτο (see Herodian, *De enclisi* III 1, p. 553, 10–12). Nevertheless, when a modern editor prints an enclitical ἐστίν, it is not clear whether this is in compliance with Herodian's rule, or whether the occurrence of the verb ἐστίν is taken to be copulative, in which case the verb is enclitical also according to Hermann's rule. (On Herodian's and Hermann's rules see Charles H. Kahn, *The Verb Be in Ancient Greek*, Dordrecht–Boston: Reidel 1973, Appendix A: "On the accent of ἐστί and its position in the sentence", 420–434, esp. 421–423.)

The phrase τίνος ὄντος τί ἐστιν, or a close variant, is printed with an enclitical ἐστίν also by Kalbfleisch (Galen, *Institutio logica* 3, p. 7, 14–15), and by Busse (Ammonius, *In De interpretatione*, p. 3, 12–13 and p. 74, 4). Wallies apparently changed his mind on this issue: in his edition of Themistius, *In An. pr.* he printed the phrase with enclitical ἐστίν (p. 92, 11–13, p. 92, 26 and p. 93, 7), whereas later, in his edition of Philoponus, *In An. pr.* (p. 243, 12–14, and p. 244, 15) the phrase is printed with paroxytone ἔστιν. Cf. the different accentuations of Aristotle, *Topics* II 4, 111b17–23 by Ross (following Hermann's rule) and by Brunschwig (following Herodian's rule).

The circle of Zenodotus – he who belongs to the line of succession of Oenopides, and is among the students of Andron – distinguished theorems and problems, in so far as a theorem inquires what attribute is predicated about the subject-matter of the theorem, whereas a problem inquires what exists on condition of the existence of what.

The final phrase of the sentence can also be construed with veridical ἐστίν, then the translation is: 'whereas a problem inquires what is the case on condition of what else is the case'.

13 Proclus, *In primum Euclidis Elementorum librum commentarii* (ed. Friedlein) p. 283, 7–10 (ad prop. 12, probl. 7: ἐπὶ τὴν δοθεῖσαν εὐθεῖαν ἄπειρον ἀπὸ τοῦ δοθέντος σημείου ὃ μή ἐστιν ἐπ᾽ αὐτῆς, κάθετον εὐθεῖαν γραμμὴν ἀγαγεῖν)

> Τοῦτο τὸ πρόβλημα πρῶτον Οἰνοπίδης ἐζήτησεν χρήσιμον αὐτὸ πρὸς ἀστρολογίαν οἰόμενος. ὀνομάζει δὲ τὴν κάθετον ἀρχαϊκῶς κατὰ γνώμονα, διότι καὶ ὁ γνώμων πρὸς ὀρθάς ἐστι τῷ ὁρίζοντι.
>
> 7 The word πρῶτον is missing in D.–K.

This testimony is also present as Scholium I 54 in the *Scholia to Euclid's* Elements.

First Oenopides studied this problem, thinking it useful for astronomy – he calls 'perpendicular' in the archaic manner 'according to the *gnômôn*', because the gnomon is also at a right angle to the horizon.

> The particle δέ in the second sentence is taken here as continuative. This way the second sentence continues the line of thought at the end of the first sentence. Accordingly, Proclus' claim in the first sentece, that Oenopides' motivation for studying the problem of the construction of perpendiculars was that it is useful for astronomy, can be supported by the terminological point supplied in the second sentence, that Oenopides employs the phrase 'according to the *gnômôn*' to designate perpendiculars. The alternative to this translation is to take the particle δέ in the second sentence as adversative. That way the second sentence would express a contrast between Oenopides' terminology and standard Greek mathematical usage ("but Oenopides calls 'perpendicular' in the archaic manner 'according to the *gnômôn*', because the gnomon is also at a right angle to the horizon").

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14 Proclus, *In primum Euclidis Elementorum librum commentarii* (ed. Friedlein) p. 333, 5–9 = Eudemus fr. 138 Wehrli (ad prop. 23, probl. 9: Πρὸς τῇ δοθείσῃ εὐθείᾳ καὶ τῷ πρὸς αὐτῇ σημείῳ τῇ δοθείσῃ εὐθυγράμμῳ γωνίᾳ ἴσην γωνίαν εὐθύγραμμον συστήσασθαι)

> Πρόβλημα καὶ τοῦτο, Οἰνοπίδου μὲν εὕρημα μᾶλλον, ὥς φησιν Εὔδημος, γωνίας δὲ σύστασιν ἀπαιτοῦν ἴσης ἄλλῃ τῇ δοθείσῃ γωνίᾳ εὐθυγράμμῳ πρὸς τῇ δοθείσῃ εὐθείᾳ καὶ τῷ πρὸς αὐτῇ δοθέντι σημείῳ.
>
> 5 καὶ om. G | ὥς φησιν Diels ὡς φησὶν Friedlein | 7 ἴσας G ἴσης C
>
> D.–K. stops mid-sentence after the word Εὔδημος on line 6.

Cf. *Scholia to Euclid's* Elements I 88 and 90.

This is also a problem, being rather a discovery of Oenopides, as Eudemus says, requiring the construction of an angle, equal to a given different straight angle, to a given straight line, at a given point on it.

Corrections*

Survey

First impression (April 2007)	Fourth impression (April 2008)
p. 3, n. 6, line 2: *Lesser Diacosmos*	*Lesser World-order*
p. 6, line 1: like that of the ecliptic	p. 5, last two lines: like that of the specific description of the ecliptic in terms of twelve 30-degree signs
p. 7, line 11: zociacal component	p. 7, line 7: zodiacal component
p. 7, 2 lines up, and p. 16, line 3: *Aristarchus of Samus*	*Aristarchus of Samos*
pp. 10f.: these are manifestations of their respective material principles. The status of Oenoides' divine world-soul […]	p. 10: these are supreme manifestations of the active elements of the Stoics, or of Diogenes' material principle. The status of what Aëtius and his sources regard as Oenopides' divine world-soul […]
p. 11, end of Section E	pp. 10f.: An additional phrase, and then an additional sentence are appended after the phrase 'the two fundamental principles, air and fire', n. 30 is moved to the end of the first clause of the appended sentence.
p. 12, n. 32, 2 lines up: Euphorus	Ephorus
p. 14, n. 38, 9 and 7 lines up	[8 and 6 lines up]: the phrases 'of the *paraplêrôma*' and 'Alcmaeon B 11' are deleted
p. 14, n. 39, last two lines: would have been presented without lettered diagrams	must have been presented without lettered diagrams
p. 15, line 4: to that of his predecessor	p. 15, line 3: to those of his predecessor

* I do not list changes in the typesetting caused by hyphenating some words here and there. I would like to thank Pavel Gregorić, Péter Lautner and András Jánossy for suggestions for corrections in the Survey article.

Testimonia

p. 23, apparatus of Theo Smyrnaeus p. 198, 14–16 Hiller in Testimony 7: the superfluous reference to an earlier edition of [Hero], *Definitiones* 138 (the edition of the excerpts with the title Ἐκ τῶν Ἀνατολίου διάφορα, in *Bibliotheca graeca*, 4th edition, ed. I. A. Fabricius, cur. G. Chr. Harles, Hamburg: C. E. Bohn – Leipzig: Breitkopf 1793, vol. III, p. 464) is removed.

p. 33, paragraph 4, line 5ff.: reference to Strabo's report on Aristotle' explanation of the summer floods of the Nile added; 'Ethiopia' is corrected to 'Aithiopia (i.e. the Middle Nile Valley, or modern Nubia)' – I am grateful to Professor László Török for advice on Aithiopia.

p. 35: The interpunction of the translation of Testimony 13 is changed – the two sentences are joined with a dash, whereas in the first two impressions the first sentence was closed with a full stop –, and an explanatory note is appended at the end of Testimony 13.