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## HIPPARCHUS AND THE “ANCIENTS:” NECHEPSOS-PETOSIRIS?

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In his sole surviving treatise, the *Commentary to the Phaenomena of Eudoxus and Aratus*, the great astronomer Hipparchus of Bithynia refers four times to “ancient” (ἀρχαίοι) authors, which he leaves unnamed.<sup>1</sup> Eudoxus and Aratus are not included in this reference. The quotations create the impression of a diversity of astronomical authors subsumed by Hipparchus under the category of the “Ancients,” but this plurality could go back to a single source that was sometimes referred to in this way in antiquity, such as the astral compendium attributed to Nechepsos and Petosiris. One might, of course, hypothesize that Hipparchus devoted part of his labours to extensive research of the history of astronomy. Yet hardly anything in the available evidence suggests that this was the case; in fact, he seems to have been more interested in correcting whichever of his predecessors was considered most authoritative, for example, Eudoxus-Aratus for the fixed stars and Eratosthenes for geography, and to have thus focused on criticizing selected authorities.<sup>2</sup>

In this regard, it is notable that Hipparchus refers several times to ἀρχαίοι πίνακες (“ancient maps”) in the geographical fragments from Book II of his work *Against the Geography of Eratosthenes*.<sup>3</sup> There, his point is not so much to study the maps of Eratosthenes’ predecessors as such, but to denounce cartographical adjustments made by Eratosthenes himself when these are not based on sound evidence.<sup>4</sup> It follows that Hipparchus’ references to “ancient

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<sup>1</sup> For the Greek text with a German translation, see Manitius 1894. A French translation is given by Zucker 2016.

<sup>2</sup> This is indicated by the two works of Hipparchus that we know the most about, his extant *Commentary to the Phaenomena of Eudoxus and Aratus* and his treatise *Against the Geography of Eratosthenes*. However, as an exception confirming the rule, see Theon of Alexandria, *Commentary to the Almagest* 3, pp. 838–841 Rome, referring to a doxography by Hipparchus on the length of the year, starting from Meton and Euctemon of Athens.

<sup>3</sup> Strab. *geogr.* 2.1.4, p. 69 C. (= Hipparchus, fr. 12 Dicks); 2.1.11, p. 71 C. (= fr. 14 Dicks); 2.1.22, p. 78 C. (= fr. 19 Dicks); 2.1.34, p. 87 C. (= fr. 24 Dicks); 2.1.38, p. 90 C. (= fr. 28 Dicks).

<sup>4</sup> Hipparchus’ attitude with regard to Eratosthenes’ modifications of the “ancient maps” is aptly summarized by Dicks 1960, 124–125 (on fr. 14): “Rather than run the risk of making a rash correction

maps” are likely based more on his reading of Eratosthenes than on earlier sources.

Hence, it seems worthwhile to search for a single source that Hipparchus may have been referring to as the “Ancients” in his *Commentary to the Phaenomena*.<sup>5</sup> Moreover, it is of considerable interest to determine who the “Ancients” referred to by Hipparchus were, as this could shed new light on the cultural horizon of one of the preeminent scholars from the Hellenistic Greek world, known for his broad scientific work and his access to ancient Near Eastern sources.<sup>6</sup>

Hipparchus’ *Commentary* conveys a rather definite idea of what the “Ancients” accomplished. He credits one of them with “forming” the constellations, meaning that they were the first to describe the starry sky in terms of named star groups:

Βούλεται γὰρ λέγειν, ὅτι μεταξὺ τοῦ Πηδαλίου καὶ τοῦ Κήτους, ὑπὸ τὸν Λαγῶν, κεῖνται ἀστέρες ἀνώνυμοι, ὀλίγοι τῶ πληθει καὶ τῶ μεγέθει· οὐ γὰρ οὕτως κεῖνται, ὥστε ἐκ τῆς θέσεως αὐτῶν ὁμοίως διαμορφωθῆναι ζῶα ἢ κατασκευάσμά τι, οἷά ἐστι τὰ λοιπὰ ἄστρα, ἀ διετύπωσέ τις τῶν ἀρχαίων.

For he (sc. Aratus, v. 367–385) means to say that between the Rudder and the Sea-Monster, below the Hare, lie unnamed stars, small in number and in magnitude; they do not lie in such a way that from their position the shape of living beings or of a contraption can be made out, as is the case with the other constellations that one of the Ancients formed.

(Hipparchus of Bithynia, *Commentary to the Phaenomena of Eudoxus and Aratus* 1.8.12, p. 80, ll. 12–17 Manitius)

Hipparchus attributes this major accomplishment, the first description of the fixed stars as constellations, to a single author who must, in his mind, predate Eudoxus’ treatment of the same subject matter and Aratus’ versification of it. To a certain extent, he is walking in the footsteps of Aratus, who in the prologue to the *Phaenomena* also refers to the “Ancients” as having created the constellations

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on insufficient grounds, it would be better to leave the old maps ‘uncorrected’ until fresh scientifically based evidence was available. (...) Whenever [Strabo] mentions Hipparchus in connection with the old maps, he gives the impression that the astronomer deliberately set out to defend them against all criticism (...) Hipparchus with his passion for astronomical data and mathematical accuracy and his conviction of the necessity for applying these to geographical research, cannot reasonably be envisaged as a staunch defender of the old maps, which he must have known had little or no scientific basis. (...) But where it seemed to him that Eratosthenes was making a correction on insufficient evidence, he did not hesitate to say so, and to recommend that on this point the old maps should be left alone.”

<sup>5</sup> This matter has in fact been the object of recent interest: see, e.g., Dekker 2013, 15, who considers Euctemon of Athens and Callippus of Cyzicus as possible candidates, but does not provide evidence for this hypothesis.

<sup>6</sup> A convenient overview of Hipparchus’ life and works is given by Toomer 1981.

and designated Astraeus as the father of the Stars.<sup>7</sup> However, he goes far beyond Aratus in also crediting the “Ancients,” all or most, with a division of the zodiac similar to his, i.e., starting from the equinoctial and solstitial points (and not, e.g., fifteen degrees from these points, a division Hipparchus attributes to Eudoxus):

Προδιδειλήφθω δὲ πρῶτον, ὅτι τὴν διαίρεσιν τοῦ ζωδιακοῦ κύκλου ὁ μὲν Ἄρατος πεποιήται ἀπὸ τῶν τροπικῶν τε καὶ ἰσημερινῶν σημείων ἀρχόμενος, ὥστε ταῦτα τὰ σημεία ἀρχὰς εἶναι ζωδίων, ὁ δὲ Εὐδόξος οὕτω διήρηται, ὥστε τὰ εἰρημένα σημεία μέσα εἶναι, τὰ μὲν τοῦ Καρκίνου καὶ τοῦ Αἰγόκερω, τὰ δὲ τοῦ Κριοῦ καὶ τῶν Χηλῶν. (...) Καὶ ὑπὸ τῶν ἀρχαίων δὲ μαθηματικῶν πάντων σχεδὸν ἢ τῶν πλείστων τοῦτον τὸν τρόπον ὁ ζωδιακὸς κύκλος διήρητο.

One must grasp beforehand that Aratus divides the zodiac circle starting from the solstitial and equinoctial points, so that these points are the beginnings of the zodiacal signs, whereas Eudoxus divides them in such a way that said points are the middle, respectively, of Cancer and Capricorn, and of Aries and the Pinchers [sc. the sign Libra]. (...) Almost all, or most, of the ancient scientists divided the zodiac circle in this way [sc. like Aratus<sup>8</sup>].

(Hipparchus of Bithynia, *Commentary to the Phaenomena of Eudoxus and Aratus* 2.1.15,19, p. 128, ll. 21–27 and p. 132, ll. 7–9 Manitius)

In fact, neither Eudoxus nor Aratus divided the ecliptic into twelve equal signs in their description of the heavens, so that the convention ascribed to them by Hipparchus is meaningless.<sup>9</sup> More importantly, the convention that Hipparchus ascribes to the “Ancients” is not securely documented in Greek literature before him.<sup>10</sup> Furthermore, when prefacing (2.4) the final part of his *Commentary*, Hipparchus turns away from correcting Eudoxus and Aratus to offer a systematic, quantitative study of simultaneous risings and settings of constellations along

<sup>7</sup> Aratus of Soloi, *Phaenomena* 99 and 103.

<sup>8</sup> That τοῦτον τὸν τρόπον refers to the conventional division of the zodiac reportedly used by Aratus, is made clear by the fact that this sentence concludes Hipparchus’ philological argument supporting his ascription of this convention to Aratus (p. 130, l. 1: ὁ μὲν οὖν Ἄρατος; p. 132, ll. 5–6: ἐν ταύτῃ τῇ τροπῇ τοίνυν τὴν ἀρχὴν ἐπέχει τοῦ Καρκίνου).

<sup>9</sup> See Petau 1703, 40–42 (repr. coll. 1346–1351); Bowen and Goldstein 1991, 241–242; Dekker 2008, 217–222.

<sup>10</sup> Euctemon of Athens, Callippus of Cyzicus and Dionysius were credited with the “Ari 0°” convention by Neugebauer 1975, vol. 2, 600. As far as Euctemon and Callippus are concerned, this claim rests solely on the “Geminus” parapegma, the reliability of which has been questioned by Evans and Berggren 2006, 275–289. Strangely, Dekker 2013, 15, perpetuates Neugebauer’s view all the while quoting Evans’ and Berggren’s re-evaluation of the “Geminus” parapegma. Concerning Dionysius, Neugebauer’s study of the “Era Dionysius” (1975, vol. 2, 1066–1067) does not seem to substantiate his claim.

with some other information.<sup>11</sup> He concludes with the remark that this surpasses the writings of the “Ancients:”

Διότι γὰρ ἡ τοιαύτη πραγματεία πολλῶν τε τῶν ὑπὸ τῶν ἀρχαίων συντεταγμένων ἐστὶν εὐχρηστοτέρα καὶ πρὸς πολλὰ συντείνει τῶν κατὰ ἀστρολογίαν θεωρημάτων, εὐκατανόητον εἶναί σοι νομίζω.

That such a study is much more useful than those composed by the Ancients and touches upon many astronomical observations, I believe, is easy for you to understand.

(Hipparchus of Bithynia, *Commentary to the Phaenomena of Eudoxus and Aratus* 2.4.6, p. 184, ll. 23–24 Manitius)

From this claim, we may infer that Hipparchus also credited the “Ancients” with a study of the simultaneous risings and settings of constellations that was comparable to his own in that it included numerical values, and thus independent from, and more advanced than, Eudoxus’ qualitative description. There appears to be a historical inconsistency between, on the one hand, the claim that the “Ancients” referred to by Hipparchus, offered the first description of the heavens, in terms of constellations, which must be situated before Eudoxus and Aratus; and, on the other hand, the claim that they already had a division of the ecliptic into twelve equal signs, a development which was missing from Eudoxus’ and Aratus’ descriptions and would thus have seemed a later innovation,<sup>12</sup> as well as a study of simultaneous risings and settings of the constellations that was more advanced than, and thus posterior to, that of Eudoxus and Aratus. This inconsistency suggests that the text ascribed by Hipparchus to the “Ancients,” while claiming to be the first description of the constellations, was in fact written after the time of Eudoxus and Aratus.

The first of the four references to the “Ancients” in Hipparchus’ commentary, which has not yet been adduced, contains an important indication towards solving this contradiction. Hipparchus ascribes to the “Ancients” an asterism of the Great Bear that only contained seven stars:

<sup>11</sup> By contrast, Eudoxus’ description of the risings and settings, after an initial list of the constellations visible at Cancer’s rising (Hipparch. 2.2.4, p. 138, ll. 5–11 Manitius), was of the (purely qualitative) form “when sign X of the zodiac is rising, constellations Y<sub>1</sub>, Y<sub>2</sub>, ... are also rising, and constellations Z<sub>1</sub>, Z<sub>2</sub>, ... are setting,” for all twelve zodiacal signs; see, e.g., Hipparch. 2.2.13, p. 142, ll. 13–18 Manitius.

<sup>12</sup> See n. 9.

Καθόλου τε οἱ ἀρχαῖοι πάντες τὴν Ἄρκτον ἐκ τῶν ἑπτὰ μόνων ἀστέρων διετύπουν.

All of the Ancients universally formed the Bear<sup>13</sup> out of just the seven stars.

(Hipparchus of Bithynia, *Commentary to the Phaenomena of Eudoxus and Aratus* 1.5.6, p. 46, ll. 7–9 Manitius)

In passing, it should be noted that the same verb διατυπώω is used as in 1.8.12 (quoted above); these are its only two uses by Hipparchus in the *Commentary*, suggesting that it may be taken over from his source (the “Ancients”). From the earliest attestations on, both Greek constellations comprised more than seven stars;<sup>14</sup> this is made clear even by their Greek name (Great and Small “Bear”),

<sup>13</sup> Here Hipparchus writes only of “the Bear,” but the entire passage beginning at 1.5.1 is a discussion of Ursa Maior.

<sup>14</sup> Boll and Gundel 1924–1937, 877, quoting Aristot. *Metaph.* 1093a19; the Eratosthenean *Catasterisms* 1; the star catalogues of Hipparchus (cf. Boll 1901) and Ptol. *alm.* 7 and 8. The Aristotelian passage being the earliest known Greek reference to the number of stars in the Bear, it should be quoted in full (Aristot. *Metaph.* 1093a13–19): ἑπτὰ μὲν φωνήεντα, ἑπτὰ δὲ χορδαὶ ἢ ἀρμονία, ἑπτὰ δὲ αἱ πλειάδες, ἐν ἑπτὰ δὲ ὁδόντας βάλλει (ἐνία γε, ἐνια δ’ οὐ), ἑπτὰ δὲ οἱ ἐπὶ Θήβας. ἄρ’ οὖν ὅτι τοιοσδὶ ὁ ἀριθμὸς πέφυκεν, διὰ τοῦτο ἢ ἐκείνοι ἐγένοντο ἑπτὰ ἢ ἢ πλειάς ἑπτὰ ἀστέρων ἐστίν; ἢ οἱ μὲν διὰ τὰς πύλας ἢ ἄλλην τινὰ αἰτίαν, τὴν δὲ ἡμεῖς οὕτως ἀριθμοῦμεν, τὴν δὲ ἄρκτον γε δώδεκα, οἱ δὲ πλείους. / “Seven are the vowels, seven strings to the scale, seven are the Pleiads; in the seventh year some animals lose their teeth (not all); and seven are those who attacked Thebes. Is it, then, because the number 7 is such as it is that they were seven, or that the Pleiads consist of seven stars? Alternatively, there were seven (sc. against Thebes) because of the seven gates, or for some other reason, and the Pleiads are seven because we count them so, just as we count the Bear as 12, whereas others count more stars.”

Could Hipparchus nevertheless be preserving the memory of an earlier Greek seven-star tradition? One may look to Indo-European comparative reconstructions for an earlier stage at which the constellation consisted of the seven bright stars. Thus, Scherer 1953, 131–141, speculates on the existence of an Indo-European constellation consisting of the seven brightest stars in the area of UMA. However, other reconstructions do not support this conclusion, see e.g. Hamp 1972. Furthermore, it is doubtful whether even the name of the “Bear” is common to (some or all) Indo-European languages or a separate development of Greek to Greek, as argued by Parvulescu 1988.

Another name for the area of UMA in Greek, attested already in the *Iliad* and *Odyssey* (Il. 18.487 = *Od.* 5.273), was ἄμαξα “(four-wheeled) Chariot.” Does this, then, suggest a Greek seven-star constellation for this area? This would require the assumption, hardly trivial, that the Chariot, due to its shape, *must* have consisted of seven stars. Even granting this, the “Chariot” seems to be a borrowing from the Near East, corresponding exactly to Assyrian-Babylonian *eriqu* (Sumerian MAR.GÍD.DA) “Chariot” (as assumed, e.g., by Duchesne-Guillemin 1986, 237). In the *Iliad* and *Odyssey*, it is clearly designated as an ἐπικλησις, “additional name” (pace Parvulescu 1988, 101), of the Bear. The name does not recur in extant Greek literature until the Hellenistic poets seize upon the Homeric line, imitated, with etymological pun, by Aratus, *Phaenomena* 27 (the additional name is also referred to in l. 93 ἄμαξαιῆς ... Ἄρκτου). Callimachus (*Iambos* 1.54 Pfeiffer) refers to the Phoenicians’ use of Ἀμάξη in navigation, and to Thales’ “measuring” (σταθμῆσασθαι) its stars. Also a poetic allusion to the *Iliad*, though difficult to date, is *Anacreontea* 4, iii, 8 West. The sparse later instances apparently stem from the reading of Homer and Aratus (e.g. Steph. Byz. s.v. Ἀρκαδία; also in Latin: Aul. Gell. 2.21).

which can hardly be derived from just the seven stars.<sup>15</sup> Is Hipparchus, then, referring to a non-Greek tradition? In this case, reference to Mesopotamian astronomy is unhelpful, as the widespread grouping of seven stars was primarily associated with the Pleiades.<sup>16</sup> One might explain the seven-star asterism of the Bear recorded by Hipparchus by the influence of a constellation akin to the Great Bear that is designated with reference to the number seven in several Indo-European languages, for example, Latin and Avestic, or even by pastoral peoples of ancient Asia, for instance, Tatars and Turcomans.<sup>17</sup> Nevertheless, Hipparchus cannot have known of these instances except by very circuitous routes. The matter is altogether different with a further instance found in a text published more than a century ago, but seemingly unnoticed by historians of ancient astronomy – the *Mysteries of John*, a Coptic apocryph in which Jesus Christ explains to his apostle John, among other things, that there are seven Northern stars that never set.<sup>18</sup>

ΠΕΧΛΑϞ ΗΑΙ ΧΕ ΕΡΕ Ν ΣΙΟΥϞΟ Ν ΤΑΞΙΣ ΤΑΞΙΣ\* ΟΥΝ ΣΙΟΥϞ ΕΦΛΑϞΘΩ ΖΗ  
 ΤΠΕ ΦΔ ΠΝΑΥ Μ ΜΕΡΡΕ' ΑΛΛΑ ΗΣΕΝΑΥ ΕΡΟΟΥ ΑΗ Ε ΤΒΕ ΠΟΥϞΕΗ Μ  
 ΠΡΗ' ΟΥΝ ΣΑΩΦ̄ Ν ΣΙΟΥϞ ΝΗΥ' ΕΞΡΑΙ ΖΜ ΠΜΖΤ Μ ΠΚΟΣΜΟΣ ΝΕΤ ΜΜΑΥ  
 ΠΑΡ ΣΕ ΖΗ ΤΠΕ ΠΝΑΥ ΗΜ' ΟΥΝ ΣΑΩΦ̄ Ν ΣΙΟΥϞ ΖΗ ΤΠΕ ΕΥΜΟΥΤΕ  
 ΕΡΟΟΥ ΧΕ ΝΕ ΕΝΤΕΡ ΜΕΥΚΩ ΝΕΤ ΜΜΑΥ' Ε ΕΙ ΕΒΟΛ ΖΗ ΝΕΥΤΑΜΙΟΝ'  
 ΕΙ ΜΗ ΤΕΙ ΠΤΕ ΠΜΟΥ ΕΙ ΕΧΜ ΠΚΑΣ'

<sup>15</sup> On the contrary, Boll and Gundel 1924–1937, col. 877, are of the opinion that the Greek asterisms of the Bear with more than seven stars were secondary interpretations of an original asterism with the seven most visible stars, but fail to adduce any early attestations for a seven-star Bear. Boll and Gundel do not seem to have been aware of the reference to it in Strab. *geogr.* 1.1.21, p. 13 C., but this passage only shows that the seven-star asterism was widely known to the Roman readership Strabo was writing for (e.g. under the name *septentrio*, from *septem* “seven” and *trio* “plough ox”) – on Strabo’s readership see Geus and Guckelsberger 2017, 172 and n. 46.

The *communis opinio* is perpetuated, e.g., by Zucker 2016, 66: “Les contemporains d’Eudoxe et d’Aratos (IV–III<sup>e</sup> s. av. J.-C.) limitaient encore l’Ours à ses fameuses quatre étoiles.” This author adduces interesting comparative evidence, but none from the Greek-speaking world, and ignores the statement to the contrary in Aristot. *metaph.* 1093a19. He assumes the “Ancients” in Hipparch. 1.5.6 to refer to Eudoxus and Aratus, without addressing the fact that this cannot be the case elsewhere in the *Commentary*; indeed Hipparchus, when he does not name his two main targets, has various other ways of referring to them, e.g. with ἐκάτερος or ἀμφοτέρος: παρ’ ἐκατέρω δ’ αὐτῶν, “in both their cases” (1.2.6, p. 12, 4 M.; 1.2.12, p. 14, 22 M.); ὑφ’ ἐκατέρου, “by both” (1.4.12, p. 38, 12 M.); μὴ ὁμοίως ἀναγράφουσιν ἀμφοτέροις οὐ δυνατόν ἐκατέρω αὐτῶν συμφωνεῖν τὸ φαινόμενον, “as both of them do not make their records under similar conditions, each cannot agree with what appears” (2.2.6, p. 138, 20–22 M.), etc.

<sup>16</sup> See Verderame 2016. The evidence does not allow to reconstruct the number of stars included in MAR.GÍD.DA, the Mesopotamian equivalent of the Great Bear (see VAT 9428, Rs. 4–7, ed. Weidner 1927).

<sup>17</sup> Scherer 1953, 138; Le Boeuffe 1977, 87–89; Zucker 2016, 65–66.

<sup>18</sup> The text of the *Mysteries of John* in Sahidic dialect was published by Budge 1913, 59–74 (Coptic text), and 241–257 (translation). A fragment of the same in Bohairic dialect was published by Evelyn-White 1926, 51. A new translation is in preparation by Daniele Tripaldi, to whom I am grateful for drawing my attention to the passage regarding the seven Northern stars.

And the Cherubim said unto me, “The stars are of different orders. There are some stars which remain in the heavens until noon, but they cannot be seen because of the light of the sun. There are seven stars which come in the north of the world, and they remain there in the heavens always. And there are seven stars in the heavens which are called  $\mu\epsilon\epsilon\iota\tau\tau\epsilon\tau\epsilon\tau$ ; those which are there are not permitted to emerge from their place of storehouse, except when death cometh upon the earth.” (fol. 19b = p.  $\Lambda$ H of the ms. BM Or. 7026 = p. 256 of the transl. by Budge 1913)

Wallis Budge points out that much of the cosmological content of these *Mysteries* is paralleled by earlier Egyptian texts;<sup>19</sup> so it is likely that this conception of a seven-star circumpolar constellation also stems from earlier Egyptian tradition. In fact, precisely such a conception is attested in Egyptian celestial depictions as the constellation called *mshtyw* or *hps̄*, represented either as a bull (the animal form of Seth) or as the same bull’s cut-off leg, often surrounded by seven stars (in particular on the so-called “diagonal star clocks”).<sup>20</sup> Due to its connection with Seth (known among others to Plut. *Is.* 21 = *mor.* 359d), this constellation had great importance in Egyptian stellar lore and mythology,<sup>21</sup> thus providing a satisfactory explanation of Hipparchus’ otherwise puzzling reference. Moreover, by pointing to the influence of Egyptian astronomical tradition on Hipparchus, it calls attention to a body of Greek texts that may lie behind his references to the “Ancients.”

Two recent publications by Stephan Heilen have greatly advanced the reconstruction of an important source in ancient Greek astrology, the handbook

<sup>19</sup> See Budge 1913, lxxvii–lxx.

<sup>20</sup> The bull’s leg contains seven stars on Coffins 2, 3, 4, 6, 8 (and probably 9) in Neugebauer and Parker 1960. See further Etz 1997, who argues that in its bull-form, the constellation may have extended further than the seven brightest stars, i.e. to  $\sigma$  UMa, but this does not affect our argument since the bull is at least sometimes depicted along with the seven stars, i.e. on the linear display Dendera E (Fig. 5, see Etz 1997, 152, and a photograph of the original in Neugebauer and Parker 1969, pl. 42, the lower register, between numbers 2 and 3). Note that the bull’s leg is mentioned as an equivalent of Ursa Maior in a Greek magical papyrus from the 4th c. AD (PGM IV, ll. 700–701:  $\mu\acute{o}\sigma\chi\omicron\upsilon\ \acute{\omega}\mu\omicron\nu\ \chi\rho\acute{\upsilon}\sigma\epsilon\omicron\nu\ \acute{\omicron}\varsigma\ \acute{\epsilon}\sigma\tau\iota\nu\ \text{\AA}\rho\kappa\tau\omicron\varsigma$ , “the golden shoulder of a young calf, that is the Bear,” see Neugebauer and Parker 1969, 183, n. 1); in the same section of the papyrus, seven  $\mu\omicron\lambda\omicron\kappa\rho\acute{\alpha}\tau\omicron\rho\epsilon\varsigma$  are referred to (by name!), presumably the seven stars of the same constellation, and they are said to cause the rotation of the heavenly axis (PGM IV, 676–692). A Hermetic Excerpt found in Stobaeus’ *Anthology* (1.21.9 = *exc.* 6, §9 Nock-Festugière) seems also to hark back to this Egyptian stream of tradition, and may even stem from “Nechepsos-Petosiris,” as it refers to a seven-star Great Bear playing an important part in the heavenly motions (see the commentary of this somewhat garbled text in Nock and Festugière, ad loc.).

<sup>21</sup> On the orientation of the temple in Edfu towards Ursa Maior, see Leitz 1991, 61–65; on the cultural significance of the constellation *mshtyw/hps̄*, see von Lieven 2000, 24–29; also Lull 2008.

attributed to Nechepsos and Petosiris.<sup>22</sup> This work, known to us only from fragments quoted by later authors, was a metric or prosimetric compendium in Greek language comprising up to fifteen books. It claimed as its authors figures from a distant past: Kim Ryholt has identified Nechepsos with Pharaoh Necho II “the Wise” (reg. 610–595 BC), who is connected to the scribe Petesis (whose name was likely misread as Petosiris at some point in time, a mistake involving a single sign);<sup>23</sup> yet in fact, it was composed at the earliest around 170 BC, at the latest around 120 BC, and most likely around 150 BC.<sup>24</sup> These dates fit well with Hipparchus’ career, for which a *terminus post quem* is given by the summer solstice observation from the year 158 BC referred to in the recently published Papyrus Fouad inv. 267 A,<sup>25</sup> and which continued at least until his observation of lunar position on 7 July 127 BC (Ptol. *alm.* 5.5). The compendium attributed to Nechepsos and Petosiris accomplished a vast syncretism of Egyptian, Mesopotamian and Greek astral knowledge: most notably, a Demotic astrological handbook is known that purports to be by Necho and Petesis (Papyrus CtYBR 422 verso and Papyrus Lund 2058),<sup>26</sup> while similarities to Mesopotamian omen literature have also been noted.<sup>27</sup> Its influence on later Greek astrology was such that it is often referred to in modern literature as the “Astrologers’ Bible.”<sup>28</sup>

In later Greek astrological literature, the terms ἀρχαῖοι / παλαιοί “Ancients” served as a byword for the compendium ascribed to Nechepsos and Petosiris. It is the case in at least two passages that can be securely attributed to “Nechepsos and Petosiris:”<sup>29</sup>

– Hephaestio of Thebes, *Apotelesmatica* 2.18.53 = Antigonus of Nicaea, fr. 2 Heilen: Τοσαῦτα μὲν ὡς ἐν συντομίᾳ ἐκ τῶν παρὰ τοῖς ἀρχαίοις εἰρημένων ἐκτίθεται ὁ Ἀντίγονος περὶ τῆς πρώτης γενέσεως. / “This is all that Antigonus expounds as in a summary from the words of the Ancients about the first coming-to-being.” This statement marks the end of the explicit quote of Nechepsos and Petosiris introduced at §21 (= fr. +4 Heilen).

– Ptol. *tetr.* 3.11.1, l. 550 Hübner = “Nechepsos-Petosiris,” fr. 15 Riess-Heilen: Κατὰ τὸν ἀρχαῖον γελοῖόν ἐστι τὰ καθ’ ἕκαστα τῶν ἀποτελουμένων ἐφαρμόζειν τῷ μηδ’ ὅλως ἐκ τῆς τῶν βιωσίμων ἐτῶν ὑποστάσεως ἐπὶ

<sup>22</sup> Heilen 2011; Heilen 2015, 39–52, 539–562 and *passim*.

<sup>23</sup> Ryholt 2011.

<sup>24</sup> For these dates, see Heilen 2015, 554–555.

<sup>25</sup> See Fournet and Tihon 2014.

<sup>26</sup> Ryholt 2011, 61–62.

<sup>27</sup> See Williams 2008, 295–314.

<sup>28</sup> Boll 1908, 106 coined the phrase *Astrologenbibel*; cf. Heilen 2015, 39, n. 183.

<sup>29</sup> A list of further passages where the “Ancients” are plausibly a reference to “Nechepsos and Petosiris,” is given by Heilen 2015, 1357 (s.v. καὶ οἱ παλαιοὶ Αἰγύπττιοι); see also 1320–1321 (s.vv. εἰσι γὰρ – λέγει).

τοὺς ἀποτελεστικούς αὐτῶν χρόνους ἤξοντι. / “According to the Ancient, it is ridiculous to attach particular predictions to one who, because of the duration of his life-years, will not entirely reach the predicted times.” The attribution to “Petosiris” is consensual on the authority of the anonymous *Commentary to Ptolemy’s Tetrabiblos*, quoted below.<sup>30</sup>

This usage was related to “Nechepsos’ and Petosiris” presumed role as astrological pioneers by the anonymous author of the late antique *Commentary to Ptolemy’s Tetrabiblos* published by Hieronymus Wolf in 1559 (p. 111 = fr. 19a Riess) commenting the phrase κατὰ τὸν ἀρχαῖον, “according to the ancient” in Ptol. *tetr.* 3.11.1, l. 550 Hübner (quoted above).<sup>31</sup>

Λέγει δὲ παλαιὸν τὸν Νεχεψῶ καὶ Πετόσιριν. Οὗτοι γὰρ πρῶτοι τὸ δι’ ἀστρολογίας ἐξήπλωσαν προγνωστικόν.

He calls “ancient” Nechepsos and Petosiris.<sup>32</sup> Indeed, they were the first to unfold the art of astrological prediction.

Now, less than a hundred fragments from “Nechepsos and Petosiris” are preserved. Among these, no trace is to be found of a description of the constellations, but it can safely be assumed that this was an inevitable part of such a large compendium. A riskier assumption is that a seven-star asterism of the Great Bear was mentioned. This is made plausible by the fact that “Nechepsos and Petosiris” continued Egyptian traditions, as stated above with reference to Ryholt, and because all other references by Hipparchus to the “Ancients” can be argued to concern precisely this text. It is likely that, as with later authors, “Nechepsos and Petosiris” used in their horoscopes (none of which have survived<sup>33</sup>) the Ari 0° convention ascribed by Hipparchus to the “Ancients.”<sup>34</sup> Furthermore, the work ascribed to Nechepsos and Petosiris did, at any rate, contain a treatment of simultaneous risings and settings similar to that by Hypsicles (cf. Vett. Val. 3.13.16 = fr. 5 Riess-Heilen),<sup>35</sup> compared to which

<sup>30</sup> See already Salmasius 1648, 353–354: “Ἀρχαῖος ille Petosiris est” (with reference to the “Scholiastes anonymus”); Riess 1892, 364 (approved by van der Waerden 1959, 1837); Heilen 2015, 1033.

<sup>31</sup> R. Caballero Sánchez is preparing a new edition of this text, on which see Caballero Sánchez 2013a and 2013b.

<sup>32</sup> The text as printed by Wolf is τὸν ἄρχαῖον καὶ πετόσιριν.

<sup>33</sup> The existence of horoscopes by “Nechepsos and Petosiris” is made quite likely by Claudius Ptolemy’s reference (*tetr.* 1.21.18) to παραδειγματικαὶ γενέσεις, “exemplary nativities” by “Egyptian” authors; cf. Heilen 2015, 33.

<sup>34</sup> On the predominance of this norm in Greek horoscopes (with some competition from the Ari 8° convention imported from Mesopotamian astronomy), see Neugebauer and van Hoesen 1959, 4–5 (s.v. “Clima”).

<sup>35</sup> Heilen 2011, 24 and n. 4; Heilen 2015, 620–621 and 1361–1365.

Hipparchus' systematic study can certainly be called superior.

The identification of the "Ancients" referred to four times in Hipparchus' *Commentary* with the compendium ascribed to Nechepsos and Petosiris thus accounts for Hipparchus' references to a distant past without supposing that he conducted vast historical investigations (which are otherwise unattested). Strikingly, such a phrase as "all of the Ancients" (οἱ ἀρχαῖοι πάντες, Hipparch. 1.5.6, quoted above) plays into the common Greek conception of the Egyptians as preserving incommensurably ancient traditions, famously expressed in Plato's *Timaeus* by a very old Egyptian priest exclaiming: "Solon, o Solon, you, the Greeks, are always children, there is no such thing as an old Greek! (...) You are young in soul, all of you; for therein you do not hold any age-old opinion passed on by ancient oral tradition, nor any timeworn knowledge."<sup>36</sup>

This identification further accounts for the fact that specific views are attributed not only to the "Ancients" as a group, but also once to a single author among the "Ancients" and once to "almost all or most" of them: as noticed by Stephan Heilen, various tenets in the compendium were attributed only to "Nechepsos" or to "Petosiris," and they sometimes held diverging views,<sup>37</sup> so that conceivably in some cases the impression arose that an opinion was shared by the majority of ancient authors, over and above Nechepsos and Petosiris as the two principal sources credited by the compendium. Moreover, John the Lydian mentions the existence of students of Petosiris, and states that the most gifted among them were handed down Petosiris' knowledge:<sup>38</sup> conceivably, in some lost passages of the astral compendium, opinions may have been ascribed specifically to various students or groups of students.

Possibly, it is due to reservations about the attribution of the work to "Nechepsos and Petosiris" that Hipparchus never referred to it by name; another, less plausible possibility is that he had little respect for such authorities, much in the way Ptolemy, by not giving the name of a single source in his *Apotelesmatica*, seems to be signalling that his is the first satisfactory exposition of the subject.<sup>39</sup> Finally, the narrative according to which the book had been authored by figures of the past would explain the apparent chronological discrepancy of considering

<sup>36</sup> Plat. *Tim.* 22b: Ὁ Σόλων, Σόλων, Ἕλληνες ἀεὶ παῖδες ἐστε, γέρον δὲ Ἕλληνα οὐκ ἔστιν. (...) Νέοι ἐστέ, εἶπεῖν, τὰς ψυχὰς πάντες· οὐδεμίαν γὰρ ἐν αὐταῖς ἔχετε δι' ἀρχαίαν ἀκοήν παλαιὰν δόξαν οὐδὲ μάθημα χρόνῳ πολιὸν οὐδέν.

<sup>37</sup> Heilen 2015, 558.

<sup>38</sup> T1 Heilen = Lyd. *ost.* 2, p. 6 Wachsmuth: Πετόσιρις τοῖς εἰδικοῖς τὰ καθολικὰ συμμίξας πολλὰ μὲν κατ' αὐτὸν παραδοῦναι βιάζεται, οὐ πᾶσι δὲ παραδίδωσι ταῦτα, μόνοις δὲ τοῖς καθ' αὐτόν, μᾶλλον δὲ ὅσοι καὶ αὐτῶν πρὸς στοχασμοὺς ἐπιτηδειότεροι. / "Petosiris, having mixed together general and specific tenets, makes every effort to hand many of them down, but only to his students, and rather to those among them who were more proficient in guess-work."

<sup>39</sup> On this attitude of Ptolemy, see van der Waerden 1959, 1837.

as “ancient” both, the first description of the constellations and the study of simultaneous risings and settings as well as the introduction of a zodiacal norm. From an Egyptian point of view, of course, figures such as Necho II and Petesis hardly qualified as “ancient,” and must have represented rather late newcomers to an age-old tradition.

To conclude, the evidence presented above suggests that

- 1) Hipparchus’ reference to a seven-star asterism of the Bear originates from Egyptian astronomy.
- 2) Hipparchus’ mentions of the “Ancients” (ἀρχαῖοι) in fact refer to the astral compendium attributed to Nechepsos and Petosiris.

Hipparchus appears to have credited Egyptian astronomy with a significant initial contribution to that same science of which he was such an eminent representative. This suggests that Egyptian astronomy may have influenced him more than has hitherto been suspected. Indeed, the Egyptian clergy seem to have discovered important aspects of no less a phenomenon than the precession of the equinoxes.<sup>40</sup> Joachim Friedrich Quack and Wolfgang Waitkus have interpreted, in an astronomical sense, the reference in Papyrus Beatty VIII 3.1ff. and Papyrus Greenfield 20.20–23, thus arguing that Egyptian priests were aware of a change in the coordinates of Ursa Maior, parts of which had ceased to be circumpolar already during the New Kingdom period.<sup>41</sup> Having thus established that the coordinates of the “fixed stars” could vary across time, Egyptian astronomers likely made a decisive contribution to Hipparchus’ study of precession (perhaps in the form of centuries-old astronomical records with precise and painstaking observations, such as have yet to be recovered).

Furthermore, Hipparchus appears to have considered “Nechepsos and Petosiris” as respectable authorities (which may lead to reconsider whether he practiced astrology himself, as some attributions suggest<sup>42</sup>). This testifies to the rapid and irresistible diffusion of “Nechepsos and Petosiris”-style astral science,<sup>43</sup> and to the embeddedness of Hipparchus’ work in the context of syncretistic Ptolemaic science.

<sup>40</sup> I am most grateful to Alexandra von Lieven for pointing out this possibility.

<sup>41</sup> Quack 1996, 156; Waitkus 2010, 179 and n. 38.

<sup>42</sup> For a collection of scholarly opinions on whether Hipparchus practiced astrology, see Heilen 2015, 23, n. 92.

<sup>43</sup> The contribution of “Nechepsos and Petosiris” to the development of astrology is aptly characterized by Pingree 1974, 548: “[T]heir illumination of – although in a very fragmentary form – two important processes of Ptolemaic science: the development of the astral omens that the Egyptians of the Achaemenid period had derived from Mesopotamia, and the invention of a new science of astrology based on Greek astronomy and physics in conjunction with Hellenistic mysticism and Egypto-Babylonian divination from astral omens.”

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