CHRONOLOGY & CATASTROPHISM REVIEW 2019:1

An Examination of Chronological Aspects of 'The 5th Century Invasions According to Tóth Gyula' by Trevor Palmer

The History of the Latter Divided Monarchy: A Review by J. Eric Aitchison

From Alalakh, In Search of Mitanni by Barry Curnock

The Uluburun Shipwreck – Evidence for a Late Bronze Age Arms Trade? by Bob Johnson

Ophir and Punt by Donald Keith Mills

Reflections on the Writings of Euan MacKie regarding Catastrophism by Phillip Clapham

Homer's *Árktos* – 'Bearly' Polar by Marinus Anthony van der Sluijs

Reflections on Possible Findings of the Black Mat in the UK by Phillip Clapham

Plus **Society News, Bookshelf and Letters**

The Euphrates between Gaziantep and Sanliurfa in Turkey (photo: T. Palmer)

5. A. Gibbons, 'Why 536 was the worst years to be alive', *Science*, 13 November 2018, *www.sciencemag.org/news/2018/11/why-536-was-worst-year-be-alive*.
6. P. Dunbavin, 'Fifteen Year on from *Atlantis of the West*', *C&C Review* 2017:3, pp. 53-55.
7. E. MacKie, 'Radiocarbon Dates for the 18th Dynasty', *SIS Review* II:3, 1978, pp. 95-96; E. MacKie, 'Radiocarbon Dates and Cultural Change', *SIS Review* III:4, 1979, pp. 98-100.
8. E. MacKie, 'Radiocarbon Dating and Egyptian Chronology', *SIS Review* VI:1-3, 1982, pp. 56-62.
9. E. MacKie, 'Can European Prehistory Detect Large-Scale Natural Disasters?', in *Natural Catastrophes During Bronze Age Civilisations*, BAR IS 728, Archaeopress, Oxford, 1998, pp. 169-171. The conference proceedings may also be read online at: http://adsabs.harvard.edu/cgi-bin/nph-abs_connect?bibcode=1998ncdb.conf.

Homer's *Árktos* – 'Bearly' Polar

Marinus Anthony van der Sluijs

In a formula he used on two occasions, Homer characterised the constellation of Ursa, the Bear (*Árkton*; accusative), as circumpolar – daily circling around the celestial north-pole while never dipping 'into the ocean', that is to say, below the horizon:

> … all the constellations with which heaven is crowned – the Pleiades and the Hyades and mighty Orion and the Bear, that men call also the Wain, that circles ever in its place, and watches Orion, and alone has no part in the baths of Ocean [1].
>
> … he watched the Pleiades, and late-setting Boötes, and the Bear, which men also call the Wain, which ever circles where it is and watches Orion, and alone has no part in the baths of Ocean. For this star Calypso, the beautiful goddess, had bidden him to keep on the left hand as he sailed over the sea [2].

Considering that Homer did not mention Ursa Minor, the Little Bear, and that a large portion of Ursa Major, the Great Bear, does set as seen from Greek latitudes, the American classicist Amirthanayagam P. David in an animated discussion deduced that the celestial pole in the time of Homer or his subject matter resided in Ursa Major and not, as it does today, in Ursa Minor. The regular rate of the precession of the equinoxes does not permit this, so that a sudden astronomical pole shift must have separated the condition Homer described from the present [3].

Despite mentioning the precession of the equinoxes, David overlooked the fact that because of this uniformitarian process practically all of Ursa Major *was* circumpolar between the 12th and 6th centuries BC as observed from Greece or Asia Minor [4].

In 700-600 BC, only a tiny segment of the left hind leg would briefly set, but in 1000 BC even this part would never be seen to be cut off by the horizon. In Homer's time, the constellation was only defined by its main asterism, the seven stars of the Plough, Wagon or Big Dipper [5]. This group was unequivocally circumpolar throughout antiquity.

The verity of Homer's words in the light of precession has long been acknowledged by commentators, none of whom David appears to have consulted. Assuming a date of 750 BC for Homer's poems, a 19th-century scholar performed calculations proving that "Clearly in those days the constellation fulfilled the conditions of the Homeric verse in a very different way to what it does now. … Since that date the various stars of the constellation have been gradually increasing their distance from the true or virtual Pole; which, *vice versa*, it may be observed has been gradually approaching the star we call the Pole-star …"[6]. In a monograph which is still a standard textbook today, a more modern authority, the English classicist David Reginald Dicks (1923-2011), noted:

> This is the first reference in Greek to circumpolar stars, i.e. those which do not rise or set at a particular locality but are always visible. … Now, of the seven bright stars of Ursa Major that form the well-known Plough (these were the only ones recognized at this early period as comprising the constellation Arctus …), the most southerly one (η) had in about 800 BC a declination of +64.5º. Greece, in an extended sense including the Aegean islands and the southern coast of the Black Sea, may be taken as lying between latitudes 33º and 43º north, so that the Plough was well within the limit of the circumpolar stars [7].

A standard commentary on Homer of recent date submits:

> The configuration of the stars was not visibly different in antiquity from the present day, but their behaviour was altered by the changing position of the celestial pole about which the stars appear to turn. … Owing to precession

> at the present day the courses of the most southerly stars of Ursa Major pass below the horizon for an observer stationed in Greek latitudes (35º-40º N.) [8].

The notion that the Bears do not set remained a literary commonplace throughout antiquity, perhaps partly on the understanding that Ursa Major does not set in its entirety [9]. The Greek Neo-Platonist Proclus the Successor (AD 412-485) mounted an attack on the theory of the precession of the equinoxes at a rate of about 1º in 100 years, in which he objected that Ursa Major does not partly set as it ought to do if the theory were accurate:

> How is it that the Bears, which have always been visible above the horizon through countless ages, still remain so, if they move by one degree in 100 years about the pole of the zodiac, which is different from the world-pole; for, if they had moved so many degrees as this would imply, they should now no longer graze (*παραξέειν*) the horizon but should partly set! [10]

That Ursa Major was the only constellation to remain permanently above the horizon, as Homer stated, would have been "true of the stars *mentioned* in Homer and Hesiod" [11]. If these were the only stars named and thus 'known' at the time [12], this gives an adequate explanation, which obviates the need for some *ad hoc* solutions suggested in post-Homeric times. For example, Aristotle read the word for 'alone' (*oíē*) as a metaphor for 'best known' [13]. And Strabo, while ignoring the precession of the equinoxes but accepting that Homer was unfamiliar with Ursa Minor, was led to interpret Homer's *Árktos* – presumably in its minimal form of the Plough – as 'arctic circle' (*tòn arktikòn*; accusative) [14]. In refuting Strabo's approach, David did not appreciate that the term 'arctic circle' in Greek astronomy referred to "the circumpolar zone on the celestial sphere" [15], which, varying with latitude, by definition contains stars that do not set [16]. Nevertheless, one can grant David that Homer intended the word to designate the constellation only, even if the term 'arctic circle' historically derived from *Árktos* as a *pars pro toto*.

Finally, David made much of the absence of Ursa Minor from Homer's texts, but in Homer's day Ursa Minor did not include the celestial north pole, but was "about 4º off the pole" [17]. "… the present appearance of the night sky in Greece (or anywhere else) is very different from what the Greeks observed; our Pole Star (α Ursae Minoris), now less than 1º from the north pole, was in Hipparchus' time (150 BC) 12º24′ from it as he himself tells us …" [18]. "When the Greeks looked up at the night sky, what they saw was not what we see today. The most obvious difference is that the star Polaris was not the centre around which the heavens rotated. In Perikles' time Polaris was just another circumpolar star, travelling round in a circle about the celestial north-pole, which at that time lay at a spot unmarked by a star in the sky … So there was no pole *star* as such" [19]. There is, accordingly, nothing surprising in the traditional understanding by ancient and modern scholars alike that the earliest Greeks used Ursa Major as the principal pointer towards the north pole, while the Phoenicians navigated by Ursa Minor, until Thales of Miletus (*c*624-*c*546 BC), who was reputedly himself of Phoenician descent, introduced the concept of Ursa Minor to the Greeks [20]. If Ursa Minor was even then still closer to the pole than Ursa Major, the Greeks' reliance on the latter was simply because their astronomical expertise was cruder than that of their Levantine contemporaries; "As for Ursa Minor, it is impossible to distinguish it immediately when you are unaccustomed to surveying or examining the celestial vault. To detect its position, you require to be forewarned of it …" [21]. Keeping Ursa to the left, as Odysseus was advised to do, simply meant sailing east and was apparently perfectly feasible:

> If he used the northerly stars of Ursa Major as a fixed beacon, a navigator would be off course to the maximum extent of *c*. 13º, hardly a serious matter for a single night's voyage amid the vagaries of wind and current [22].

In conclusion, the astronomical details of Homer's description of Ursa do not present an "incongruity with visible reality" [23], but are entirely consistent with the consensus that the positions of the celestial poles relative to the stars over the past 3000 years or more have changed only due to the precession of the equinoxes, not due to any irregular rapid astronomical pole shift. In antiquity, Ursa Major was circumpolar, not polar. Consequently, Homer's Bear bears no relation to the Greek myth about the sun's midday return to the east in the time of Thyestes [24], the Hebrew legends of Joshua's 'long day' (traditionally mid-15th century BC) and the sudden retreat of the sun's shadow on the sun dial of king Ahaz (late 8th century BC), or the voluminous scientific evidence for a brief geomagnetic excursion around the middle of the 1st millennium BC.

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Notes and References

1. Homer, *Iliad*, 18.485-489, tr. Murray 1999, pp. 322-323.
2. Homer, *Odyssey*, 5.271-275, tr. Murray 1998, pp. 202-203.
3. David 2018, pp. 12-19, 27-29. A change of geographical poles would take Greece into different latitudes, but the north pole's position in Ursa Minor would remain unaffected; compare 2018, pp. 5-6.
4. Vinci (p. 320) fell into the same trap, arguing that Homer's diction would be accurate at a Baltic but not a Greek latitude. Vinci, F., *The Baltic Origins of Homer's Epic Tales; The* Iliad, *the* Odyssey, *and the Migration of Myth* (trs. F. Vinci & A. de Francesco), Inner Traditions, Rochester, Vermont, 2006. See van der Sluijs 2006 for additional critique of Vinci's thesis. For sky simulations, I relied on the computer software programme Stellarium, version 0.12.4 (2013).
5. "Centuries later, the Greek astronomers included many more stars in the constellation of the Great Bear …" Dicks 1970, p. 31. According to Le Boeuffle (1983, p. 155 note 12), this expansion occurred in the time of Eudoxus and Hipparchus. Classical sources include: "Überhaupt bildeten die alten Astronomen alle den Bären nur aus den bekannten sieben Sternen." Hipparchus, *Commentary on the* Phaenomena *of Aratus and Eudoxus*, 1.5.6, tr. Manitius 1894, pp. 46-47; "… later, in connection with the seven stars, … twenty-five were grouped by certain astronomers to complete the form of the Bear, not seven." Parmeniscus (3rd century BC?), in Hyginus, *Poetical Astronomy*, 2. 2, tr. Grant 1960, p. 183.
6. Pearson 1883. Gallenmüller (1884-1885) calculated the shift in positions of the stars respective to the pole between 900 BC and AD 1855, but did not address the 'Homeric question' at hand. To Heath (1913, p. 8 note 2), who did, it was "evident that in Eudoxus's time the whole of the Great Bear remained well above the horizon."
7. Dicks 1970, p. 31.
8. Hainsworth 1992, pp. 276, 278, and as paraphrased in Green 2018, p. 96 note 6.
9. An exhaustive list of *loci* is in Pease 1958, p. 806 note. Examples are Ovid, *Metamorphoses*, 2.171-172; *Tristia* (*Sorrows*), 3.10.3; 4.3.1-6; Cicero, *De Natura Deorum* (*On the Nature of the Gods*), 2.41 (105); Seneca, *Thyestes*, 476-477, 867; Hyginus, *Poetical Astronomy*, 2.1.
10. "pōs gàr aeiphaneis eisin hai Árktoi kaì nyn, apò tósōn dià tósōn etōn tōn émprosthen ousai aeiphaneis, eíper kinountai mían moiran en hekatòn étesi perì tòn tou dià mésōn pólon, héteron ónta parà tòn kosmikón; édei gàr tosaútas ḗdē moíras kinētheísas mēkéti paraxéein tòn horízonta, allà méresin heautōn aphaneis gínesthai." Proclus the Successor, *Hypotyposis Astronomicarum Positionum* (*Outline of Astronomical Hypotheses*), 7.46 (315), ed. Manitius 1909, p. 234, tr. Heath 1913, p. 9 note 2. Heath commented that Proclus should have spoken "with greater caution".
11. Hainsworth 1992, p. 278.
12. *e.g.*, Edwards 1991, p. 213; Scherer 1953, p. 132; Heath 1913, p. 9. Dicks (1970, p. 31) opined that "There is no reason to suppose that Homer was unaware that many other stars also did not bathe in Oceanus."
13. Aristotle, *Poetics*, 25 (1461a).
14. Strabo, *Geography*, 1.1.6 (citing Crates and Heraclitus), tr. Jones 1917, pp. 8-11. According to Heath (1913, p. 61), Heraclitus "called the arctic circle by the more poetical name of 'the Bear', … whereas of course it is the arctic circle, not the Bear itself, which is the confine of setting and rising (i.e. the stars within the arctic circle never set)." Compare Scherer 1953, p. 134: "Der Name des Sternbilds dient schon seit ältester Zeit auch zur Bezeichnung des Nordens …".
15. Hainsworth 1992, p. 278, *cf*. Dicks 1970, p. 31; Jones 1917, pp. 364-365 note 2.
16. "… in Greek latitudes – if these signify at all when it comes to Homer – large parts of the Arctic circle set nightly", David 2018, p. 17.
17. Hainsworth 1992, p. 277.
18. Dicks 1970, p. 15.

19. "About 400 B. C. … the two stars forming the back end of the little dipper could be used as a pointer to the celestial north pole, just as the back end of the big dipper is now used to point to Polaris." Rihll 1999, pp. 66-67; *cf*. Gallenmüller 1884-1885, pp. 2, 9.
20. Callimachus, *Iambics*, Fr. 191, in Diogenes Laertius, *Life of Thales* (1.1), 23; Aratus, *Phaenomena* (*Appearances*), 36-44; Quintus Lucilius Balbus, in Cicero, *De Natura Deorum*, 2.41 (106); Strabo, *Geography*, 1.1.6; Ovid, *Tristia*, 4.3.1-2; Hyginus, *Poetical Astronomy*, 2.2; compare Pliny the Elder, *Natural History*, 7.56 (209). For more references and discussion, see Pease 1958, pp. 807-809 note; Nisbet 1982, p. 49; Hainsworth 1992, p. 278; Rihll 1999, p. 68; Graham 2013, p. 56-58.
21. Davenport Adams 1875, p. 11.
22. Hainsworth 1992, pp. 276-277.
23. David 2018, p. 17.
24. David (2018, p. 27) perceived tension between his alleged Homeric shift of Ursa Major's position and an intimation in Seneca's play *Thyestes* regarding "the descent of the Bear from its vaulted place at the pole", insofar as the internal chronology of Greek myth places Thyestes about a generation before the Trojan War. No such discrepancy exists if Homer's Ursa was where uniformitarian retrocalculation expects it to have been. That aside, however, while David suspected that "Velikovsky seems not to have been aware of the repeated lines from Homer", he himself does not appear to have looked up Seneca. Had he done so instead of blindly relying on Velikovsky (1950, pp. 110-111, *cf*. pp. 217-218, 313-314, 317), he would have realised that, according to the lines in question (867-878), Ursa's fall and other stellar disturbances were not actually stated to have come to pass, but were merely dramatised imaginary consequences – voiced by the chorus – of the actual catastrophe, *i.e*., the sun's sudden return to the east at midday, which threw the world into apocalyptic darkness. The logic espoused by Velikovsky (1950, p. 218) was, at any rate, flawed: "… the Great Bear – or one of its stars – never set beneath the horizon, and thus the polar star was among its stars during the age that came to its end in the time of the Argive tyrants." Circumpolar constellations, of course, do not necessarily include a polar star.

Reflections on Possible Findings of the Black Mat in the UK

Phillip Clapham

I was looking at the archaeology pages on the Archive.Today web-site and flicked onto this page, https://archive.is/zSsqZ, 'Stratigraphy and Paleoenvironmental Sampling'. This was quite revealing as the investigation of the Late Pleistocene and Early Holocene is not something you see mentioned much in geology. However, this is an archaeological report on a survey of The Grove, a former estate but now a golf course, between Watford and the M25 motorway. It was originally part of the much bigger estate of Cassio (now Cassiobury, confined to an area south-west of Watford) and includes the valley of the River Gade (which joins the Colne a short distance away). The valley is where the geological/environmental study was made – on a slope leading down to the river. The Gade, we may note, is a small river as rivers go, but it is one of several rare examples of rivers on the Chilterns plateau and was historically important (because of the palace at Kings Langley for example) and industrially (for a succession of paper-mills in the 19th and 20th centuries). The findings come from three trenches – two on the slope and one on the valley bottom. It provided interesting environmental information for the Late Glacial to early Holocene transition. The sequence runs across the centre and sides of the valley and, as one might suspect, the bottom had a large amount of peat, as well as what the investigators describe as tufa deposits. These appear to be dip-slope deposits (material washed down the slope as a result of heavy rainfall or other environmental factors, such as frost erosion and slope slide).

They are important as they illustrate that what is being investigated is a boggy zone. Trench 1 is in the middle section of the valley. Trench 2 is set over the valley edge and Trench 3, which is of particular interest, was excavated from the valley side and across the valley floor. It was composed of a mixture of clay and gravel-rich sediments (some of them containing chalk from the hillside above) and cold climate periglacial solifluction deposits. These are due to extreme cold causing the chalk to crack and gradually move downwards, a common process on the chalk downs and hills of southern England. I won't go into a description of the solifluction process as you can put the word into a search engine and find all the information necessary, but this is an important part of what was found on the valley bottom (and on the slope). What is important is the discovery of a black organic and silt layer that is defined as belonging to the Late Glacial Interstadial, also known as the Allerød Interstadial (which in popular language is the time of the Younger Dryas event).