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THE PATHS OF THE CELESTIAL BODIES ACCORDING TO ANAXIMENES*

Part I. Discussion of former interpretations and proposal for a new one

Introduction: the cap simile

One of the strangest theories, combined with one of the most enigmatic images in Presocratic cosmology, which have puzzled many scholars, is ascribed to Anaximenes. According to him, it is said, the sun and the other celestial bodies do not go underneath the earth, but move laterally around it like a kind of felt hat (or a turban, or a ribbon)[1] around our head. Anaximenes' theory, as well as the image meant to illustrate it, are mentioned in a report by Hippolytus, *Ref. haer.* 1. 7. 6 = Gr Axs12(6) = TP2 As56 [7.6] = DK 13 A 7 (6):[2]

> (Anaximenes) denies that the heavenly bodies move under the earth, as others suppose, but he says they turn around the earth like a felt cap (πιλίον) around our head (περὶ τὴν ἡμετέραν κεφαλήν). The sun is hidden not by going under the earth, but by being covered by the higher parts of the earth and by being a greater distance away from us.

Aëtius' text, as handed down by Pseudo-Plutarch, mentions the theory, but does not mention the image (Aët. 2. 16. 6. = Gr Axs19 = TP2 As38 = DK 13 A 14):

> Anaximenes [says] the stars revolve not under but around the earth.

And the same holds for Diogenes Laërtius 2. 3 = Gr Axs1 = TP2 As72 = DK 13 A 1:

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* This study was supported by Czech Grant Agency Project, GACR GA15-08890S.

[1] Several possible translations are discussed in Bicknell 1966, 17–18.

[2] All translations of Greek texts are from Graham 2010, occasionally with slight alterations, and unless otherwise indicated. The references are to his book (= Gr), as well as to Wöhrle 2012 (= TP2) and 2009 (= TP1), and Diels, Kranz 1951/52 (= DK).

> (Anaximenes) says that the heavenly bodies do not travel under the earth, but around it.

Finally, two texts that do not mention Anaximenes. The first, by Epicurus, is only recently added to the doxography on Anaximenes (Epicurus, *De nat.* ΙΑ [33] Arrighetti, from *PHerc* 1042. 8. vi = Gr Axs 20, not in DK and TP2, but see 243, n. 2):

> [A polemic against earlier theories:] They construct walls in a circle [around the earth] so that they may screen us against the vortex, as it whirls around outside the earth, and for all those who drive the heavenly bodies around in a circle overhead ([ὑ]π[ὲρ κε]φα[λ]ῆς).

The other is by Aristotle (*Meteor.* 354 a 28–32 = Gr Axs18 = TP2 As4 = DK 13 A 14) and is usually considered as describing the theory of Anaximenes (and others):

> Many of the ancient cosmologists are convinced that the sun does not travel under the earth, but rather around the earth and that (northern) region,[3] and it disappears and causes night because the earth is high toward the north.

In the first part of this article I will discuss two interpretations, namely by McKirahan and Bicknell, which I think are wrong, and offer a suggestion that has the intention to bring the interpretation somewhat further. The history of Anaximenes' theory of the paths of the celestial bodies, from its beginnings in the doxography until the most recent interpretations, is a minefield of misunderstandings, confusions, slips of the pen, mistakes, and even sheer blunders, which must be dismantled to clear the ground for my interpretation.

An example of the difficulties we will encounter can be found already in the last clause of the very first quotation of Hippolytus. That the sun is hidden "by being covered by the higher parts of the earth" has nothing to do with the sun's "being a greater distance away from us". Moreover, for those who believe, like Anaximenes, that the earth is flat, the sun is not far away, but rather nearby, as will be explained in the course of this article. Apparently, Hippolytus wants to display his knowledge of astronomy by stating that the sun is far away. He forgets, however, that this discovery follows from the conception of the earth as spherical and does not hold for a flat earth.

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[3] Graham translates "this region", but meant is the northernly region mentioned just before.

In the second part of this article I will draw some consequences from the results of the first part, and insert a methodological section on the interpretation of texts on ancient cosmology.

McKirahan's interpretation of Anaximenes

Let us start with McKirahan's interpretation, because it shows some of the difficulties that are connected with the interpretation of the paths of the celestial bodies according to Anaximenes. He offers an illustration to clarify his interpretation, shown, slightly adapted, in figure 1.[4] The main modification consists in adding two letters, A and B, which will be explained presently.

McKirahan rightly remarks: "the cap is a handy model, because as it turns, the various points on its surface maintain constant relative positions".[5] However, the model is, says McKirahan, only partially useful, because it "cannot account for all the visible stars (…). Worse, it cannot account for the sun's and the moon's motions".[6] Rather than blaming Anaximenes that his model can account only for some stars one may wonder whether McKirahan's rendition of the cap simile is right. Therefore, let us look more closely at the picture in figure 1 to see the consequences of his interpretation.

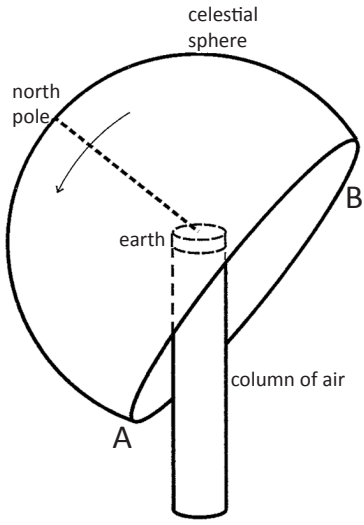

Figure 1. Anaximenes' cosmos according to McKirahan

Under the earth McKirahan draws a column of air, which supports it. This rather strange feature is apparently McKirahan's interpretation of the reports that say that according to Anaximenes the earth because of its

[4] See McKirahan [2]2010, 57.

[5] McKirahan [2]2010, 56. It is strange that McKirahan in his model of Anaximander's universe (*ibid*., 40) does not let the stars move according to the same principle (all in parallel circles) but in impossible curves. Moreover, in the same drawing he lets sun and moon move in impossible orbits as well: around the earth's horizon. Making correct drawings is obviously not McKirahan's cup of tea. In Couprie 1995, 174, I pointed out these flaws as they already occurred in the first edition of McKirahan's book.

[6] McKirahan [2]2010, 56 n. 15.

flatness rides on the air or covers the air below like a lid.[7] This pillar of air is nowhere mentioned in the doxography, but the following quotation is obviously meant as an explanation: "If Anaximenes envisaged the earth as supported on a sea of air, he might have thought that the heavenly bodies, especially the sun, could not pass under the earth without disturbing its serene poise".[8] The problem of how the earth can be thought to rest on air does not concern us in this article, so we will leave it with the remark that the doxograpy says no more than that not only the earth, but also the sun, the moon, and the stars float on air because of their flatness.[9]

A celestial body, being somewhere on the celestial sphere at point A would naturally be called to be *under* the earth, although not exactly perpendicularly under it (where the alleged column of air supporting the earth is supposed to be). They are 'under the earth' in the sense that they cannot be seen from the earth's surface. So McKirahan's picture does not show what it should show, namely that the celestial bodies do not go under the earth. Moreover, looking from the flat earth towards the south in the direction of B, in a big part of the sky there are no stars at all. In order to save his model, McKirahan needs to assume that Anaximenes was not keen enough to realize this.

Another problem of McKirahan's drawing is that the earth is rendered much too small, or, which comes to the same, the distances to the celestial bodies are much too big. For people who think that the earth is flat, the celestial bodies are rather nearby and accordingly rather small. This can be explained with the help of the drawings in figures 2a and 2b.

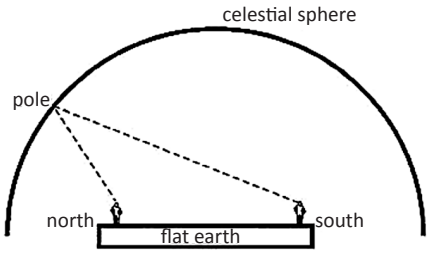

Figure 2a. The distance of the stars on a flat earth

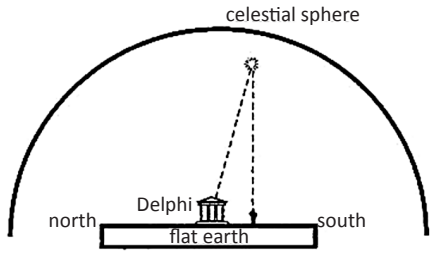

Figure 2b. The distance of the sun on a flat earth

[7] See Ps.-Plut. *Strom.* 3 = Gr Axs11 = TP2 As83 = DK 13 A 6, Arist. *DC* 294 b 13 = Gr Axs13 = TP2 As3 = DK13A20, and Aët. 5. 15. 8 = Gr Axs15 = TP2 As46 = DK 13 A 20.

[8] McKirahan [2]2010, 56.

[9] Cf. Hippol., *Ref. haer.* 1. 7. 1–9 = Gr Axs12 = TP2 As56 = DK 13 A 7.

The farther one goes to the north, the higher the polar stars stand,[10] and the more one goes southward, the lower they stand above the horizon. On a flat earth, the only way to explain this phenomenon is to take for granted that the stars are not far away, as is shown in figure 2a. Similarly, the farther one goes to the south, the higher the sun stands at noon, until one reaches a place where the sun in the sommer solstice stands in the zenith. Again, the only way to explain this phenomenon, when standing on a flat earth, is that the sun (being lower than the stars) must be nearby and accordingly smaller than the earth, as is shown in figure 2b. The Milesians, who traveled from the Black Sea to Egypt, certainly were acquainted with both phenomena. How McKirahan's drawing of the cap simile looks like when the stars are nearby is shown in figure 3.

The gap without stars would be much bigger than in figure 1. Again, in order to save his interpretation of the cap simile, McKirahan needs to assume that Anaximenes did not realize that the heavenly bodies were far away.[11]

So another explanation of the cap simile is called for. Already in 1969, Bicknell has suggested an ingenious interpretation of the path of the celestial bodies according to Anaximenes, which we shall discuss below.[12] In view of the fact that the confusion about the idea of the tilt of the celestial axis will play an important role in the discussion, we will treat this issue first.

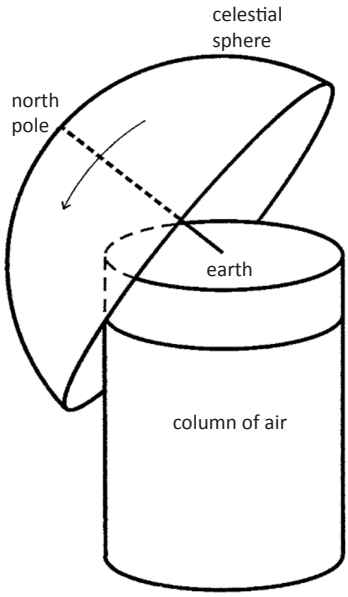

Figure 3. Revised version of Anaximenes' cosmos according to McKirahan

[10] In Anaximenes' time there was not one star (almost) at the celestial pole, as is now the Polar star. People hat to orientate themselves by means of the circumpolar stars, such as the Two Bears.

[11] It might be brought up that, somewhat earlier, Anaximander apparently was not bright enough to understand these phenomena, for in all available interpretations of his numbers the celestial bodies are too far away to account for them. For a more extensive discussion of this issue see Couprie 2011, 134–136. Anaximenes' cap, however, is a three-dimensional image, in which the difficulties show themselves immediately.

[12] Bicknell 1969, 53–85.

The tilted celestial vault of the Presocratics

Most Presocratics believed that the earth is flat. The general idea was that of a disk of a certain height, like Anaximander's column-drum. The edge of the earth was conceived of as a circle, an extrapolation of the circle of the horizon. Strictly speaking, the surface of this cylindrical earth was not conceived of as flat, but as slightly concave.[13] Traditionally, the center of the disk-shaped earth was Delphi, the earth's navel, and the basin of the Mediterranean Sea was the lowest part of the concave surface. Over this flat earth arched the celestial vault, on which the heavenly bodies turn around the celestial axis that ends in the celestial pole. The Greek word πόλος means both the celestial axis and the pole of this axis.[14] On a flat earth, the celestial axis runs through the center of its disk (Delphi), and not through the both poles of the earth as we are used to on a spherical earth.

Greek cosmologists had to face the problem that the celestial axis is not perpendicular to their flat earth. They commonly explained this by the assumption that somehow during the cosmogony the heavens tilted.[15] In the doxography on Anaxagoras, Empedocles, Archelaos, and Diogenes we read reports on an inclination or tilt of the cosmos (κόσμος), the heavens (οὐρανός), the stars (ἄστρα), or the pole (πόλος, ἄρκτοι[16]), which all amounts to the same. This inclination of the heavens makes that the celestial pole is no longer in the zenith, as it allegedly was originally. The relevant texts are:

> (On Anaxagoras) The heavenly bodies (ἄστρα) at first traveled as around a dome (θολοειδῶς), so that the always visible pole[17] (πόλος) appeared at the zenith (κατὰ κορυφήν) above the earth, but later it inclined (Diog. Laërt. 2. 9 = Gr Axg37[9] = DK 59 A 1 [9]).

> Diogenes and Anaxagoras said after the world (κόσμος) was formed and brought forth living things from the earth, the world (κόσμος)

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[13] As regards Anaximander's column drum-like earth, Hahn 2001, 169 ff. and 195–196 has convincingly shown how such drums were made slightly concave by a technique called ἀναθύρωσις. See also Archelaos, DK 60 A 4 (not in Gr), Anaxagoras DK 59 A 42 (5) = Gr Axg38, and Democritus, DK 68 A 94 = Gr Dmc72.

[14] Cf. LSJ s. v. πόλος.

[15] Cf. Furley 1989, 12 n. 32.

[16] See note 19.

[17] Graham translates: "so that the pole always appeared at the zenith", which seems less correct. Cf. Dumont 1988, 616: "le pôle toujours visible". Gershenson, Greenberg 1964, 177, translate: "with the circumpolar constellations forming a cap over the earth". However, the text mentions neither constellations, nor the cap (πιλίον).

somehow spontaneously inclined towards its southern portion[18] (Aët 2. 6. 1 = Gr Axr42 = DK 59 A 67).

Empedocles (says) that (…) the Bears (ἄρκτοι)[19] tilted (…) and accordingly, the whole world (κόσμος) tilted, and the northern parts were raised, the southern lowered,[20] and accordingly the whole world (κόσμος) tilted (Aët. 2. 8. 2 = Gr Emp70 = DK 31 A 58).

(Archelaos) says that the heavens (οὐρανός) are inclined and this is how the sun came to shine on the earth, made the air transparent, and the earth dry. For in the beginning the earth was a marsh, elevated at its periphery and hollow in the middle (Hippol. *Ref. haer.* 1. 9. 4 = DK 60 A 4 [4], not in Gr.).

The successive situations can be visualized as in figure 4a and 4b. Mark that in these pictures the orbits of the heavenly bodies under the earth are not drawn, because only what can be seen from the surface of a flat earth is rendered.

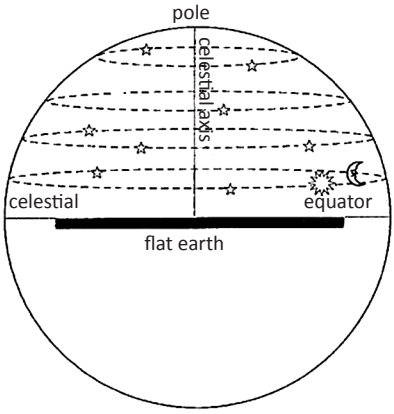

Figure 4a. The original situation of the heavens

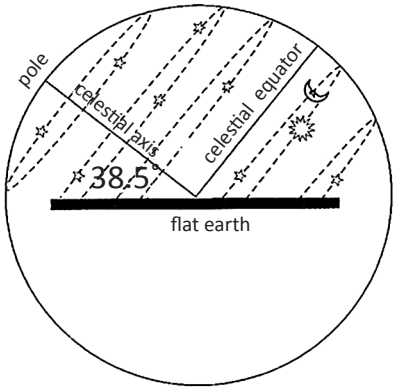

Figure 4b. The present situation after the inclination of the heavens

[18] Below more on this indication of the direction of the tilt.

[19] Graham (and others) translate "poles". Guthrie 1965, 192 n. 1, refers to Arist. *Meteor.* 362 a 32 in defense of this translation. However, ἄρκτοι usually indicates the Great Bear and the little Bear (e. g. Gr Prm56 = DK 28 A 53), and thus refers to the pole that is visible from a flat earth. DK note "ἄρκτους] Nordpol der Erde", which has to be "celestial pole".

[20] See n. 18.

First a few remarks on figures 4a and 4b. On a flat earth, north and south are differently defined than on a spherical earth. South is where the sun stands at noon, and north is the opposite direction. On a spherical earth this is only the case on the northern hemisphere (for the situation on a spherical earth always compare figure 7). On a flat earth the celestial axis runs through its center. According to the quoted texts, the celestial pole, which is the upper end of the celestial axis, stood originally in the zenith (see figure 4a), and later it tilted (see figure 4b). Consequently, originally the plane of the flat earth coincided with the plane of the celestial equator (see figure 4a), but after the tilt of the heavens this is no longer the case (see figure 4b). When we take Delphi as the center of the flat earth, the celestial axis is tilted as much as 51.5° in relation to its original position (see figure 4b).

These remarks may look trivial, but they are essential to understand the misunderstandings with which the rendition and interpretation of the theory of the inclination of the heavens are burdened, both already in the doxography, and in recent commentaries. Most of these misunderstandings are due to a confusion between a flat and a spherical earth as well as between the inclination of the celestial axis and the obliquity of the ecliptic.

One example is the text by Aëtius on Diogenes and Anaxagoras quoted above. It says that the cosmos is "inclined towards its southern portion". Seen from a flat earth, the southern portion of the heavens is where the south lies. But Figure 4b shows that the cosmos is inclined towards the north. The misunderstanding originates from the concept of a spherical earth. Standing on the northern half of a *spherical* earth one might say that the cosmos (and the earth itself together with it) is inclined towards its southern portion (see figure 7), but this makes no sense when standing on a *flat* earth. Another example is Aëtius' text on Empedocles. It is said that the northern parts of the cosmos were raised, and the southern lowered. As is clearly shown in figure 4b, it must be the other way round: the northern part of the heavens is lowered and the southern part raised. Yet another one of these misunderstandings that, I will argue, has led to a wrong interpretation of Anaximenes, is discussed in the next section on Leucippus and Democritus.

The original situation of the heavens (figure 4a), with the pole in the zenith (κατὰ κορυφήν), the heavenly bodies circling in paths parallel to the celestial equator and the sun and the moon low above the horizon, is the same as what we would see standing on the north pole of our spherical earth.[21] Some ancients even seem to have understood the consequences

[21] Cf. Wöhrle 1993, 73; Bicknell 1969, 77; Heidel 1933, 122.

of the original situation, for in the quoted text on Archelaos we read that, before the tilting of the heavens, the sun, circling around the horizon, did not shine at all upon the earth because it was invisible behind the raised edges of the concave earth. If the earth originally would have been completely flat (as drawn in figure 4a), night and day would have lasted half a year, just like on the poles of a spherical earth.

The allegedly tilted earth of Leucippus and Democritus

Sometimes, in the doxography on Leucippus and Democritus, it is not the heavens that have been tilted, but the earth. The relevant texts are:

> (Leucippus held the view of) <…> the earth's being tilted toward the south (Diog. Laërt. 9. 33 = Gr Lcp47[33] = DK 67 A 1[33]).

> Leucippus (says) the earth tilts towards the south (Aëtius, *Placita* 3. 12. = Gr Lcp76 = DK 67 A 27).

> Democritus (says) (…) as the earth grew it tilted toward the south (Aët. 3. 12. 2 = Gr Dmc77 = DK 68 A 96).

The successive situations can be visualized again:

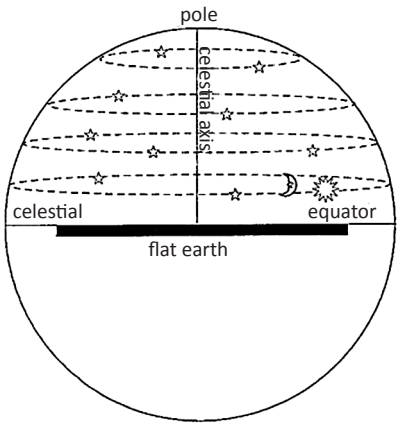

Figure 5a. The original situation of the heavens

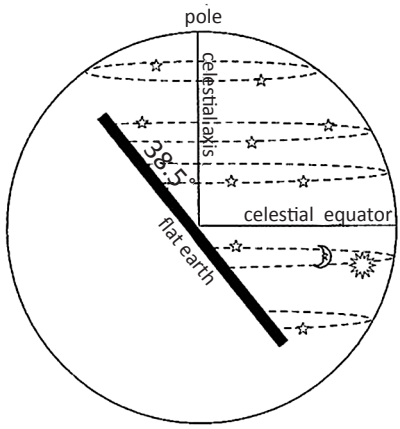

Figure 5b. The present situation after the alleged dip of the earth

In the first quoted damaged text Graham inserts, following Diels' suggestion, "the oblique path of the ecliptic results from". There is no good reason for this emendation. The obliquity of the ecliptic has as such

nothing to do with the inclination of the celestial axis on a flat earth, nor with the alleged dip of the earth. The obliquity of the ecliptic in relation to the celestial equator in the supposed original state (figure 5a) is exactly the same as in the present situation (figure 5b): about 23.5°. This means that the oblique path of the ecliptic is not the result of the earth's tilting towards the south. Actually the confusion between the tilt of the heavens and the inclination of the ecliptic on a flat earth is one of the main sources of misunderstanding both in the doxography and in the literature on ancient Greek cosmology. I will, however, not burden this article with its discussion.[22]

As we have seen, the inclination of the celestial axis on a flat earth is 38.5° in relation to the earth's surface. This results in an alleged dip of the earth of 51.5° (see figure 5b). I will postpone a further critical discussion of the relevant texts until after an exposition of how Bicknell used them in his interpretation of the paths of the celestial bodies according to Anaximenes.

Bicknell's interpretation

To begin with, Bicknell says that "Leucippus and Democritus (…) *indisputably* held that *the earth* was tilted *towards the north*".[23] The last words must be a slip of the pen, as the texts explicitly say that the earth was tilted towards the south (which means that the northern part was lifted). What the word "indisputably" is worth we will see in the next section.

Although the sources do not mention it, Bicknell suggests that Anaximenes, just like Leucippus and Democritus, held the idea of a tilted earth, and he maintains that this explains the way Anaximenes described the paths of the celestial bodies. Bicknell expresses this in rather cryptic wordings. After a description of Anaxagoras' theory of the inclination of the heavens, he writes: "The alternative (to Anaxagoras' theory, D. C.) was to assert that in fact the heavenly bodies *did* orbit daily in paths parallel to the equatorial plane which intersected one of the diameters of an earth tilted upwards in the north (this time the expression is right, D. C). The earth's obliquity to the celestial equator would correspond exactly to the observed obliquity of the paths of the luminaries to the plane of the horizon. This, I suggest, was exactly the view of Anaximenes".[24] Kirk makes a similar suggestion: "This tilting (of the earth, D. C.) would

[22] See chapter 5, *The Riddle of the Celestial Axis* in Couprie 2011, 69–78.
[23] Bicknell 1969, 78 (my italics).
[24] Bicknell 1969, 78.

explain how the stars could set, supposing that they are somehow fixed in the heaven: they rotate on the hemisphere (whose pole is in the Wain) and pass below the upper, northern edge of the earth but not below its mean horizontal axis".[25]

Without an explanatory picture, these lines remain rather cryptic. Fortunately, Wöhrle has explained and drawn what Bicknell (and Kirk) meant, and this is shown in figure 6: the paths of the celestial bodies go *behind* (on the picture: to the left of) the earth and not *under* the earth.[26] We will return to Bicknell's interpretation, but this much can already be remarked here: on the picture the heavenly bodies perhaps can be said to pass behind the earth, but for the people living on the slanted earth the setting celestial bodies still pass under the earth (see figure 6).

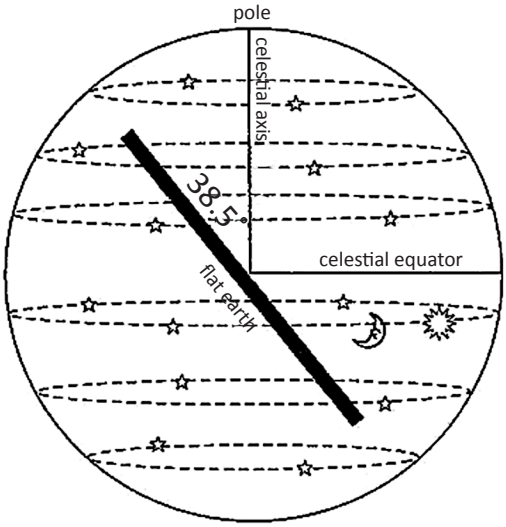

Figure 6. Leucippus' and Democritus' cosmos according to Bicknell. Here the full orbits of the heavenly bodies are rendered in order to show what Bicknell meant.

[25] Kirk, Raven, Schofield [2]2007, 157. On the same page, a characteristic confusion appears, when the tilting of the flat earth is ascribed to Anaxagoras, Leucippus, and Diogenes. Anaxagoras and Diogenes taught the inclination of the heavens, not of the earth.

[26] Cf. Wöhrle 1993, 74–75.

Critical notes on the alleged dip of the earth

Zeller already uttered doubts about the alleged dip of the earth: why doesn't all the water of the earth accumulate in the southern regions?[27] Other authors, and more recently Wöhrle, have raised similar questions: why don't people have the slightest awareness of living on an earth tilted that much?[28] They also point to the following texts:

> Anaximenes, Anaxagoras, and Democritus say flatness is the cause of [the earth's] staying in place. It does not cut, but covers the air like a lid. (Arist. *DC* 294 b 13–21 = Gr Axs13 = TP2 As3 = DK 13 A 20).
>
> (…) the earth was formed first, being completely flat. Therefore it makes sense that it should float on air. (Ps.-Plut. *Strom.* 3 = Gr Axs11 = TP2 As83 = DK 13 A 6).
>
> Anaximenes [says] owing to its flatness the earth floats on air. (Aët. 5. 15. 8 = Gr Axs15 = TP As46 = DK 13 A 20).
>
> The earth is flat riding on air. (Hippol. *Ref. Haer.* 1. 7. 1–9 = Gr Axs12 = TP2 As56 = DK 13 A 7)

It is hard to see how these texts can be brought into agreement with a tilt of earth of 51.5°. Moreover, when Aristotle speaks of Anaximenes and Democritus, he mentions them in one breath with Anaxagoras, who definitely did not teach a dip of the earth, but an inclination of the heavens. Aristotle wrote a book on Democritus, which is now lost.[29] Had he known of such a strange theory of an inclined flat earth, he would certainly have mentioned it in this connection.

In the usual interpretation, the idea of a dip of the earth is treated as just another way of expressing the inclination of the heavens: the visual effect of an inclination of the heavens towards the north amounts to the same as a dip of the earth towards the south; it is a question of relativity whether you express it this way or that way.[30] Leucippus and Democritus, one might say, turned the tables and held that not the celestial axis, but

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[27] Zeller, Nestle [6]1920, 1108 n. 6.

[28] Wöhrle 1993, 75. See also Kirk, Raven, Schofield [2]2007, 157.

[29] Cf. Simpl. *In Arist. DC* 294. 33 = Gr Dmc12 [F5] = DK 68 A 37. See also Dicks 1970, 82.

[30] So, e. g., McKirahan [2]2010, 56: "The north part of the earth is tilted toward the celestial pole, or rather the celestial pole is tilted toward the north part of the earth". When he adds: "This tilt could be the source of calling the northern parts of the earth 'higher'", this might hold for the alleged dip of the earth, but not for the dip of the heavens.

the earth was tilted, like in an analogous way Copernicus said that the sun does not orbit around the earth, but that the earth orbits around the sun. I think looking at it this way is untenable. The original problem was that the axis of the heavens is observably not perpendicular to the flat earth. An acceptable solution to this problem was already given by the theory of the inclination of the celestial axis. Why should Leucippus and Democritus have defended another theory that yielded such extra problems? Copernicus had his reasons for opposing the Ptolemaic system, but I cannot imagine which reasons could have prompted Leucippus and Democritus to reject the theory of the tilted heavens and replace it by the theory of a tilted earth.

If the atomists really had defended it, we would expect that a view like the dip of the flat earth would have been concluded by something like: "and this is why the celestial pole is not in the zenith". Instead, when we read the texts more carefully, Leucippus and Democritus do not seem to be bothered with this problem, but with climatologic questions. Diogenes Laërtius' and Aëtius' quoted texts on Leucippus go on as follows:

> (<…> the earth's being tilted toward the south.) The region toward the north is always snowy, cold, and frozen (Diog. Laërt. 9. 33 = Gr Lcp47[33] = DK 67 A 1[33]).
>
> (the earth tilts towards the south) because of the rarity [of the air] of the southern regions, whereas the northern regions are compacted because they are frozen by frosts, while the contrary regions are fiery (Aët. 3. 12. 1 = Gr Lcp76 = DK 67 A 27).

And before and after the earlier quoted text on Democritus we read:

> Democritus [says] because the southern part is weaker than its surroundings, (as the earth grew it tilted toward the south). For the northern regions are intemperate, the southern temperate; hence this region is heavy, where there is a greater abundance of flora, as a result of the growth (Aët. 3. 12. 2 = Gr Dmc77 = DK 68 A 96).

It is unthinkable that according to Democritus the 51.5° dip of the earth is caused by a greater abundance of flora on the southern part. Leucippus and Democritus probably said something about the various climates on their flat earth, and connected this with the inclination of the celestial axis, which results in the sun making the southern parts hotter and the northern parts colder.

I think the confusion originated with the doxographers, who were acquainted with the sphericity of the earth and with the inclination of the ecliptic, which can also be described as an inclination of the *spherical*

earth in relation to the plane of the ecliptic (see figure 7).[31] They confused this with the inclination of the celestial pole on a *flat* earth in relation to the earth's surface and thought that this could be described as a dip of the earth as well.

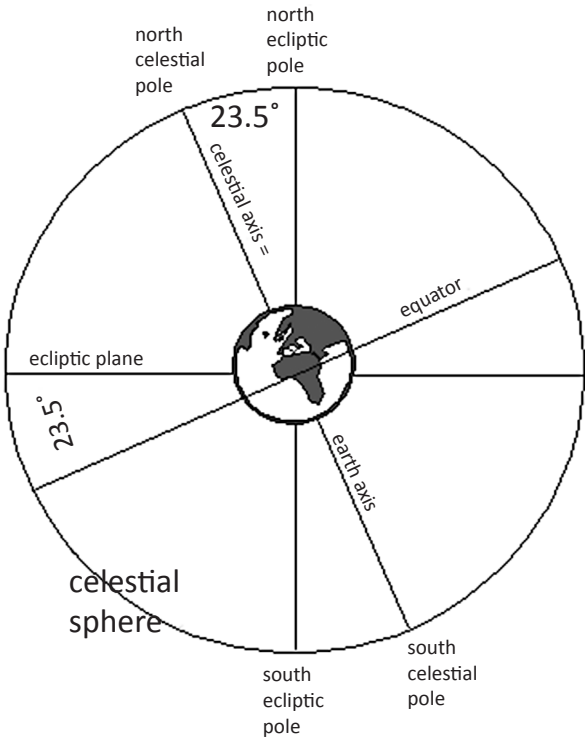

Figure 7. The spherical earth and the celestial sphere are inclined 23.5° in relation to the plane of the ecliptic

For these reasons I think that the reports on the so-called dip of the earth are mistaken and that the atomists, just like other Presocratics, taught an inclination of the *heavens*. The reader may understand this section as an elaboration of Kirk's casual remark that in this matter possibly Leucippus was misinterpreted later.[32]

[31] This is the way we are used to put globes: tilted by 23.5°.

[32] Kirk, Raven, Schofield [2]2007, 157 (not Anaxagoras as well, to whom Kirk here wrongly ascribes the theory of the dip of the earth. Perhaps this is a slip of the pen and we have to read 'Democritus' instead of 'Anaxagoras').

Critical notes on Bicknell's interpretation

Bicknell's exposition is also not free from the confusions mentioned above. He starts his discussion of the paths of the heavenly bodies according to Anaximenes with the remark: "If the early Ionian thinkers made *the obvious assumption* that the surface of the flat earth at the centre of the universe coincided with the plane of the *celestial equator*, the facts of observation would be in blatant contradiction with preconceptions based on theory".[33] There is, however, no reason at all why this should be an obvious assumption. It only holds for a *spherical* earth that the plane of the earth's equator is also the plane of the celestial equator. The situation of the early Ionians is represented in figure 4b, in which the celestial equator does not coincide with the plane of the earth.

Moreover, it is a little noticed fact that the Ionians did not speak of the celestial equator (ὁ ἰσημερινὸς κύκλος). Perhaps they did not even know the concept. The expression is used only once in the doxography on the Presocratics, in a text on Thales that is certainly unreliable, as it is a typical example of the habitude ascribing to Thales all kinds of discoveries and knowledge.[34] The reason for this silence is probably that the concept of the celestial equator, which is a projection of the terrestrial equator out into space, is linked to the discovery of the sphericity of the earth. On a flat earth there is no terrestrial equator in the same sense of the word. That which can be called the "Ionian equator" is not a circle, but the diameter of the flat earth which divides it in a northern and a southern half. This line can be thought to run from the Pillars of Hercules, through Delphi and probably through Miletus.[35] The ancient Ionians did not speak of a celestial equator, but they spoke of the celestial pole or the celestial axis, around which the heavenly bodies orbit. When in figures 4, 5, and 6 and in their explanation I used the expression "celestial equator" and drew it, this was mainly to make things clear to the present-day reader. Even Plato does not use the expression "celestial equator" when he describes in the *Timaeus* the circle that represents the movement of the Same, although he was acquainted with the sphericity of the earth. Aristotle still uses it once (*Meteor.* 345 a 3), but only to indicate the location of a comet.

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[33] Bicknell 1969, 77–78, my italics.

[34] Aëtius, *Placita* 2. 12. 1 = DK 11 A 13 c, not in Gr, and the part relevant here not in TP1 156 as well. O'Grady 2002 doesn't even mention this text.

[35] See Heidel 1937, 20 and 53–54. Cf. chapter 6, "The First Map of the Earth", in Couprie 2011, 79–86.

What Bicknell mentions as an obvious assumption is what the Presocratics, confronted with the riddle of the tilted celestial axis, offered as an explanation: *originally* the celestial axis was perpendicular to the earth (and thus the surface of the flat earth coincided with the plane of the celestial equator, see figure 4a), but later the celestial axis tilted. Bicknell's strange definition of the problem also leads to an even more strange formulation of Anaxagoras' solution: "The heavenly bodies, he held, had *once circled on paths parallel to the celestial equator* (…). Later (…) Nous had given the celestial movements their presently observed obliquity".[36] This sounds as if in the present situation the heavenly bodies no longer circle parallel to the celestial equator, which is nonsense. The consequence of what Anaxagoras (and others) meant was, of course, that when the heavens tilted, the celestial equator, which originally was situated in the plane of the surface of the flat earth, went with it.

The same strange idea recurs in Bicknell's rendition of Leucippus' and Democritus' alleged idea of a tilted earth: "(…) the heavenly bodies *did* orbit daily in paths parallel to the equatorial plane *which intersected one of the diameters* of an earth tilted upwards in the north (…)".[37] That the equatorial plane intersects one of the diameters of the flat earth is, however, not a distinctive feature of the alleged theory of a dip of the earth (see figure 5b), for this is also the case when the heavens are tilted, as Anaxagoras and others held (see figure 4b). In both cases this diameter is what Heidel called the "Ionian equator".[38]

For his interpretation, Bicknell refers to Aristotle's quoted text from *Meteor.* 354 a 28–32. When we read this text in its context, there is no trace of a reference to a dip of the earth. All Aristotle says is "that the earth is high toward the north". Kirk already remarked: "Yet attractive as this interpretation (a dip of the earth ascribed to Anaximenes, D. C.) is, it is made very doubtful by [the text in *Meteorologica*]; here Aristotle refers to the theory of higher parts", and Kirk continues: "but his context, which is concerned with showing that the greatest rivers flow from the greatest mountains, in the north, makes it quite clear that he understands 'the earth being high to the north' to refer to its northern mountain ranges", the mythical Rhipaean mountains.[39] Bicknell's "logical supposition (…) that (…) Aristotle alludes to the slanted earth theory and that the thinkers he has in mind are Anaximenes and the two atomists who therefore held

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[36] Bicknell 1969, 78, my italics.
[37] Bicknell 1969, 78, second italics mine.
[38] See note 35.
[39] Kirk, Raven, Schofield [2]2007, 157.

that the world's greatest rivers flow down from the north of their tilted earth"[40] is not so logical after all. The Presocratics were acquainted with the existence of the great river Nile, flowing from south to north. The alleged dip of the earth would have meant that the Nile streams uphill against a slope of 51.5°. At the end of this part of the article I will come back once more on Aristotle's text.

From the arguments in the preceding and present sections I conclude that there did not exist a Presocratic theory of a dip of the earth and that, consequently, we will have to discard Bicknell's interpretation of the path of the heavenly bodies according to Anaximenes as well.

A new interpretation

Having discarded the idea of a dip of the flat earth as a possible interpretation, the unattractive alternative seems to remain that Anaximenes fell back to the ancient mythological stories that "told how the sun, when he set in the west, was carried round the encircling stream of Ocean in a golden boat to rise in the east again".[41] This image, which entails a double bend in the paths of the heavenly bodies, at their rising and setting, is of a certain naivety, as Wöhrle dryly remarks.[42] Anaximenes was a fellow townsman of Anaximander, who taught that the heavenly bodies turned like wheels, and passed under the earth. It is hard to believe that Anaximenes would have fallen back into the archaic world picture. There is one other possibility, however. We may acknowledge that the idea of an inclination of *the heavens* to explain the tilted position of the celestial axis, as promoted by the Presocratics, is probably old and can be linked to Anaximenes as well. The reports on his theory of the paths of the heavenly bodies and the image of the felt cap, I think, do not concern the *actual* situation of the heavens, as Bicknell and others supposed, but the *original* state before the inclination of the heavens (see figure 4a).

Figure 4a, which depicts not the present but the original situation, makes perfect sense as an illustration of Anaximenes' image of the heavenly bodies turning around the earth like a felt cap around our head. Wöhrle already seems to acknowledge this. After comparing the *original* situation on a flat earth with the situation on the north pole of a spherical earth, he concludes "(damit) dreht sich natürlich das ganze Himmelsgewölbe – wie

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[40] Bicknell 1969, 78–79.
[41] Guthrie 1962, 138.
[42] Wöhrle 1993, 74.

eine Kappe um den Kopf".[43] The same idea of the celestial bodies turning around our head as in figure 4a is also invoked in the image of a millstone turning around horizontally:

> [on the cosmos] some held that it turns around (περιδινεῖσθαι) like a millstone (μυλοειδῶς), others like a wheel (τροχός) (Theodoret. *Graec. aff. cur.* 4. 15–16 = TP2 As112 = Ar135 = DK 13 A 12, not in Gr).

Diels, followed by other scholars, maintains that Anaximenes (millstone) and Anaximander (wheel), respectively, are meant, and that the clause is about the cosmos, and I think they are right. According to Wöhrle, however, the text is about the earth. In this he cannot be right, because the word περιδινεῖσθαι clearly has to do with the cosmos, and τροχός is Anaximander's word for the heavenly bodies. Anaximander's celestial wheels are said to be slanted,[44] which accounts for the present stuation (see figure 4b). A millstone turns horizontally, like the celestial bodies in the original situation before the inclination of the heavens (see figure 4a).

Another indication might be found in Epicurus' quoted text, where there is talk of "walls in a circle [around the earth]". This reminds us of another earlier quoted text where Hippolytus says that according to Archelaos, before the tilting of the heavens the sun circled around the horizon and did not shine upon the earth because it was invisible behind the raised edges of the concave earth. In the same sense we may read the last part of Hippolytus' text on Anaximenes, in which the image of the felt cap appears: "The sun is hidden (…) by being covered by the higher parts of the earth". There is no intrinsic reason to think that Hippolytus is hinting only at the northern mountains instead of at the higher periphery of the concave earth as a whole. In that case both Hippolytus and Archelaos describe the original situation before the heavens tilted.

An obvious objection against my interpretation is that the quoted texts on Anaximenes speak about the present and not about the original situation. Nevertheless, I would suggest that the doxographers, being acquainted with the sphericity of the earth, no longer understood what Anaximenes, speaking of the origin of the tilt of the heavens, really meant. As said before, the misunderstandings about the inclination of the celestial axis were (and are) widespread. I think we can even identify one source of the confusion. The texts of the doxographers on the paths of

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[43] Wöhrle 1993, 73.

[44] Aët. 2. 25. 1 = Gr Axr25 = TP2 Ar151 = DK 12 A 22. Anaximander's slanted celestial bodies can best be understood as another expression for the tilt of the heavens.

the heavenly bodies according to Anaximenes look as if they go back to Aristotle (*Meteor.* 354 a 28–32), also quoted above. For clarity's sake I will quote it once more:

> Many of the ancient cosmologists are convinced that the sun does not travel under the earth, but rather around the earth and that (northern) region, and it disappears and causes night because the earth is high toward the north.

Remarkably, Aristotle speaks of "*many* of the ancient cosmologists". If there has not existed such a thing as a theory of the dip of the earth, as argued above, Aristotle cannot have meant Leucippus and Democritus, as Bicknell thought. This would make Anaximenes the only remaining candidate for the "many ancient cosmologists", which is a little bit few. When we try to read Aristotle's text with an eye, unbiased by how Diels wants us to read it, I think that Aristotle is not referring to Anaximenes, but to the "pre-philosophical world-picture, where the sun floats (at night, D. C.) round river Okeanos to the north".[45] An indication is perhaps that he doesn't speak of ἀστρολόγοι, but of μετεωρολόγοι. Of course in this archaic conception there must be mountains to hide the sun on its journey around the north. If this interpretation is right, Diels was not the first to make the mistake to list it as a report on Anaximenes, and Bicknell was not the first to read Aristotle's words on the high northern parts of the earth as if they were about a strange theory of a dip of the earth. The doxographers made the same mistakes, and thus a description of the archaic idea of the sun being carried round the north behind the northern mountains became a theory of a dip of the earth, which does not make sense on a flat earth like that of Anaximenes, Leucippus, and Democritus.

Part II. Consequences and methodological remarks

After the tilt of the heavens

In the first part of this article I argued that Anaximenes' cap simile was meant to illustrate the original situation of the heavens, before the tilt of the celestial axis. The next legitimate question is: how does the present situation of the heavens, after the tilt of the celestial axis, look like according to Anaximenes? Perhaps one would expect a picture, where the 'cap' is first right and then slanted:

[45] Kirk, Raven, Schofield [2]2007, 156, see also 12–13.

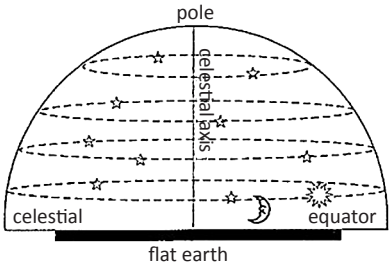

Figure 8a. The original situation of the heavens (the cap simile)

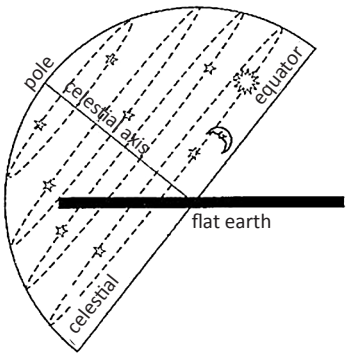

Figure 8b. The present situation after the inclination of the heavens (slanted cap)??

Figure 8b looks very much like McKirahan's rendition of the cap simile, which I criticized because it leaves a big gap without stars at the southern part of the heavens. This means that figure 8b cannot be considered as an accurate rendition of the situation after the tilt of the heavens.

In my opinion, Anaximenes, elaborating on Anaximander's slanted celestial wheels, tried to imagine the original situation before the tilt of the heavens. As argued in part one of this article, I disagree with Bicknell's interpretation of the cap simile on two important points. In the first place, Bicknell speaks of a dip of the earth instead of a tilt of the heavens. In the second place, according to Bicknell the cap simile pictures the situation *after* the alleged dip of the earth, whereas according to me the cap simile illustrates the situation *before* the tilt of the heavens.

To be more precise, I think that Anaximenes' cap simile was meant to illustrate what a person *would have seen* if he had been present on the surface of the flat earth before the tilt of the heavens. As he would have seen only that part of the heavens which is above the surface of the flat earth, what is below that surface is not rendered. This is what pictures 8a and 9a (as well as 4a and 5a in the first part of this article) show. It is the same as what a person who is at the north pole of a spherical earth sees, as was already stipulated in the first part of this article. In other words, the cap simile is not meant to illustrate the universe as such, but only the situation *before* the tilt of the heavens, *as seen* by someone who stands on the earth's flat surface. What an observer on a flat earth sees in the situation *after* the tilt of the heavens, is the slanted orbits of the celestial bodies as rendered in figure 9b, and of course not as rendered in figure 8b,

with the gap without stars above the southern horizon. In the first part of this article I already remarked: "Mark that in these pictures the orbits of the heavenly bodies under the earth are not drawn, because only what can be seen from the surface of a flat earth is rendered".

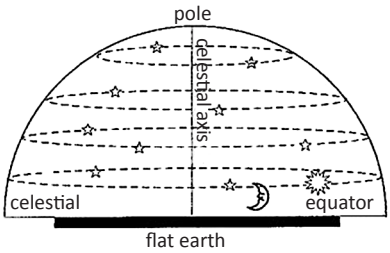

Figure 9a. What an observer would have seen before the tilt of the heavens (the cap simile)

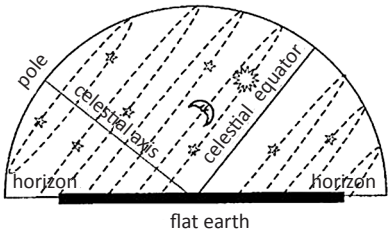

Figure 9b. What an observer sees after the tilt of the heavens (the present situation)

The celestial sphere

However, when a person, standing during the winter on the north pole of the spherical earth, tells us that the stars do not set but turn around his head, this does not mean that he believes that there are no stars under the horizon, but only that he cannot see those stars. Similarly during the summer, when he tells us that the sun does not set but turns around his head, he does not mean that when it is winter there is no sun under the horizon, but only that then the sun is invisible. The implication of figures 8a and 9a is not that in the situation before the tilt of the heavens there are no celestial bodies under the flat earth, but only that they cannot be seen. When we draw, in the original situation before the tilt of the heavens, the paths of the stars under the earth, which are invisible to someone living on the surface of the flat earth, the picture looks like figure 10a. And when we let the celestial axis tilt, we get figure 10b. These pictures (10a and 10b) exemplify, according to me, Anaximenes' conception of the cosmos.

I think that figures 8a and 9a give a fair rendition of Anaximenes' cap simile, and that figures 10a and 10b are a fair rendition of Anaximenes' conception of the heavens. Yet these pictures seem to be at odds with the testimonies in the doxography, which say that according to Anaximenes the celestial bodies do not go under the earth. So I have to explain why I think that according to Anaximenes the celestial bodies go under the earth as well, although the doxography seems to attest the opposite.

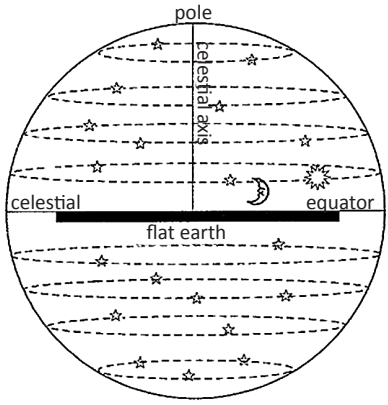

Figure 10a. The original situation of the heavens

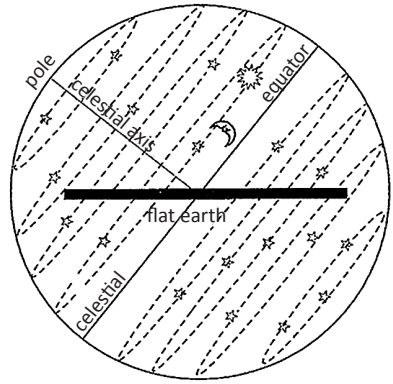

Figure 10b. The present situation after the inclination of the heavens

Methodological remarks

In order to make my position clear a methodological digression is needed. Somewhere in his newest book, Daniel Graham accuses me of trying "to impeach the sources", which he calls "dubious methodology at best, since the sources provide the only ground we have to stand on".[46] Graham's criticism concerns my interpretation of Anaxagoras' measurement of the sun and the moon, but I guess that he would say the same thing as regards my interpretation of Anaximenes as defended in this article. So let me explain my methodology somewhat more, so that the reader may decide for himself whether it is dubious or not.

When studying the texts on ancient Greek cosmology we must realize that the sources are *not* the only ground to stand on. The cosmological conceptions of the early Greek philosophers were not just abstract ideas, they were ideas about the earth and the heavenly bodies. Together these ideas made up their world picture. The most striking feature of this world picture was that the Presocratic cosmologists (or at least most of them) believed that the earth is flat, floating in the center of the cosmos. In order to really understand what it must have been like to live on a flat earth, we need what I once called a 'mental gymnastics'. Or, to formulate it otherwise, what we need is a methodological tool that allows us to imagine what it must have been to live with the conviction that the earth is flat. We need an interpretative tool that allows us to understand the paradigm

[46] Graham 2013, 147.

of a flat earth. I hinted at this tool when it came to the understanding of Anaximander's cosmological achievement: "(…) we have to place ourselves both into the archaic way of thinking and into the thought of those who developed the new world-picture, and especially into that of Anaximander. Accordingly, we have to suspend our own world-picture, as we have to learn to look 'with Anaximander's eyes'".[47] When we want to understand the flat earth cosmology of the ancient Greeks, we must accomplish a kind of retrograde paradigm switch.

This methodological tool is akin to what I, in *Earth and Heaven in Ancient Greek Cosmology*, called 'creative imagination', which generates a new world picture. It is worth the while to quote what I wrote there: "Anaximander's cosmology was not descriptive astronomy, but *speculative* astronomy. Speculative astronomy or cosmology is the product of (…) 'creative imagination'. Creative imagination is quite something other than fantasy. (…). Fantasy creates things or images that do not help in understanding the celestial phenomena, but rather adapts them to a preconceived idea. Creative imagination, on the other hand, puts known empirical data into a new interpretative arrangement that helps us to understand the phenomena".[48] To create a new cosmological paradigm, as Anaximander did, is an effort of creative imagination, and the same holds for the conception of the sphericity of the earth, initiated by Aristotle and others. In order to understand ancient Greek cosmology, before the discovery of the sphericity of the earth, we must use retrograde creative imagination to re-create the speculative astronomy of the flat earth. We can achieve this by suspending all we know of the spherical earth and the concepts that belong to it.

We tend to think there cannot be a problem in understanding the world-picture of ancient people who believed, or did not know better than, that they lived on a flat earth. It is not so easy, however, to really appreciate the true impact of that ancient world picture and to look at the earth and the heavens with Presocratic eyes. The conviction that the earth is flat yields surprising consequences for cosmology, climatology and time-measuring. For instance, when the earth is flat the celestial bodies are not at enormous distances from us, but on the contrary very close to the earth. A flat earth is divided in a northern, colder, and a southern, warmer half. On a flat earth it is always everywhere the same time of the day. That a retrograde paradigm switch is not so easy to achieve is shown by the fact that there is hardly any area of the study of ancient

[47] Couprie 2011, xxiv.
[48] Couprie 2011, xxxi, see also Couprie, Pott 2002, 58.

Greek philosophy that is so full of anachronistic misunderstandings and misinterpretations. An anachronism is nothing but a manifestation of our inability to put ourselves in the position of those early thinkers. Many an author on early Greek cosmology, both in ancient and in recent times, has fallen into this pitfall. This means that the doxographic reports on ancient Greek cosmology must be studied with the awareness that they can contain anachronistic features. Generally speaking, supposing that something has gone wrong in the tradition is a bad ad hoc recourse in the interpretation of ancient texts. When it can be shown, however, that similar mistakes occur frequently and systematically, that they are akin to mistakes made by modern authors, and that they are due to a confusion of how things are on a flat and on a spherical earth, it is allowed to suppose that the tradition of ancient cosmology is not always free from anachronism. In this way, the interpretative tool of creative imagination allows us to re-create the ancient world picture and thus to understand the available cosmological texts, to recognize anachronisms in the doxography and to avoid the pitfalls of anachronism in interpreting these texts.[49]

Conclusions about Anaximenes' cosmology

And now back to Anaximenes. Anaximenes was a younger co-citizen of Anaximander, who was the first, as far as we know, who taught that the celestial bodies make full circles and thus go under the earth as well. This as such already makes us look with some suspect at reports saying that Anaximenes held that the celestial bodies do not go under the earth. Moreover, Anaximenes suggested an alternative solution for the main problem why the earth does not fall, which Anaximander could not loose or for which he only offered a purely logical argument (if we may believe the sources on this point). Instead, Anaximenes put forward a physical argument:

> Anaximenes (…) say[s] that flatness is the cause of [the earth's] staying in place. It does not cut, but covers the air like a lid (Aristot. *DC* 294 b 13 ff. = Gr Axs13 = TP2 As3 = DK 13 A 20).

and

> Anaximenes [says] owing to its flatness it floats on air (Aët. 3. 15. 8 = Gr Axs15 = TP2 As46 = DK 13 A 20).

[49] In my forthcoming book *When The Earth Was Flat* I have planned to systematically investigate the numerous distinctive features of the concept of a flat earth, as well as to discuss several examples of anachronistic misunderstandings and misinterpretations, both in ancient and in modern authors.

This looks rather as an attempt to strengthen the new world-picture than as a relapse into archaic notions. Moreover, another report says:

> Anaximenes [says] the stars are fixed like nails to a crystalline surface so as to form constellations (Aët. 2. 14. 3 = Gr Axs17 = TP2 As38 = DK 13 A 14).

This can only mean that Anaximenes understood this crystalline surface as a sphere with the earth in the center. In any other interpretation the movements of the stars become completely incomprehensible. If this is right, he also cannot have meant that the sun does not go under the earth, for the orbit of the sun in its daily movement is parallel and similar to the daily movement of the stars.

When it is maintained that "the sources provide the only ground we have to stand on", one is at a loss, because those who hold that Anaximenes taught a hemispherical firmament in which the heavenly bodies do not go under the earth must necessarily consider the report that the stars are like nails in the crystalline vault as erroneous. Here the interpretative tool of understanding what it must have been to look at the heavens with the eyes of those who thought that the earth is flat provides a means to understand both texts in relation to one another: in my interpretation both the report that the stars do not go under the earth and the report that the stars are like nails can be retained: the first as being about what the heavens look like when seen at the state of the universe before the tilt of the heavens, and the other as being about the sphere of the stars as such, both before and after the tilt of the heavens.

In my opinion Hippolytus, who has handed over Anaximenes' cap simile, and the doxographers, who wrote about the celestial bodies not going under the earth, were acquainted with the concept of a spherical earth, but they were not able to achieve the necessary retrograde paradigm switch. They wrongly thought that with these words Anaximenes meant to describe the present situation of the heavens. At the end of the first part of this article I already suggested what the source of this misunderstanding could have been. Most modern commentators followed the anachronistic rendition of the doxography, either by declaring the report on the stars as nails in the firmament corrupted or by simply not noticing the discrepancy between this report and those which say that according to Anaximenes the celestial bodies do not go under the earth.

Curiously enough, here I am completely in agreement with Bicknell, who maintains "that Anaximenes regarded his star-studded heaven as a sphere" and rejects the view "that it was a hemispherical dome". It is worth the while to quote him at length, because I agree with every word of it:

> My reason for rejecting this view is that at Miletus, which lies roughly 37 degrees north, the celestial equator and the planes of diurnal rotation of all the heavenly bodies are inclined to the plane of the horizon by an angle of 53 degrees. To an observer at Miletus or anywhere near it, it would immediately be evident that the apparent movements of the fixed stars could not be explained on the supposition that they were attached to a hemispherical dome. Such an account would fit the facts of observation only at the terrestrial poles where the celestial pole corresponds to the zenith and the planes of the horizon and the celestial equator coincide. (…) the diurnal paths of the fixed stars are parallel to those of the rest of the luminaries, and therefore whatever Anaximenes said of the latter must have applied to the former too. (…) At Miletus, the sun, moon, and planets and the majority of the fixed stars appear to pass beneath the earth.[50]

It is a pity that Bicknel spoiled these right observations and considerations by his strange interpretation of the cap simile which was discussed in the first part of this article.[51]

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[50] Bicknell 1969, 77.

[51] The text of this article was finished when I became acquainted with Dmitri Panchenko's intriguing interpretation of Anaximenes' cosmology. I decided to leave my text as it was, so that the reader can judge for him- or herself. In my forthcoming book *When the Earth Was Flat* I hope to confront both interpretations.

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Abbreviations

Gr – Graham 2010
TP1 – Wöhrle 2009
TP2 – Wöhrle 2012
DK – Diels, Kranz 1951/52

Anaximenes is said to have maintained that the celestial bodies do not go underneath the earth, but move laterally around it like a kind of felt cap around our head. In the first part of this article the interpretations of McKirahan and Bicknell are discussed and a new interpretation is proposed. McKirahan's interpretation is shown to suffer from several shortcomings, such as not to account for the stars in the southern part of the heavens. Bicknell's interpretation presupposes that Anaximenes taught a dip of the earth as is reported of Leucippus and Democritus. It is argued that this interpretation is wrong, mainly because there did not exist such a thing as a Presocratic theory of a dip of the earth: Leucippus and Democritus taught a tilt of the heavens, just like other Presocratics. Following a suggestion of Wöhrle's, it is argued that what Anaximenes meant to describe was not the actual state of celestial affairs but that before the tilt of the heavens. In the second half of the article some methodological premises about the interpretation of ancient cosmological texts are exposed and the conclusion is drawn that Anaximenes taught not a hemispherical but a spherical universe.

Анаксимену приписывается утверждение о том, что небесные тела не проходят под землей, но двигаются вокруг нее, как войлочная шапка вокруг головы. В первой части статьи обсуждаются толкования МакКирэна и Бикнелла и выдвигается новая интерпретация. Толкование МакКирэна имеет ряд недостатков: например, оно не учитывает наличие звезд в южной части небесной сферы. Толкование Бикнелла подразумевает, что Анаксимен разделял учение о наклоне земли, приписываемое также Левкиппу и Демокриту. Это неправильно главным образом потому, что у досократиков не существовало учения о наклоне земли: Левкипп и Демокрит, как и другие досократики, говорят о наклоне небесной сферы. Разделяя предположение Вёрле, автор полагает, что обсуждаемое утверждение Анаксимена относится не к реальному движению звезд, а к тому, которое имело место до наклона небесной сферы. Во второй части статьи излагаются методологические предпосылки к толкованию свидетельств о космологии древних философов и делается вывод о том, что вселенная Анксимена была не полусферической, а сферической.

CONSPECTUS

ARCHAEOLOGICA

Статьи сопровождаются резюме на русском и английском языке
Summary in Russian and English

DISPUTATIONES

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