

Chapter Title: Alexander of Aphrodisias on How the Sun Heats: Aristotle's Meteorology 1.3
in Context

Chapter Author(s): Inna Kupreeva

Book Title: Letture medievali di Aristotele: il De Caelo e le Meteore

Book Editor(s): Elisa Coda

Published by: Pisa University Press S.R.L.. (2022)

Stable URL: <https://www.jstor.org/stable/jj.2036755.6>

JSTOR is a not-for-profit service that helps scholars, researchers, and students discover, use, and build upon a wide range of content in a trusted digital archive. We use information technology and tools to increase productivity and facilitate new forms of scholarship. For more information about JSTOR, please contact support@jstor.org.

Your use of the JSTOR archive indicates your acceptance of the Terms & Conditions of Use, available at <https://about.jstor.org/terms>



JSTOR

Pisa University Press S.R.L. is collaborating with JSTOR to digitize, preserve and extend access to *Letture medievali di Aristotele: il De Caelo e le Meteore*

Alexander of Aphrodisias on How the Sun Heats: Aristotle's *Meteorology* 1.3 in Context

Inna Kupreeva

Aristotle's explanation of the sun heating the sublunary cosmos by rubbing against its upper edge is problematic within his own physical model of the universe. At the same time, it has certain importance for Aristotle's physical system insofar as it links the processes of coming to be and perishing to their heavenly cause and thus accounts for the unity of the cosmos. The reconstruction of Aristotle's argument which would lend it full credibility is therefore seen by Alexander as an important task. Alexander's interpretation of Aristotle's account should be read against the background of Hellenistic debates about providence in general and Peripatetic discussions of the cosmic role of divine causes in particular. The few works that have been devoted to Alexander's argument so far expressed misgivings on whether his proposed interpretation will actually work, or whether there is in fact a consistent account behind his defence of Aristotle¹. In this

Inna Kupreeva, University of Edinburgh.

¹ P. Moraux, *Der Aristotelismus bei den Griechen*, Bd.3: *Alexander von Aphrodisias*, De Gruyter, Berlin-New York 2001, pp. 279-80; recently Valérie Cordonier raised the question whether Alexander's solution to the problem is based on a unified approach cf. V. Cordonier, *La transmission de la chaleur solaire comme mouvement médiatisé chez Alexandre d'Aphrodise. Naissance d'un problème et ambiguïté d'un modèle à l'origine de la tradition médiévale*, in T. Suarez-Nani – O. Ribordy – A. Petagine (eds), *Lieu, espace, mouvement: Physique, Métaphysique et Cosmologie (XII^e-XVI^e siècles)*. Actes du colloque international Université de Fribourg (Suisse), 12-14 mars 2015, Brepols, Turnhout 2017, pp. 1-15, part. pp. 11-15.

DOI: 10.12871/97888333970164

paper I aim to show how the Aristotelian explanation can be made to work, in Alexander's view, and how the logic of this latter discussion forces some crucial theoretical choices in Alexander's own reading of Aristotle's metaphysics and philosophy of nature, in particular his hylomorphic theory of elements.

The paper consists of five sections. The first presents the problem in Aristotle, the second gives a brief survey of Alexander's Peripatetic background and outlines the connection between *Meteorology* and the Peripatetic discussions of providence, the third discusses the impassivity of the transmitting body, the fourth concentrates on the hylomorphic theory of elements, sublunary and heavenly, underlying the explanation of alteration and sui generis passivity of the stuff of the heaven. The fifth section contains concluding remarks.

1. Aristotle on the Sun Heating: an Outline of the Problem

Aristotle's theory of the sun heating the sublunary cosmos by rubbing against the lower body is attested in two of his main works, *Meteorology* I 3 and *On the Heaven* II 7. The differences between the two versions are due to the respective contexts: *On the Heaven* discusses the properties of the heavenly body, whereas the *Meteorology* discusses the upper layers of the sublunary cosmos and gives more attention to the question of boundary between the regions of the eternal and the perishable.

(T1a) Aristotle, *De Caelo* II 7 (289 a 19-33)

(1) Heat and light are produced by them because the air is chafed by their motion. (2) For motion is capable of setting on fire wood, stones, and iron, (3) so it is even more reasonable that it can do so to what is nearer the fire, and the air is nearer. (4) As in the case of moving arrows: for they themselves become hot to such an extent that leaden parts melt and since they become so hot, the air around them must be subject to exactly the same effect. (5) Now, these are heated because they move in the air, which becomes fire because of the impact made by motion. (6) As for the upper bodies, each of them moves in a sphere,

so that they themselves do not become hot, but the air, since it is under the sphere of the body that moves in a circle, must be heated because of its motion, and particularly by the one by which the sun happens to be bound. This is why it is when it approaches and stays high up above us heat comes about (trans. W.K.C. Guthrie [Heinemann, London 1939 (Loeb Classical Library)] modified)².

The context is the explanation of the nature and properties of heavenly bodies, in particular the explanation of the appearances of light and heat which heavenly bodies produce in the sublunary cosmos (T1a.1). As Alexander points out in his commentary, Aristotle mainly concentrates on heat, while the nature and production of light is discussed more in the *De Anima*³. Aristotle explains next that the physical mechanism at work in the production of these effects is the same as friction in the sublunary processes (T1a.3). He then considers the example of leaden parts of arrows heated in the motion of an arrow so as to melt (T1a.5)⁴. According to the explanation of

² (1) Ἡ δὲ θερμότης ἀπ' αὐτῶν καὶ τὸ φῶς γίνεται παρεκτριβομένου τοῦ ἀέρος ὑπὸ τῆς ἐκείνων φορᾶς. (2) Πέφυκε γὰρ ἡ κίνησις ἐκπυροῦν καὶ ξύλα καὶ λίθους καὶ σίδηρον. (3) εὐλογώτερον οὖν τὸ ἐγγύτερον τοῦ πυρός, ἐγγύτερον δὲ ὁ ἀήρ. (4) οἷον καὶ ἐπὶ τῶν φερομένων βελῶν· ταῦτα γὰρ αὐτὰ ἐκπυροῦται οὕτως ὥστε τήκεσθαι τὰς μολυβδίδας, καὶ ἐπειπερ αὐτὰ ἐκπυροῦται, ἀνάγκη καὶ τὸν κύκλῳ αὐτῶν ἀέρα τὸ αὐτὸ τοῦτο πάσχειν. (5) Ταῦτα μὲν οὖν αὐτὰ ἐκθερμαίνεται διὰ τὸ ἐν ἀέρι φέρεσθαι, ὅς διὰ τὴν πληγὴν τῆς κινήσει γίνεται πῦρ. (6) Τῶν δὲ ἄνω ἕκαστον ἐν τῇ σφαίρᾳ φέρεται, ὥστ' αὐτὰ μὲν μὴ ἐκπυροῦσθαι, τοῦ δ' ἀέρος ὑπὸ τὴν τοῦ κυκλικοῦ σώματος σφαίρᾳ ὄντος ἀνάγκη φερομένης ἐκείνης ἐκθερμαίνεσθαι, καὶ αὐτῆ μάλιστα ἢ ὁ ἥλιος τετύχηκεν ἐνδεδεμένος· διὸ δὴ πλησιάζοντός τε αὐτοῦ καὶ ἀνίσχοντος καὶ ὑπὲρ ἡμῶν ὄντος γίνεται ἡ θερμότης.

³ Alexander *apud* Simpl., *In De Cael.* 442.4-12 Heiberg (= fr. 147c Rescigno [cf. A. Rescigno [ed.], Alessandro di Afrodisia, *Commentario al De Caelo di Aristotele. Frammenti del secondo, terzo e quarto libro*, Hakkert, Amsterdam 2008, part. p. 229]), referring to *De Anima* II 7, 418 b 11-13. Cf. Simplicii *In Aristotelis De Caelo commentaria*, ed. I.L. Heiberg, Reimer, Berlin 1894 (CAG VII).

⁴ Gennadius Scholarius explains the term μολυβδίς as a part by which the iron of the arrowhead is fastened onto the wooden shaft of an arrow: καὶ ἐπὶ τῶν φερομένων τοῦτο ἐνίοτε βελῶν γίνεται, ὥστε καὶ τὰς μολυβδίδας αὐτὰς τήκεσθαι, καθ' ἃς ὁ σίδηρος τῷ ξύλῳ συνάπτεται (*Adnotationes in Aristotelis opera diversa*, ed. M. Jugie – L. Petit – X.A. Siderides, *Oeuvres complètes de Georges (Gennadios) Scholarios*, vol. 7, Maisonneuve la bonne presse, Paris 1936, part. 2 *De Cael.* 2, pp. 164-6.

Alexander, endorsed by Simplicius, the rapid motion of the leaden parts heats the adjacent air which in turn heats the leaden parts to the point of melting. In the analogy used by Aristotle, the leaden parts must stand for the heavenly bodies, whose motion heats the air, or rather the ‘tinder’ (ὑπέκκαυμα) adjacent to them⁵. However, differently from the leaden parts of the arrows, heavenly bodies are not affected by the heat their motion produces, and this difference sets both the limit and scope for the analogy.

In *Meteorology*, we find a general reference to the process of heating to the point of melting (**T1b.3** below):

(**T1b**) Aristotle, *Meteor.* I 3, 341 a 13-36

(1) As for the heat derived from the sun, the right place for a special and scientific account of it is in the study of sense perception, since heat is an affection of sense, (2) but we may now explain how it can be produced by those [viz. heavenly bodies], given that they are not such by nature [i.e. are not themselves hot – trans.]. (3) We see that motion is able to dissolve and inflame the air; indeed, moving bodies are often actually found to melt. (4) Now the sun’s motion alone is sufficient to account for the origin of terrestrial warmth and heat. (5) For a motion that is to have this effect must be rapid and near, and that of the stars is rapid but distant, while that of the moon is near but slow, whereas the sun’s motion combines both conditions in a sufficient degree. (6) That most heat should be generated where the sun is present is easy to understand if we consider the analogy of terrestrial phenomena, (7) for here, too, it is the air that is nearest to a thing in rapid motion which is heated most. (8) This is just what we should expect, as it is the nearest air that is most dissolved by the motion of a solid body. (9) This then is one reason why heat reaches our world. Another is that the fire surrounding the air is often scattered by the motion of the heavens and driven downwards in spite of itself. (10) Shooting-stars are a sufficient proof that the

⁵ Simpl., *In De Cael.*, p. 439.13-32 Heiberg.

celestial sphere is not hot or fiery: for they do not occur in that upper region but below: yet the more and the faster a thing moves, the more apt it is to take fire. (11) Besides, the sun, which most of all the stars is considered to be hot, is really white and not fiery in colour (trans. H.D.P. Lee, [Heinemann, London 1952 (Loeb Classical Library)]⁶).

It is clear that Aristotle has designed the argument to show a causal relation between the heavenly and the sublunary processes. The question of the nature of the heat produced by the sun belongs to the study of various kinds of heat that fall under our sense perception (T1b.1). In (T1b.2-5) Aristotle states his theory: fast motion can produce heat, and the sun is certainly moving fast and is close enough to earth to be able to do so. Its brightness is an effect which has nothing to do with the internal heat (as the last sentence of the passage, [T1b.11], indicates). In (T1b.6-8), Aristotle appeals to ordinary experience and although no specific example is stated, we can go back to the example of leaden parts of the arrow in the *De Caelo* passage above (T1a4-5). T1b.9 explains how heat thus generated can descend to the earth: the point important for Aristotle given his theory of

⁶ (1) περὶ δὲ τῆς γιγνομένης θερμότητος, ἣν παρέχεται ὁ ἥλιος, μᾶλλον μὲν καθ' ἑαυτὸ καὶ ἀκριβῶς ἐν τοῖς περὶ αἰσθήσεως προσήκει λέγειν (πάθος γάρ τι τὸ θερμὸν αἰσθήσεώς ἐστιν), (2) διὰ τίνα δ' αἰτίαν γίγνεται μὴ τοιούτων ὄντων ἐκείνων τὴν φύσιν, λεκτέον καὶ νῦν. (3) ὁρῶμεν δὴ τὴν κίνησιν ὅτι δύναται διακρίνειν τὸν ἀέρα καὶ ἐκπυροῦν, ὥστε καὶ τὰ φερόμενα τηρόμενα φαίνεσθαι πολλακίς. (4) τὸ μὲν οὖν γίγνεσθαι τὴν ἀλέαν καὶ τὴν θερμότητα ἱκανὴ ἐστὶν παρασκευάζειν καὶ ἡ τοῦ ἡλίου φορὰ μόνον. (5) ταχεῖάν τε γὰρ δεῖ καὶ μὴ πόρρω εἶναι. ἡ μὲν οὖν τῶν ἄστρον ταχεῖα μὲν πόρρω δέ, ἡ δὲ τῆς σελήνης κάτω μὲν βραδεῖα δέ· ἡ δὲ τοῦ ἡλίου ἄμφω ταῦτα ἔχει ἱκανῶς. (6) τὸ δὲ μᾶλλον γίγνεσθαι ἅμα τῷ ἡλίῳ αὐτῷ τὴν θερμότητα εὐλογον, λαμβάνοντας τὸ ὅμοιον ἐκ τῶν παρ' ἡμῖν γιγνομένων. (7) καὶ γὰρ ἐνταῦθα τῶν βίᾳ φερομένων ὁ πλησιάζων ἀπὸ μάλιστα γίγνεται θερμός. καὶ τοῦτ' εὐλόγως συμβαίνει. (8) μάλιστα γὰρ ἡ τοῦ στερεοῦ διακρίνει κινήσεις αὐτόν. (9) διὰ τε ταύτην οὖν τὴν αἰτίαν ἀφικνεῖται πρὸς τόνδε τὸν τόπον ἡ θερμότης, καὶ διὰ τὸ τὸ περιέχον πῦρ τὸν ἀέρα διαρραίνεσθαι τῇ κινήσει πολλακίς καὶ φέρεσθαι βίᾳ κάτω. (10) σημεῖον δ' ἱκανὸν ὅτι ὁ ἄνω τόπος οὐκ ἐστὶ θερμὸς οὐδ' ἐκπεπυρωμένος καὶ αἱ διαδρομαὶ τῶν ἀστέρων. ἐκεῖ μὲν γὰρ οὐ γίγνονται, κάτω δέ· καίτοι τὰ μᾶλλον κινούμενα καὶ θᾶττον, ἐκπυροῦται θᾶττον. (11) πρὸς δὲ τούτοις ὁ ἥλιος, ὅπερ μάλιστα εἶναι δοκεῖ θερμός, φαίνεται λευκός ἄλλ' οὐ πυρώδης ὢν.

natural motion according to which heated materials are expected to go upwards. The downward motion of generated heat is not natural but forced as the fire scattered in the constant rotation of the heavens is forced downwards.

There are serious reasons why Aristotle is not free to subscribe to a more natural view of the sun heating by virtue of being hot. The primary reason is his theory of the cosmos according to which there is a strict divide between the sublunary and the heavenly parts, the latter being made of a special stuff, not subject to change and sharing very few properties with the ‘so called elements’ of the sublunary cosmos⁷. The main shared property is locomotion⁸, and solidity is another property (mentioned in **T1b.8**) that is important in Aristotle’s explanation. In virtue of its fast motion and solidity, heavenly body heats the upper layer of the sublunary cosmos, itself remaining unaffected.

This explanation might work for Aristotle on his terms, had he not been committed to a very particular physical interpretation of homocentric cosmology developed by his contemporary and near contemporary astronomers, Eudoxus of Cnidus, who was connected with Plato’s Academy, and his student Callippus. This system of cosmology based on astronomical observations of planetary motions as well as on mathematical speculation, sees the cosmos as a system of nested spheres rotating around the earth as its single centre. The planets known to the ancient astronomers include the moon, the sun,

⁷ H. Bonitz, *Index Aristotelicus*, Akademische Druck- u. Verlagsanstalt, Graz 1955², 702 b 2-7: «nomen iam usu receptum esse Ar. significat, quod ea dicit τὰ λεγόμενα, τὰ καλούμενα, τὰ καλούμενα ὑπὸ τινῶν στοιχεῖα *Phys.* I 4, 187 a 26; IV 5, 204 b 33; GC II 1, 328 b 31, 329 a 26, *Meteor.* I 3, 339 b 5, *PA* II 1, 646 a 13; *GA* II 3, 736 b 31».

⁸ The arguments for the nature and properties of the ‘first body’ are stated in *De Caelo* I. Bonitz, *ibid.*, 23-30 also gives a list of passages where Aristotle calls the heavenly body στοιχεῖον distinguishing it from the four sublunary elements. In *Metaphysics* XII 3, describing the heavenly part of the cosmos, Aristotle mentions its being made of the so-called topical matter (more precisely, matter ποθὲν ποι).

Venus (the Morning Star), Mercury, Mars, Jupiter, Saturn. In this order, which is sometimes called ‘Egyptian’, they are introduced in Plato’s *Timaeus* 38C. In the 2nd century, especially after Ptolemy, the so-called ‘Babylonian’, or ‘Chaldaean’ order, is used, where the moon is followed by Venus, Mercury, the sun, and the three ‘outer’ planets – Mars, Jupiter, and Saturn.

In the homocentric system of Eudoxus, multiple spheres are introduced in order to explain the motion of each planet (three for each of the sun and the moon and four for the rest of the planets), this system is modified in some of its details by Callippus and again by Aristotle, who introduces the physical interpretation of what the astronomers regard as a mathematical system and takes each of the planetary spheres to be made of aether, the first element, ungenerated and indestructible, subject to only one change, with respect to place. In *Metaphysics* XII 8, there are fifty-five spheres, with five assigned to the moon, the closest to us, and nine to each of Mars, Mercury and Venus⁹. The order of planets accepted by Aristotle is not stated explicitly in the extant texts¹⁰. But even if we assume that the sun is at the next remove from earth after the moon (the ‘Egyptian’ order) there still remains a question of how the heat can pass through the five spheres of the moon, all made of indestructible and impassive material of aether.

The reason why this problem becomes important for Aristotle readers in later antiquity is that the answer to this question may be taken as decisive for the relation between the realm of the ‘divine’ (heavenly bodies, moving substances, in Aristotle’s account, are still divine bodies ‘not subject to any mortal trouble’) and the world of coming to be and perishing. All the passages

⁹ For the recent overview of interpretations, see Aristotle, *Metaphysics Book A*, trans. and comm. by L. Judson, Oxford U.P., Oxford 2019.

¹⁰ But if we take Mercury, Mars and Venus to be a grouping within the order, this might indicate the ‘Egyptian’ order. The ‘Egyptian’ order is found in Ps-Aristotelian *De Mundo* 392 a 20-30.

between these two worlds would be carefully watched by ancient philosophers, Aristotelians or non-Aristotelians¹¹. The process by which the sun heats the earth is one of such passages. Within this framework, every small step in the physical argument can become philosophically important.

2. *Alexander's Meteorology commentary and its Peripatetic context*

Alexander's is the first extant commentary on Aristotle's treatise. It covers all the four books of *Meteorology* and is fully preserved; moreover, it is well attested through Philoponus' commentary, and somewhat more problematically through Olympiodorus¹². It is short¹³; written in what is to become a standard form of a hypomnematic commentary, with lemmata, summaries of arguments, separate discussions of conceptual and textual problems. The exposition often manifests a paraphrastic style, which reminds us of the genre of *epidromê* described by Bruns for some of the *quaestiones*¹⁴. The reader will notice that Alexander often abbreviates Aristotle's narrative, skips the discussion of details, sometimes simply referring his audience to *historia* for the empirical evidence. At the same time, we can find more extensive discussions of some principal or problematic points, close in style to the genre of a problem proper in the school collection.

¹¹ For the presentation of Aristotelian position on providence in Hellenistic and post-Hellenistic sources and for the development of the idea within the school, see R.W. Sharples, *Aristotelian Theology after Aristotle*, in D. Frede - A. Laks (eds.), *Traditions of Theology. Studies in Hellenistic Theology: Its Background and Aftermath*, Brill, Leiden 2001 (Philosophia Antiqua), pp. 1-40.

¹² The problem of authenticity discussed and resolved positively by Moraux, *Der Aristotelismus bei den Griechen* (above, n. 1), pp. 264-7; I discuss this evidence in a companion article on Philoponus.

¹³ 227 Berlin pages for 52 Bekker pages of Aristotle's *Meteorology*. It is certainly short compared with Olympiodorus' commentary on the same text (320 Berlin pages), but it is also rather short by Alexander's standards (for comparison, Alexander's commentary on the first book of the *Prior Analytics*, whose Greek text is 29 Bekker pages, is 418 Berlin pages).

¹⁴ Alexandri Aphrodisiensis *Praeter Commentaria scripta minora* ed. I. Bruns, Reimer, Berlin 1892 (*CAG Supplementum Aristotelicum* II), pp. IX-X.

The discussion of Aristotle's explanation of the sun heating in *Meteor.* I 3 belongs to this genre.

The Peripatetic context is important for Alexander's discussion of the problem of the sun heating the sublunary world and may be worth a brief overview. The study of *Meteorology* is popular in the Lyceum after Aristotle. In the list of Theophrastus' writings in Diogenes Laertius, out of forty-three titles of physical books listed in *Theophrastus of Eresus: Sources for his Life, Writings, Thought and Influence* (=FHSG) at least eighteen are devoted to the meteorological topics¹⁵. Of Strato, Seneca tells us (as he lists Aristotle's account of exhalations in support of his view of *pneuma* as the cause of earthquakes) that he «belongs to the same school, specialised in this branch of philosophy and researched into natural science»¹⁶.

This interest in *Meteorology* continues in the Imperial schools. Strabo, who was a student or co-student of Boethus of Sidon, has preserved for us Strato's discussion of the sea¹⁷. Xenarchus, active about the same time, produced a battery of arguments against the 'first element' potentially challenging the world order described in *Meteorology*¹⁸. In the Peripatetic physical fragments of Arius Didymus, we find several 'meteorological', which represent the Aristotelian doctrines fairly accurately¹⁹. The abridgments of *Meteorology* I-III and of *Meteorology* 4 form parts of the Nicolaus of Damascus' *Compendium* Περὶ τῆς Ἀριστοτέλους φιλοσοφίας preserved in a later Syriac summary²⁰.

A summary of *Meteorology* placing it within the Hellenistic theological context, is found in the Ps-Aristotelian treatise *Peri kosmou*

¹⁵ W.W. Fortenbaugh et al., *Theophrastus of Eresus: Sources for his Life, Writings, Thought and Influence*, Part I Brill, Leiden 1992 (*Philosophia Antiqua*, 54), § 137 (p. 277-87).

¹⁶ Strato, Fr. 53 Sharples = Seneca QN 6.13.2.

¹⁷ Strato, Fr. 54 Sharples.

¹⁸ [T2]-[T13] A. Falcon, *Aristotelianism in the First Century BCE*, Cambridge U.P., Cambridge 2012.

¹⁹ Ar. Did., *Fr. Phys.* 10-14 Diels.

²⁰ See I. Kupreeva, *Nikolaos von Damaskus*, in C. Riedweg - C. Horn - D. Wyrwa (eds.), *Die Philosophie der Antike 5/1, Philosophie der Kaiserzeit und der Spätantike*, Schwabe, Basel 2018, pp. 308-13 for references and literature.

(*De Mundo*), the treatise dating from about the 2nd century AD, considered genuine by Philoponus²¹ and possibly by Alexander²². The *De Mundo* surveys all the main points of the Aristotelian doctrine, including the account of the lower cosmos being heated by the movement of the aethereal body²³, and especially dwells on the question of the source of unity and order in the cosmos as a whole and in its sublunary region, the remotest from god, in particular.

(T2) [Aristotle] *De Mundo* 6, 397 b 13 - 398 a 6

(1) It is indeed an ancient idea, traditional among all mankind, that all things are from God and are constituted for us by God, and nothing is self-sufficient if deprived of his preserving influence. (2) So some of the ancients were led to say that all the things of this world are full of gods, all that are presented to us through our eyes and hearing and all the senses; (3) but in saying this they used terms suitable to the power of God but not to his essence. (4) For God is indeed the preserver of all things and the creator of everything in this cosmos however it is brought to fruition; but he does not take upon himself the toil of a creature that works and labours for itself, but uses an indefatigable power, by means of which he controls even things that seem a great way off. (5) God has his seat in the highest and first place, and is called Supreme for this reason, since according to the poet it is 'on the loftiest crest' of the whole heaven that he dwells: his power is experienced most of all by the body that is closest to him, less by the next, and so on down to the regions inhabited by us. (6) So earth and the things that are on earth, being at the farthest remove from the help of God, seem to be feeble and discordant and full of confusion

²¹ Philoponus, *De Act. mundi*, pp. 174.25-175.2 Rabe cf. Ioannes Philoponus, *De Aeternitate mundi contra Proclum*, ed. H. Rabe, Teubner, Leipzig 1899.

²² On the date of the treatise, see J.C. Thom (ed), *Cosmic Order and Divine Power: Ps.-Aristotle, On the Cosmos*, Mohr Siebeck, Tübingen 2014 and literature review in I. Kupreeva, *Überblick: Aristoteles und der Peripatos in der Kaiserzeit (inkl. Ps.-Aristoteles De Mundo)*, in Riedweg - Horn - Wyrwa (eds.), *Die Philosophie der Antike 5/1, Philosophie der Kaiserzeit und der Spätantike* (above, n. 21), pp. 255-301.

²³ *De Mundo* 392 a 31 - 392 b 2.

and diversity; but nevertheless, in that it is the nature of the Divine to penetrate to everything, even the things around us occur in the same way as the things above us, each having a greater or smaller share of God's help in proportion to its distance from him. (7) So it is better to suppose, what is also fitting and most appropriate to God, that the power which is based on the heavens is also the cause of preservation in the most remote things, as we may say, and indeed in everything, rather than that of itself it carries out its tasks on earth by penetrating and being present where it is not honourable or fitting that it should²⁴.

In (T2.4), god is described as creator and preserver of the whole cosmos and everything in it who is acting not by himself but by means of his indefatigable power (ἄτρυτος δύναμις) that controls all things.

The doctrine of *De Mundo* represents a view on providence which differs from both the view associated with the circle of Critolaus according to which there is no sublunary providence and the divine providence only extends to the heavenly realm, and the view most prominently defended by Alexander of Aphrodisias, according to which the sublunary region is an object of divine providence at the level of

²⁴ (1) Ἀρχαῖος μὲν οὖν τις λόγος καὶ πάτριός ἐστι πᾶσιν ἀνθρώποις ὡς ἐκ θεοῦ πάντα καὶ διὰ θεὸν συνέστηκεν, οὐδεμία δὲ φύσις αὐτῆ καθ' ἑαυτὴν ἐστὶν αὐτάραξης, ἐρημωθεῖσα τῆς ἐκ τούτου σωτηρίας. (2) Διὸ καὶ τῶν παλαιῶν εἶπεῖν τινες προήχθησαν ὅτι πάντα ταῦτά ἐστι θεῶν πλέα τὰ καὶ δι' ὀφθαλμῶν ἰνδαλλόμενα ἡμῖν καὶ δι' ἀκοῆς καὶ πάσης αἰσθήσεως, (3) τῇ μὲν θεῖα δυνάμει πρέποντα καταβαλλόμενοι λόγον, οὐ μὴν τῇ γε οὐσία. (4) Σωτὴρ μὲν γὰρ ὄντως ἀπάντων ἐστὶ καὶ γενέτωρ τῶν ὀπωσθήποτε κατὰ τόνδε τὸν κόσμον συντελουμένων ὁ θεός, οὐ μὴν αὐτουργοῦ καὶ ἐπιπόνου ζῶου κάματος ὑπομένων, ἀλλὰ δυνάμει χρώμενος ἀτρυτῶ, δι' ἧς καὶ τῶν πόρρω δοκούντων εἶναι περιγίνεται. (5) Τὴν μὲν οὖν ἀνωτάτω καὶ πρώτην ἔδραν αὐτὸς ἔλαχεν, ὑπατάς τε διὰ τοῦτο ὠνόμασται, κατὰ τὸν ποιητὴν «ἀκροστάτη κορυφῇ» τοῦ σύμπαντος ἐγκαθιδρυμένος οὐρανοῦ· μάλιστα δὲ πὼς αὐτοῦ τῆς δυνάμεως ἀπολαύει τὸ πλησίον αὐτοῦ σῶμα, καὶ ἔπειτα τὸ μετ' ἐκεῖνο, καὶ ἐφεξῆς οὕτως ἄχρι τῶν καθ' ἡμᾶς τόπων. (6) Διὸ γῆ τε καὶ τὰ ἐπὶ γῆς ἔοικεν, ἐν ἀποστάσει πλείστη τῆς ἐκ θεοῦ ὄντα ὠφελείας, ἀσθενῆ καὶ ἀκατάλληλα εἶναι καὶ πολλῆς μεστὰ ταραχῆς· οὐ μὴν ἀλλὰ καθ' ὅσον ἐπὶ πᾶν διικνεῖσθαι πέφυκε τὸ θεῖον, καὶ ἐπὶ τὰ καθ' ἡμᾶς ὁμοίως συμβαίνει τὰ τε ὑπὲρ ἡμᾶς, κατὰ τὸ ἐγγιόν τε καὶ πορρωτέρω θεοῦ εἶναι μᾶλλον τε καὶ ἧττον [398a] ὠφελείας μεταλαμβάνοντα. (7) Κρεῖττον οὖν ὑπολαβεῖν, ὃ καὶ πρέπον ἐστὶ καὶ θεῶ μάλιστα ἀρμόζον, ὡς ἡ ἐν οὐρανῷ δύναμις ἰδρυμένη καὶ τοῖς πλεῖστον ἀφεστηκόσιν, ὡς ἐνὶ γε εἶπεῖν, καὶ σύμπασιν αἴτιος γίνεται σωτηρίας, μᾶλλον ἢ ὡς διήκουσα καὶ φοιτῶσα ἐνθα μὴ καλὸν μηδὲ εὐσχημον αὐτουργεῖ[ν] τὰ ἐπὶ γῆς.

species, but not individuals²⁵. In our passage, the sublunary region and the earth are at the farthest remove from god, yet god reaches out to it, even if on a minimal scale (T2.6) and not directly, but by means of its power residing in the heavens (T2.7).

The idea of god ruling through intermediary subordinate agents may be a Hellenistic development of Aristotle's analogy between god the ruler of the cosmos and the army commander in *Metaphysics* XII 10²⁶. It is the nature of this divine power, the instrument of providence, that makes *Meteorology* relevant in the theological context. In the *De Mundo*, it is described in a very general way, without any further metaphysical detail. We get a detailed discussion of the nature of this power in Alexander's school treatise *Quaestio* 2.3 whose manuscript title apparently just repeats the opening statement of the problem: «What is the power that comes to be, from the movement of the divine body, for the body adjacent to it which is mortal and subject to coming-to-be?»²⁷ This treatise is representative of this interest in the circle of Alexander²⁸. In this wording we can already spot a connection with

²⁵ On Critolaus: Sharples, *Aristotelian Theology after Aristotle* (above, n. 12); D. Hahm, *Critolaus and Late Hellenistic Peripatetic Philosophy*, in A.M. Ioppolo - D.N. Sedley (eds.), *Pyrrhonists, Patricians, Platonizers: Hellenistic Philosophy in the Period 155-86 BC*, Bibliopolis, Napoli 2007, pp. 47-102; I. Kupreeva, *Stoic Themes in Peripatetic Sources?*, in R. Salles (ed.), *God and Cosmos in Stoicism*, Oxford U.P., Oxford 2009, pp. 135-70; on Alexander of Aphrodisias cf. Alexander of Aphrodisias, *Quaestiones 1.1-2.15*, trans., comm. by R.W. Sharples, Duckworth, London 1992 and Alexander of Aphrodisias, *Quaestiones 2.16-3.15*, trans., comm. by R.W. Sharples, Duckworth, London 1994; Sharples, *Aristotelian Theology after Aristotle* (above, n. 12); H.-J. Ruland (ed.), *Die arabischen Fassungen zweier Schriften des Alexanders von Aphrodisias: Über die Vorsehung und über das liberum arbitrium*, diss. Saarbrücken 1976; Alexandre d'Aphrodise, *Traité de la providence (Peri pronoiās, version Arabe de Abu Bissar Matthae ibn Yunus*, intr., éd. et trad. de P. Thillet, Verdier, Lagrasse 2003.

²⁶ The analogy is used by Critolaus in political fragments, for the sake of the idea of the good ruler (Kupreeva, *Stoic Themes in Peripatetic Sources?* [above, n. 25], pp. 146-8).

²⁷ *Iovī*, p. 47.28-31 Bruns: «Τίς ἡ ἀπὸ τῆς κινήσεως τοῦ θεοῦ σώματος γινομένη δύναμις τῷ γειτνιῶντι αὐτῷ θνητῷ τε καὶ ἐν γενέσει σώματι;».

²⁸ It is a difficult text which has been discussed by a number of scholars, see P. Moraux, *Alexander von Aphrodisias Quaest.2.3*, «Hermes», 95.2 (1967), pp. 159-69;

both *De Mundo* 6 which mentions the divine power and *Meteorology*, where the body ‘adjacent’ to the divine body is described with the same term, γειτρῶντι, as in our treatise²⁹.

The author asks what contribution is made by the power that proceeds from the movement of the divine body to the constitution of the sublunary bodies, (a) simple or (b) composite. In both cases (a) and (b) the difficulty is that if the divine power intervenes when the bodies, either simple or composite, have already achieved their completion as such (i.e. the elemental bodies possess their tangible properties and natural movements and composites – plants, animals, humans – have their being as these kinds) then there is nothing more that this divine power can contribute to their being. The solution proposed by the author of the *Quaestio* 2.3 then considers two scenarios: (i) the divine power operates in the sublunary region in which all the simple bodies are complete, but not all the composite ones, and (ii) the divine power intervenes in the very process of coming to be of the divine elements.

On scenario (i) the divine power combines itself with the composite bodies through the mechanism of mixture and in accordance with the elemental composition of those bodies. This divine nature when it resides in the right kind of a composite body is its soul and ‘second nature’:

(T3.1) Alexander of Aphrodisias, *Quaestio* 2.3, p. 49.4-18 Bruns

(i) This nature and soul itself comes to be different according to the quantities of the simple bodies of which the body possessing it is [composed]. One [compound body] shares in the divine power to a greater extent through being closer to the divine body and being rare and more pure, another to a lesser extent because of its greater distance

R.W. Sharples, *Alexander of Aphrodisias, Quaestiones 2.16–3.15*, Duckworth, London 1994; S. Fazzo, *Aporia e Sistema: La materia, la forma, il divino nelle Quaestiones di Alessandro di Afrodizia*, ETS, Pisa 2002. I will not go into every detail of the discussion, but only highlight the points relevant to the subject of this paper.

²⁹ See Aristotle, *Meteor.* I 1, 338 b 2-3.

and the denseness of its constitution. (ii) For as many compound bodies as possess the greatest quantity of earth share in the power of soul to a small extent, because the body that possesses the greatest share in their being has a lesser share in the divine power; but as many as have in themselves more of the fiery and hot substance, these have a share in more perfect soul, because the body that predominates in them has a greater share in the divine power. (iii) And in this way the second nature, which we have said is the divine power, would come to be inherent in sublunary bodies because of their proximity to it; it uses the simple natural bodies as material for the coming-to-be of bodies that are more perfect and animate³⁰.

This scenario may reflect the view of Critolaus and his circle, according to which rational soul is made of the divine body – the idea itself possibly going back to an interpretation of νοῦς θύραθεν in Aristotle's *Generation of Animals* II 3 (736 b 28) as divine body entering the constitution of the embryo³¹. This is not Alexander's view of the soul, and it is likely that he endorses the second scenario,

³⁰ (i) ἤτις φύσις τε καὶ ψυχὴ κατὰ τὴν ποσότητα τῶν ἀπλῶν σωμάτων, ἐξ ὧν ἐστὶ τὸ ἔχον αὐτὴν σῶμα (ὧν τὸ μὲν ἐπὶ πλεόν [δὲν] κοινωνεῖ τῆς θείας δυνάμεως τῷ ἐγγυτέρω τε εἶναι τῷ θείῳ σώματι καὶ εἶναι λεπτομερέες τε καὶ καθαρότερον, τὸ δ' ἐπ' ἔλαττον διὰ τε τὸ ἀπόστημα τὸ πλεῖον καὶ διὰ τὴν τῆς συστάσεως παχύτητα), διάφορον καὶ αὐτὴ γίνεται. (ii) ὅσα μὲν γὰρ τῶν συνθέτων σωμάτων τὸ πλεῖστον γῆς ἔχει, ταῦτ' ὀλίγης τινός* κοινωνεῖ ψυχικῆς δυνάμεως τῷ καὶ τὸ τὴν πλείστην μοῖραν τῆς οὐσίας αὐτῶν ἔχον σῶμα** ἔλαττον τῆς θείας μεταλαμβάνει*** δυνάμεως. ὅσα δὲ πλεῖον ἐν αὐτοῖς ἔχει τῆς πυρῶδους τε καὶ θερμῆς οὐσίας, ταῦτ' ἔσται ψυχῆς τελειότερας μεταλαμβάνοντα τῷ τὸ πλεονάζον σῶμα ἐν αὐτοῖς ἐπὶ πλεόν τῆς θείας μεταλαμβάνει**** δυνάμεως. (iii) οὕτω δ' ἂν εἴη δευτέρα φύσις, ἣν εἰρήκαμεν θεῖαν δύνάμιν εἶναι ἐγγινομένην τοῖς ὑπὸ σελήνην σώμασι διὰ τὴν πρὸς ἐκείνην γεινίασιν, ὡς ὕλη χρωμένη τοῖς ἀπλῶς φυσικοῖς σώμασι πρὸς τὴν τῶν τελειότερων τε καὶ ἐμψύχων γένεσιν σωμάτων. [Text: * 49.10 read ὀλίγης τινός Apelt for Bruns's γῆς τινός, ** 49.11 ἔχον Moraux; *** 49.11-12 μεταλαμβάνειν (for Bruns's μεταλαμβάνει Apelt, following MS H (BVH 88); **** 49.14 μεταλαμβάνει Moraux (for Bruns's μεταλαμβάνειν), Moraux, *Alexander von Aphrodisias Quaest. 2.3* (above, n. 29); Fazzo, *Aporia e Sistema* (above, n. 29), pp. 193-4].

³¹ Critolaus, Frs. 17-18 Wehrli. Against this, for a deflationary reading of GA II 3 passage, see V. Caston, *Aristotle's Two Intellects: A Modest Proposal*, «Phronesis» 1999, pp. 199-227, part. pp. 215-6.

according to which the divine power seated in the heavenly body is causally involved in the constitution of the simple bodies themselves.

(T3.2) Alexander of Aphrodisias, *Quaestio* 2.3, pp. 49.28-50.15 Bruns

(i) Or rather: one could say that the power from the divine [bodies] is the cause of the <difference> between the simple bodies and of their coming-to-be, itself coming to be their form and nature. (ii) For matter which is in itself without quality or shape is and comes to be in actuality, is given form and shaped, by the power which comes to be [in] it from the divine bodies; (iii) the [part] of it which is near the divine body and adjacent to it has a greater share in the divine power and is given form by heat and dryness, for these are the first of the affections [derived] from [the divine bodies] in mortal things; (iv) that which is more removed from the divine bodies, which are the causes of this change and coming-to-be for it, is either altogether given form by the opposites of these, or else acquires one of these and one of the forms and affections that are opposite to these, being given form in different ways according to the different relation of [the divine bodies] to things here [on earth] at different times which results from [their] movement on a circle of this sort. (v) For this is what the arrangement of the zodiac is like; the sun and the moon and those others of the stars that are said to wander move along this, and come to be causes of heat and dryness, in which the being of fire consists, in each part of the matter which they approach more, or more closely; in another [they cause] heat and moisture, which are the nature of the air, in another moisture and coldness, which is the nature of water, and in another what is left from the two simple oppositions of the primary qualities, that is cold and dryness, which constitute the nature of earth³².

³² 49.28 (i) Ἡ τῆς πρὸς ἄλληλα <διαφορᾶς>* δύναται τις λέγειν καὶ τῆς τῶν ἀπλῶν σωμάτων γενέσεως τὴν ἀπὸ τῶν θείων δύναμιν αἰτίαν εἶναι αὐτὴν γινομένην αὐτῶν εἶδος τε καὶ φύσιν. (ii) ἢ γὰρ ὕλη** κατὰ τὸν ἑαυτῆς λόγον ἄποιός τε οὔσα καὶ ἀσχημάτιστος ὑπὸ τῆς ἀπὸ τῶν θείων σωμάτων δυνάμεως γινομένης ἐν αὐτῇ ἐνεργείᾳ*** σῶμα ἔστι τε καὶ γίνεται, εἰδοποιεῖται τε καὶ σχηματίζεται, ὡς τὸ μὲν πρὸς τῷ θείῳ σώματι αὐτῆς καὶ γειτνιῶν [τι] [50] ἐκείνῳ πλείονος τῆς θείας μεταλαμβάνον δυνάμεως

In (T3.2), we learn how the divine power could contribute to the constitution of simple bodies by providing them with forms. In T3.2iii, the author says that the part of matter which is near the divine body has a greater share in divine power and is given form by heat and dryness. This refers to the formation of fire, since heat and dryness are the elemental qualities which together constitute fire, according to Aristotle's *On Generation and Corruption* II 3, 330 b 1-7.

In (T3.2iv), we have a general description of the remaining three elements as 'more remote' from the divine bodies whose qualitative formula therefore includes either one (water, air) or even two (earth) 'forms or affections' that are contrary to the ones originally produced in the sublunary region by the divine body. The analysis here is presented only vaguely and in outline: elemental qualities 'dry' and 'hot' seem to be both referred to as 'forms', in plural. We find a more developed version of such a hylomorphic analysis of the elements at the opening of Alexander's treatise *De Anima*, where the form of each of the four simple bodies is described as an ensemble of primary elemental qualities, e.g. dryness, heat, and lightness in the case of fire³³.

εἰδοποιεῖσθαι θερμότητι καὶ ξηρότητι (ταῦτα γὰρ τὰ πρῶτα τῶν ἀπ' ἐκείνων ἐν τοῖς θνητοῖς πάθη), (iii) τὸ δὲ πλεῖον ἀφαστὸς τῶν ταύτης τῆς μεταβολῆς τε καὶ γενέσεως αἰτίων αὐτῇ θείων σωμαίων ἢ πάντη τοῖς**** τούτων ἐναντίως εἰδοποιεῖσθαι, ἢ τὸ μὲν τι τούτων, τὸ δὲ τι τῶν τούτων**** ἐναντίων εἶδος τε καὶ πάθος λαμβάνειν κατὰ τὴν ἐκείνων ἄλλοτε ἄλλοιαν πρὸς τὰ τῆδε σχέσιν διὰ τὴν ἐπὶ τοῦ τοιούτου κίνησιν κύκλου διαφόρως εἰδοποιούμενον. (iii) τοιαύτη γὰρ ἡ τοῦ ζῳδιακοῦ διάθεσις, ἐφ' οὗ κινούμενα ἡλιός τε καὶ σελήνη καὶ τὰ ἄλλα τὰ πλανᾶσθαι τῶν ἀστέρων λεγόμενα τῷ μὲν τι νι τῆς ὕλης μέρει, ᾧ μᾶλλον ἢ καὶ ἐγγυτέρω πρόσεισιν, ἐκάστω θερμότητός τε καὶ ξηρότητος αἴτια γίνεται, ἐν οἷς τὸ εἶναι τῷ πυρί, τῷ δὲ θερμότητός τε καὶ ὑγρότητος, ἥτις φύσις ἀέρος, τῷ δ' ὑγρότητος τε καὶ ψυχρότητος, ἥ ἐστιν ὕδατος φύσις, τῷ δὲ τῆς ἔτι καταλειπομένης ἐκ τῶν ἀπλῶν τῶν πρώτων δύο ἐναντιώσεων, ἥπερ ἐστὶ ψυχρότης τε καὶ ξηρότης, ἃ τὴν τῆς γῆς συνίστησι φύσιν.[*49.28 <διαφορᾶς> Moraux **49.30 codicum lectio stet (Moraux) *** 49.32 ἐν αὐτῇ ἐνεργείᾳ Moraux (for ἄνευ τῆς ἐνεργείας), ****50.4 Moraux (deleted <εἶδεσι> added by Bruns, see Moraux, *Alexander von Aphrodisias Quaest. 2.3* (above, n. 29); cf. Fazzo, *Aporia e Sistema* (above, n. 29), pp. 197-203].

³³ Alexander of Aphrodisias, *De Anima*, pp. 3.21-5.12 Bruns. This parallel provides further evidence in favour of the attribution of *Quaest. 2.3* to Alexander.

The passage (T3.2iv) is peculiar in that it emphasizes the role not only of the sun, but also of the other planets in the production of the elements. It seems that the author has in mind the specific role of the part of the heavenly body that is nearest to the sublunary region, which must be the last sphere of the moon. The force of the reference made to the zodiac circle and all the planets may be to emphasise the role not just of the moon, but the whole ecliptic circle as the ‘neighbour’ (γείτων) of the sublunary region³⁴.

The description of matter and form of fire and other elements that we find in *Quaest.* 2.3 is unorthodox: we don’t find it in Aristotle, and modern scholars often speak against such an analysis³⁵. Alexander’s view on the role of the divine body in the elemental economy of the sublunary world was also questioned recently in M. Wilson’s study of Aristotle’s *Meteorology*³⁶. But the present argument in *Quaest.* 2.3 shows how Alexander’s theory of elements in general and hylomorphic analysis in particular could have been brought to life from the pressures of the contemporary debate concerning the relation between the nether and upper cosmos. The solution that appears to be favoured by the author of this school treatise is fully in line with the account of the role of the divine body in generation of the elements in *Meteorology*. Let us now turn to Alexander’s defense of this account in his *Meteorology* commentary.

In his commentary, Alexander restates Aristotle’s arguments in full detail and formulates his response to the obvious difficulty of explaining the process in which the sun heats the sublunary cosmos. The response addresses the problem we have indicated above: how

³⁴ This reference may have been given a different, much stronger interpretation by Alexander’s Neoplatonic readers. I discuss this in a companion paper.

³⁵ Cf. recently Ch. Pfeiffer, *Aristotle’s Theory of Bodies*, Oxford U.P., Oxford 2018, p. 10 (without reference to Alexander).

³⁶ M. Wilson, *Structure and Method in Aristotle’s Meteorologica. A More Disorderly Nature*, Cambridge U.P., Cambridge 2013, p. 43 and n. 18 on Alexander.

can the sun cause heating by rubbing against the air, or the ‘tinder’ layer of the atmosphere, if it cannot come into contact with it, being separated from it by other aethereal spheres? The answer outlined by Alexander presupposes a certain causal mechanism of generation and transmission of qualities in the heavenly realm which connects the sun to the sublunary sphere, where this effect of the sun can convert into a sublunary power of heat.

Alexander’s solution (*παραμυθία*) of this difficulty rests on two main assumptions about the heavenly body: (i) the possibility for the body in general, and for the heavenly body in particular, to transmit an affection without being itself affected by it; (ii) the acceptance of some sort of affection in the heavenly bodies. The first assumption is needed to secure the impassive status to the heavens. The second assumption is necessary to explain the transmission of the effect of the sun in the upper cosmos: without any such process in place, the sun cannot reach out to the sublunary cosmos. If both assumptions are secured, then Alexander’s defence of Aristotle is credible, since it will follow that the sun’s motion in the heaven can transmit its heating action to the sublunary air and produce heat in it without thereby heating any of the heavenly bodies. And, as we have already noted, there is more at stake for Alexander: if this explanation works, he can explain, or begin to explain, how the upper cosmos acts upon the lower cosmos by producing the sensible forms of the sublunary simple bodies.

Let us look at Alexander’s two assumptions in turn.

3. *Impassive transmission*

According to the first assumption, bodies can receive and transmit the affection without themselves being affected by it. This is how Alexander explains it in the *Meteorology* commentary:

(T4) Alexander, *In Meteor.*, p. 18.8-28 Hayduck

(1) As for the problem of how the motion of the sun ignites and

heats the air without touching it, given that the sphere of the moon is below the sphere of the sun, taking the intermediate position between the solar sphere and the body subject to affections, and is itself impassive (for the sun and its motion is in contact not with the sublunary sphere, but with the impassive one), it might be alleviated in the following way: (2) it is often the case with many bodies that are subject to affections that they, when not being themselves acted upon, do not prevent some other bodies from being affected through them. For not everything that can be affected can be affected by everything that can act upon. (3) At any rate, things which are kindled by the heat of the sun through the glass vessels filled with cold water themselves are affected, indeed, since they are kindled, and affected through these [vessels]; at any rate, if the vessel happened to be moved away [from its position between the sun and the things being kindled], those things would no longer catch fire; yet, it is not the case that the water in the vessel also is affected and heated. And even if it is affected, still it is not to such an extent as to get kindled. (4) But net-fishermen also say that they know when they've got a torpedo-fish in their net because their hands by which they pull the cords get numb, while the cords are not pre-affected by this kind of affection. (5) But if these bodies transmit to those next to them the affections without themselves being affected by them, there is small wonder if the lunar sphere without being affected by the sun's motion passes on to the body which is naturally disposed to be affected by the sun the affection which is by nature produced in it by this motion³⁷.

³⁷ (1) τὸ δὲ ἀπορούμενον, πῶς τοῦ ἡλίου ἢ κίνησις ἐκπυροῖ τε καὶ θερμαίνει τὸν ἀέρα τὸν οὐχ ἀπτόμενον αὐτοῦ, εἴ γε ἡ σφαῖρα, ἐν ἧ ἢ σελήνη, ὑπὸ τὴν τοῦ ἡλίου σφαῖραν ἐστὶ, μέση τὴν θέσιν οὐσα τῆς ἡλιακῆς σφαίρας καὶ τοῦ παθητοῦ σώματος, οὐσα καὶ αὐτὴ ἀπαθῆς (γίνεται γὰρ ὁ ἥλιος καὶ ἡ τοῦδε κίνησις οὐ τοῦ ὑπὸ τὴν σελήνην ἀπτομένη σώματος, ἀλλὰ τοῦ ἀπαθοῦς) τοῦτο δὴ παραμυθίας τυγχάνοι ἂν τῆσδε. (2) ὅτι πολλὰ καὶ τῶν παθητῶν σωμάτων πολλακίς οὐδὲν αὐτὰ πάσχοντα μὴδὲν ἐμποδίζει [τοῦ] ἄλλοις τισὶ πάσχειν δι' αὐτῶν. οὐ γὰρ πᾶν τὸ παθητὸν ὑπὸ παντὸς ποιητικοῦ παθητὸν· ἄλλα γὰρ ὑπ' ἄλλων πάσχειν πέφυκε. (3) τὰ γοῦν ὑπὸ τῆς ἀπὸ τοῦ ἡλίου θερμότητος ἐξαπτόμενα διὰ τῶν υελίνων ἀγγείων ὕδατος ψυχροῦ πεπληρωμένων αὐτὰ μὲν πάσχει, εἴ γε ἐξάπτεται, καὶ πάσχει δι' ἐκείνων· εἰ γοῦν ἐκποδῶν γένοιτο τὸ ἀγγεῖον, οὐκέτ' ἐκεῖνα ἐξάπτεται· οὐ μὴν πάσχει τι καὶ θερμαίνεται καὶ τὸ ἐν τῷ ἀγγεῖῳ ὕδωρ. εἰ δὲ καὶ πάσχει, ἀλλ' οὐχ ὥστε

The structure of the argument is as follows. The main thesis that is being established is the italicized sentence in (T4.2). This is a specific thesis. It is illustrated by two examples from the sublunary physics, in (T4.3-4), and then in (T4.5) we have a conclusion which follows a fortiori from (T4.3-4) for the case of heavenly bodies.

On the other hand, the examples used in (T4.3) and (T4.4) are both cited in the testimonia for Strato of Lampsacus, as part of Strato's argument for the existence of microvoid in the bodies³⁸. Our evidence comes, in part, from Simplicius, and Simplicius also tells us about the way the problem raised by Strato could be overcome on the basis of Peripatetic assumptions.

(T5) Simplicius, *In Phys.*, p. 693.10-22 Diels (= Strato fr. 30A Sharples, part.)

(1) This then is what Aristotle set out about the void. (2) But Strato of Lampsacus tries to show that void divides the whole of body, so that

καὶ ἐξάπτεσθαι. (4) ἀλλὰ καὶ οἱ σαργνευταὶ γνωρίζειν φασίν, ὅταν ἔχωσιν ἐν τῇ σαργνῇ νάρκη, τῷ νερῶν* αὐτῶν τὰς χεῖρας, αἷς σύρουσι τὰ καλώδια, οὐ δῆπου καὶ τῶν καλωδίων τοῦτο τὸ πάθος ὑπὸ τῆς νάρκης προπασχόντων. (5) εἰ δὲ ταῦτα τὰ σώματα ὧν μὴ πάσχει παθῶν, τοῦτων τοῖς μετ' αὐτὰ διάκονα γίνεται, τί θαυμαστόν, εἰ καὶ τὸ τῆς σεληνιακῆς σφαίρας σῶμα μὴδὲν ὑπὸ τῆς ἡλίου πάσχον κινήσεως τῷ πάσχειν ὑπ' αὐτῆς πεφυκῶτι σώματι διαδίδωσι τὸ ἀπ' αὐτῆς ἐν αὐτῷ γίνεσθαι πεφυκὸς πάθος; *There is a textual problem in this sentence. I read τῷ νερῶν* where Hayduck prints the unsatisfactory τῶν νερῶν. This suggestion has been made in A. Rescigno, *Alessandro di Afrodisia e Plotino: il caso della θαλαττία νάρκη*, «Koinônia», 24/2 (2000), pp. 199-230, part. p. 201 n. 7. This seems to be also the reading in the MS *Paris. gr.* 2034, fol. 8v, l.5 (the page has a tear in this place and we can see only the ending of [ν]ερῶν, but the second α seems to be clearly visible). For other suggestions and further information on the text, see Cordonier, *La transmission de la chaleur solaire* (above, n. 1), p. 8 and n.15.

³⁸ For recent survey of evidence for Strato, see S. Berryman, *The Evidence for Strato of Lampsacus in Hero of Alexandria's Pneumatica*, in M.L. Desclos – W.W. Fortenbaugh (eds.), *Strato of Lampsacus: Text, Translation and Discussion*, Transaction Press, New Brunswick NJ 2011, pp. 277-91, and K. Sanders, *Strato on 'Microvoid'*, *ibid.*, pp. 263-76; for a most interesting and detailed discussion of the history of this example from the Lyceum to Galen, see V. Cordonier, *A Micro-Intertextual Approach to Ancient Thought: The Case of the Torpedo Fish from Plato to Galen*, «Graduate Faculty Philosophy Journal: The New School of Social Research», 37/1 (2016), pp. 15-48.

it is not continuous, saying (3) «Neither light, nor heat nor any other bodily power would be able to pass right through water or air or another body [if this were not the case]. (4) For how would the rays of light pass right through to the base of a vessel [of water]? (5) For if the liquid did not have pores, but the rays divided it by force, the result would be that full vessels would overflow, and it would not be the case that some of the rays would be reflected upwards, while others pass through below». (6) I think, however, that it is possible to resolve these points in accordance with Peripatetic assumptions, according to which heat and the other bodily powers and light, being incorporeal, do not need a void interval as the basis for their existing and passing through, but exist in bodies without increasing their bulk³⁹.

The example of the torpedo fish, *Torpedo marmorata*, is cited as a proof of the same point in the battery of examples in Hero of Alexandria's introduction to his *Pneumatics*, which follows the text almost verbatim repeating our (T5)⁴⁰.

(T6) Hero, *Pneumatica* 1 (= Strato, fr. 30 B, p. 80.23-25 Sharples)

And [things] pass right through bronze and iron and all other

³⁹ (1) ταῦτα μὲν οὖν ὁ Ἀριστοτέλης περὶ τοῦ κενοῦ διετάξατο· (2) ὁ μέντοι Λαμψακηγὸς Στράτων δεικνύουσι πειρᾶται, ὅτι ἔστι τὸ κενὸν διαλαμβάνον τὸ πᾶν σῶμα, ὥστε μὴ εἶναι συνεχές, (3) λέγων ὅτι “οὐκ ἂν δι’ ὕδατος ἢ ἀέρος ἢ ἄλλου σώματος ἐδύνατο διεκπίπτειν τὸ φῶς οὐδὲ ἡ θερμότης οὐδὲ ἄλλη δύναμις οὐδεμία σωματική. (4) πῶς γὰρ ἂν αἱ τοῦ ἡλίου ἀκτῖνες διεξέπιπτον εἰς τὸ τοῦ ἀγγείου ἔδαφος; (5) εἰ γὰρ τὸ ὑγρὸν μὴ εἶχε πόρους, ἀλλὰ βία διέστελλον αὐτὸ αἱ αὐγαί, συνέβαινε ὑπερκεχεῖσθαι τὰ πλήρη τῶν ἀγγείων, καὶ οὐκ ἂν αἱ μὲν τῶν ἀκτίνων ἀνεκλῶντο πρὸς τὸν ἄνω τόπον, αἱ δὲ κάτω διεξέπιπτον”. (6) ἀλλὰ ταῦτα μὲν οἶμαι λύειν δυνατὸν κατὰ τὰς Περιπατητικὰς ὑποθέσεις, καθ’ ἃς καὶ ἡ θερμότης καὶ αἱ ἄλλαι σωματικαὶ δυνάμεις καὶ τὸ φῶς ἀσώματα ὄντα οὐ χρῆζει κενοῦ διαστήματος ὑποκειμένου πρὸς ὑπόστασιν καὶ δίοδον, ἀλλ’ ἐν τοῖς σώμασιν ὑφίσταται οὐκ ὀγκοῦντα τὰ σώματα.

⁴⁰ For discussion, see K. Sanders, *Strato on ‘Microvoid’* (above, n. 38), pp. 263-76; S. Berryman, *Horror vacui in the Third Century BC: When is a Theory not a Theory?*, in R. Sorabji (ed.), *Aristotle and After*, «Bulletin of the Institute of Classical Studies», *Suppl.* Vol. 68 (1997), pp. 147-57. On Hero as a source for Strato, see Berryman, *The Evidence for Strato in Hero of Alexandria’s Pneumatics* (above, n. 38), pp. 277-91, with references to the earlier discussion.

bodies, as with what happens in the case of the torpedo-fish (trans. Sharples)⁴¹.

The problem raised by Strato is that of propagation of bodily substances through bodies. He resolved it by introducing microvoids, channels through which bodily substances, including such as heat, light, and others, could pass⁴². Strato apparently construed all of these substances as bodies with volume (or as properties inseparable from their bodily substrates). The way the problem is formulated in the Strato testimonia shows that he was concerned by the fact that these substances that are propagated in this way do not bring about the increase in volume of the bodies they are passing through. Simplicius in (T5.6) tells us about the Peripatetic solution of the problem of microvoids, which apparently rejected Strato's assumption that heat and light are themselves thin bodily masses and treated them instead as incorporeal properties of bodies. Simplicius may be using Alexander as a source for 'Peripatetic assumptions' here⁴³.

Alexander's task in the argument in our text (T4) is different from that of Strato's and his Peripatetic amenders. It has to do not so much with physical mechanism of transmission through the body (this is his central interest elsewhere, e.g. in *De Mixtione*), as with causal mechanism of acting and being acted upon through the medium. Alexander uses the examples cited by Strato and Hero in order to show that there are cases where physical bodies transmit certain properties that affect other bodies, without themselves being affected

⁴¹ ἀλλὰ μὴν καὶ διὰ χαλκοῦ καὶ σιδήρου καὶ τῶν ἄλλων ἀπάντων διεκπίπτει σωμαίων, καθάπερ καὶ τὸ ἐπὶ τῆς νάρκης τῆς θαλασσίας γινόμενον

⁴² Frs. 26-30 Sharples, for two different interpretations of the evidence, see Berryman, *Horror vacui in the Third Century BC* (above, n. 40), and Id., *The Evidence for Strato in Hero of Alexandria's Pneumatics* (above, n. 38), and Sanders, *Strato on 'Microvoid'* (above, n. 38).

⁴³ This view is very close to what we find in very many works of Alexander, where he argues against the Stoic thesis according to which qualities are corporeal, often treating it as a generic rather than school-specific claim (*De Mixtione* is a good example).

in the process of transmission. In this way, one could say, Alexander strengthens Aristotle's example of melting leaden parts in *De Caelo* II 7 by emphasizing the disanalogy between the two processes of heating – one caused by a 'normal' sublunary agent and another by the divine body. The disanalogy was that the divine agent will not be affected by the effect it produces in its sublunary object. Alexander uses the examples of electric charge and light to show that sublunary agents also can produce effects which work in some objects but not others, and so impassivity of heavenly body towards heating should not be seen as something totally outlandish.

But in his interpretation of these examples Alexander does indeed resort to the Peripatetic assumption about the ontological status of the mechanisms involved in the production of light and electric charge mentioned in Simplicius. According to Alexander's argument in *Meteorology*, these effects are produced by the incorporeal powers that pass through bodies affecting some of them but not others. What needs to be explained is why these powers act in such a selective way.

It is possible that working out his explanation of this selective action, Alexander was able to find some help in the earlier Peripatetic tradition. Simplicius in his commentary on *Physics* III 3 reports Andronicus' interpretation of Aristotle's account of motion being in the thing moved as its actuality caused by the mover⁴⁴. The report consists of two small passages, both having to do in the first instance with establishing or explaining the text of Aristotle's treatise and both seeming to have the same doctrinal bearing.

⁴⁴ Andronicus' name is mentioned by Simplicius only four times in the *Physics* commentary. On one occasion, to do with the division of the treatise into two parts, *On Principles* and *On Motion*, Simplicius also mentions the work of Andronicus on which he (or his source) draws, as 'Aristotelian books' (p. 924.19 Diels). These passages have been discussed by H.B. Gottschalk, *Aristotelian Philosophy in the Roman World from the Time of Cicero to the End of the Second Century AD*, in W. Haase (ed.), *Aufstieg und Niedergang der römischen Welt* II.36.2, *Philosophie (Platonismus; Aristotelismus)*, De Gruyter, Berlin 1987, pp. 1079-174.

(T7a) Andronicus of Rhodes *apud Simplic. In Phys.* III 3, p. 440.12-17 Diels

One should know that in this passage [202 a 14] many write this text clearer in this way: «for it is its actuality [produced] by the mover», and Andronicus as follows: «for it is the actuality of the moved and by it», and explains that even if the mover is outside, the moved, being led to actuality from the internal potentiality, seems to be moved by itself⁴⁵.

Here Andronicus provides his preferred reading of the passage (found also in our MS J) and explains it by appealing to the internal potentiality of the thing moved which is brought to actuality by the external mover, so that a thing moved seems to be moved by itself. In the next passage Andronicus has more to say about the interaction between the external mover and the internal potentiality of the moved.

(T7b) Andronicus of Rhodes *apud Simplic., In Phys.* III 3, p. 450.16-20 Diels

Now, nature being itself predisposed disposes the subject [of change] inside in accordance with each kind of change, as Andronicus already pointed out. For even though water is heated by fire, still it is the nature in the water which becomes hot first, then heats and co-heats the subject⁴⁶.

This report comes from a commentary on Aristotle's discussion of change as the actuality of what is potentially active or acted upon (*Phys.* III 3, 202 b 23-29). More specifically, it is found in Simplicius' comment on Aristotle's wording in his definition of change as

⁴⁵ ἰστέον δὲ ὅτι ἐν τούτῳ τῷ χωρίῳ οἱ μὲν πολλοὶ σαφέστερον οὕτω γράφουσι ταύτην τὴν λέξιν· ἐντελέχεια γὰρ ἐστὶ τούτου ὑπὸ τοῦ κινητικοῦ, ὁ δὲ Ἀνδρόνικος οὕτως· ἐντελέχεια γὰρ ἐστὶ τοῦ κινητοῦ καὶ ὑπὸ τούτου. καὶ ἐξηγεῖται ὅτι κἂν ἐξῴσθην ἢ τὸ κινεῖν, ἐκ τῆς ἐνούσης δυνάμεως εἰς ἐνέργειαν ἀγόμενον, ὅφ' ἑαυτοῦ κινεῖσθαι δοκεῖ τὸ κινούμενον.

⁴⁶ ἢ δὲ φύσις καὶ προδιατιθεμένη διατίθησι τὸ ὑποκείμενον ἔνδοθεν καθ' ἕκαστον κινήσεως εἶδος, ὡς καὶ ὁ Ἀνδρόνικος ἔλεγε. κἂν γὰρ θερμαίνεται ὑπὸ πυρός τὸ ὕδωρ, ἀλλ' ἢ ἐν τῷ ὕδατι φύσις πρώτη θερμῆ γενομένη, οὕτως θερμαίνει ἢ συνθερμαίνει τὸ ὑποκείμενον.

the actuality of that which is potentially active or passive as such (ἐντελέχεια ... ἡ τοῦ δυνάμει ποιητικοῦ καὶ παθητικοῦ ἢ τοιοῦτον). Simplicius raises a question of how one should understand something being «potentially active qua such» (τὸ δυνάμει ποιητικόν ἢ τοιοῦτον). Simplicius suggests that Aristotle might have said ‘potentially active’ to indicate a distinction of the movement imparted by the unmoved causes from the natural and technical movement (p. 450.2-5 Diels). In the latter case, the natural cause of movement will be active in the process of movement, but inactive prior to this process, and this state is referred to as «potentially active». In support of his explanation, whose structure and wording are Platonist, Simplicius cites what may be Andronicus’ explanation of this passage, our (T7b).

This explanation lacks immediate context, but fortunately it is illustrated with an example which makes it clear that Andronicus does not have in mind, at least not exclusively, a difference between the natural and the supernatural proposed by Simplicius. His analysis is meant to work in the case of sublunary physical processes, such as heating the water by the fire. In this process, fire has the role of the external mover, water, of the thing being acted upon, and the problematic role of the «potentially active» thing seems to be given, strikingly, to the internal nature of the water which is taken to be distinct from water as the mere object of heating. It is this nature that is first disposed itself in a certain way by fire, and then disposes water itself, the subject of change, in accordance with the change of heating. ‘First’ and ‘then’ in the previous sentence are probably not to be understood chronologically: Andronicus has in mind the causal priority. The scholars pointed out a similarity of the analysis with the Stoic distinction between the principal and the antecedent cause⁴⁷. But Andronicus’ wording as the report has it (this internal nature ‘heats or

⁴⁷ Gottschalk, *Aristotelian Philosophy in the Roman World* (above, n. 45), p. 119.

co-heats' the subject) can hardly allow us to see the internal nature as the Stoic principal cause of heating in this example⁴⁸.

Andronicus' analysis splits the role of the agent or mover into two levels, of the external and the 'internal' mover, respectively. The logic of this split can remind us of Aristotle's hierarchy of movers following the distinction between the unmoved and moved mover (as in *Phys.* VIII 5, 256 a 4-8)⁴⁹.

If Alexander is aware of Andronicus' discussion, he might be attracted by the idea of treating the internal nature of the subject of change as a causal factor with an active role of its own, still dependent on the external mover for any given change, but also capable of accelerating or inhibiting this change by itself.

This concept of internal nature of the subject of change, which is «potentially active», i.e. brought to activity by an external mover, could explain why the same causal agent produces a particular effect in one case but not in the other. The idea of such a difference can be found in Aristotle's discussion of the way the same cognitive states (presentation with something fearful or meant to cause anger) can produce different psychological reactions depending on the bodily disposition of the living being presented with these impressions⁵⁰.

⁴⁸ In the Stoic system, the expression 'co-heating' would illustrate either co-operant (*σύνεργα*) or auxiliary causes (*συναίτια*). The internal nature of a thing is neither of them, it corresponds to the 'principal' or 'cohesive' cause. So even if the Stoic analysis served as a model for Andronicus, this model has been reworked in accordance with the Aristotelian analysis of acting upon in this passage.

⁴⁹ Simplicius has not preserved to us any reference to this Aristotelian context; he himself uses Andronicus' division to assign the role of external mover to the 'unmoved causes' and the role of the internal nature to all the natural and technical causes.

⁵⁰ *De Anima* I 1, 403 a 18-25. Aristotle's examples are designed to show that when we are experiencing emotions, not only our soul, but the body also is affected (this is what it means for the reasons to be in matter: *ἅμα γὰρ τούτοις πάσχει τὸ σῶμα*). So the proof of the body's being affected jointly with the soul consists in the impact it can have on the soul's emotion, amplifying or diminishing the emotional effect produced by the cognitive state.

Alexander's examples of torpedo-fish and glass vessel can be construed on the lines of Andronicus' explanation as showing that the inner nature of a right sort may be lacking in some things of sublunary world, e.g. fishermen's nets and lenses' glass, and be present in some other things, e.g. fishermen's hands and Marcellus' fleet burnt through the lenses (according to a legend, admittedly, used here to make the point more graphic). Therefore the former kind of things - nets and lenses - can work as transmitters and the latter kinds of things - hands and wooden ships - as recipients, respectively, of the numbing effect and burning.

In the case of the sun heating the atmosphere, the inner nature of the stuff of the heavens lacks the recipient nature of the right sort to exhibit the effect of heating, even though it can transmit the action of heating and, as we shall see shortly, even be affected by it in its own way. The inner nature of the tinder sphere, on the other hand, is just right for the reception of the effect of heating. The principal cause of heating in this case is different in kind from the inner nature of a heated substance which acts as a co-cause in the sublunary world. Alexander's external mover in the case of the sun heating is not unmoved, although it represents a different class of moved substances, namely the eternal moved substances.

Alexander now has to explain the nature of this difference. What exactly is special about the transmission in the heavenly body? Is Alexander compelled to introduce some novel, supernatural factor into Aristotle's story of the sun heating the lower cosmos? As we shall see from the next section, Alexander's answer would be 'yes' and 'no'. 'Yes', because Alexander needs to supply an account of how heat is transmitted from the sun through the aethereal body made up of several spheres, to produce the effect of friction at the edge of the sublunary cosmos. 'No', because Alexander seems reluctant to introduce any new physical force as an ad hoc solution to the problem and concentrates in a painstaking way on the differences in the hylomorphic structure between the sublunary and the heavenly elements. This may be the

most interesting and rewarding part of his solution, from the point of view of the development of Aristotelian doctrine in Alexander's school. Let us look at it closely in the next section.

4. *Heavens have qualities and are in a way passive*

In *De Caelo* I 3, Aristotle discusses the properties of the first body. In a series of arguments, he aims to show that it is neither heavy nor light (269 b 18 - 270 a 12), ungenerated and indestructible since it has no contrary (270 a 13-23), not subject to growth and diminution (270 a 23-26), and unalterable (270 a 25-35). The latter argument is complex, and worth being presented as a whole:

(T8) Aristotle, *De Caelo* I 3, 270 a 25-35

(1) And if it is not subject to growth and indestructible, then it belongs to the same reasoning to assume that it is unalterable. (2) For alteration is change with respect to the quale, and of [the category of] the quale the states and dispositions do not happen without changes with respect to affection, for instance health and disease. (3) But we see that as many of the physical bodies as change with respect to affection possess also growth and diminution, for instance the bodies of animals and plants and their parts, and similarly those of the elements. (4) So if the body moving in a circle can have neither growth nor diminution, it is reasonable that it is unalterable⁵¹.

⁵¹ (1) Εἰ δ' ἐστὶ καὶ ἀναύξητον καὶ ἀφθαρτον, τῆς αὐτῆς διανοίας ἐστὶν ὑπολαβεῖν καὶ ἀναλλοίωτον εἶναι. (2) Ἐστὶ μὲν γὰρ ἡ ἀλλοίωσις κίνησις κατὰ τὸ ποιόν, τοῦ δὲ ποιοῦ αἱ μὲν ἕξεις καὶ διαθέσεις οὐκ ἄνευ τῶν κατὰ τὰ πάθη γίνονται μεταβολῶν, οἷον ὑγίεια καὶ νόσος. (3) Κατὰ δὲ πάθος ὅσα μεταβάλλει τῶν φυσικῶν σωμάτων, ἔχονθ' ὀρώμεν πάντα καὶ αὔξησιν καὶ φθίσιν, οἷον τὰ τε τῶν ζώων σώματα καὶ τὰ μέρη αὐτῶν καὶ τὰ τῶν φυτῶν, ὁμοίως δὲ καὶ τὰ τῶν στοιχείων. (4) ὥστ' εἴπερ τὸ κύκλῳ σῶμα μήτ' αὔξησιν ἔχειν ἐνδέχεται μήτε φθίσιν, εὐλογον καὶ ἀναλλοίωτον εἶναι.

Aristotle's argument about alteration continues the line of thought pursued in the two immediately preceding arguments (about growth and diminution and coming to be and perishing) which presupposes a connection between the four main kinds of change in the sublunary realm. The logic of the argument seems to be as follows:

- (1) All alteration involves affection (T8.2)
- (2) All affection involves being subject to growth and diminution (T8.3)
- (3) Heavenly body is not subject to growth and diminution (T8.4)
- (4) Hence it does not receive any affection [from (2) and (3)]
- (5) Hence it is not subject to alteration [from (1) and (4)] (T8.4)

This outline is drastically simplified in order to show what is needed for the argument to work. There are many details in Aristotle's wording which resist such a simple reading of the argument. One might ask, for instance, why in (T8.2) Aristotle chooses to speak of just one out of the four main kinds of quality in the classification of *Categories* 8, namely states and dispositions (*Categ.* 8, 8 b 26 - 9 a 13). The answer would probably have to do with the nature of the heavenly body and the kinds of qualities with respect to which it may be presumed without an argument to lack change, for instance, because this is clear from the very concept of these qualities which can be taken for granted as not needing a proof. Thus, since the heavenly body is always spherical in shape, we can assume that it does not change its shape (the fourth class in the *Categories* 8, 10 a 11-16). We can assume that it does not change in respect of capacities (second class, *Categ.* 9 a 14-27), because they are always the same in the case of this body. What is left is states and dispositions (first class, *ibid.*, as above) and affections (third class, *Categ.* 9 a 28 - 10 a 10). Aristotle's argument includes as its crucial step the denial of affections to the heavenly bodies. So the premiss can only include states and dispositions. The argument is designed to show that change in respect to them also involves affections, and

what cannot be affected (as the heavenly body cannot), cannot have a change in respect of quality.

Aristotle concludes the chapter by pointing out how these properties of the heavenly body established in the arguments just outlined agree with the appearances⁵².

Alexander in his commentary seems to build on these observations and on the wording of the argument in insisting that it is not stated as demonstrative in terms of necessity, but only reasonable. He draws attention to the wording of the conclusion (T8.4), which says ‘it is reasonable that it is unalterable’:

(T8a) Alexander *apud* Simplicius, *In De Caelo*, p. 111.24-31 Heiberg

(1) It should be noted, says Alexander, that the formulation [of the argument] is not stated as necessary, but according to what is ‘reasonable’. (2) For it is not the case that if in the things that by their nature are capable of being affected the states are with affection, it is by the same token necessary in the things impassive. (3) Nor yet if we see that around us the things that are undergoing alteration are also growing and decreasing is it reasonable that generally if some thing is altered it is also growing. (4) For if insofar as it is altered it grows and decreases, then the argument has necessity, and if not, not. (5) But also, [Alexander] says, Aristotle said in the *Categories* that it is not necessary for the things that change in respect of affection either to grow or decrease⁵³.

⁵² *De Caelo* I 3, 270 a 36 - b 25: all men have a conception of god and assign the highest place to the divine (270 b 6-12); in the records of observations handed down there is no evidence of change in the whole of the outermost heaven or its proper parts (b 12-17); etymological argument: αἰθήρ handed down as the name for the divine element derives from αἰεὶ θεῖν (and not from αἰθεῖν as Anaxagoras wrongly supposed).

⁵³ (1) σημειωτέον δὲ, φησὶν ὁ Ἀλέξανδρος, ὅτι ἡ λέξις οὐχ ὡς ἀναγκαία, ἀλλὰ κατὰ τὸ εὐλογον εἴρηται. (2) οὕτε γάρ, εἰ ἐν τοῖς πάσχειν πεφυκόσιν αἰ ἐξείεις μετὰ πάθους, ἤδη καὶ ἐν τοῖς ἀπαθέσιν ἀναγκαῖον, (3) οὕτε, εἰ τὰ ἀλλοιούμενα αὐξόμενα καὶ μειούμενα ὁρώμεν ἐν τοῖς παρ’ ἡμῖν, εὐλογον καὶ καθόλου, εἴ τι ἀλλοιοῦται, τοῦτο αὐξέσθαι. (4) εἰ μὲν γάρ, ἢ ἀλλοιοῦται, ταύτη αὐξεται καὶ μειοῦται, ἀνάγκη ὁ λόγος ἔχει, εἰ δὲ μή, οὐ. (5) ἀλλὰ καὶ ἐν Κατηγορίαις, φησὶν, αὐτὸς ὁ Ἀριστοτέλης εἶπεν, ὅτι οὕτε αὐξέσθαι ἀναγκαῖόν ἐστι τὰ κατὰ πάθος κινούμενα οὕτε μειοῦσθαι.

Alexander says that Aristotle's argument only establishes that the processes of alteration are found in the things that grow and decrease. This is reasonable. But this argument does not establish that each thing that is undergoing alteration, i.e. changing any of its qualities, is also by the same token either increasing or decreasing in size. This would have been the demonstration whose conclusion would be necessary, if established. But we don't have such an argument, because Aristotle does not intend it here. In fact, in the *Categories* Aristotle raises it as a difficulty concerning the alteration, whether it should be accompanied by an increase and/or decrease, and resolves this negatively (it should not be accompanied by either).

(T8b) Aristotle, *Categories* 14, 15 a 17-27

(1) Concerning the alteration, there is a certain difficulty: perhaps it is necessary for that which undergoes alteration to be altered with respect to any of the remaining changes. (2) But this is not true. For with respect to practically all, or most, affections we happen to be altered without taking part in any of the other changes. (3) For it is not necessary for that which changes in respect of affection to increase nor to decrease, and similarly with all the others, so that alteration will be different from other movements. (4) For had it been the same, that which is altered should have at the same time increase or decrease or follow any of the other changes. But this is not necessary⁵⁴.

Aristotle argues here that all the six kinds of change (coming to be, perishing, growth, diminution, alteration and change with respect to place) are distinct from each other. While the case is clear

⁵⁴ (1) ἐπὶ δὲ τῆς ἀλλοιώσεως ἔχει τινὰ ἀπορίαν, μήποτε ἀναγκαῖον ἦ τὸ ἀλλοιούμενον κατὰ τινὰ τῶν λοιπῶν κινήσεων ἀλλοιοῦσθαι. (2) τοῦτο δὲ οὐκ ἀληθές ἐστιν· σχεδὸν γὰρ κατὰ πάντα τὰ πάθη ἢ τὰ πλεῖστα ἀλλοιοῦσθαι συμβέβηκεν ἡμῖν οὐδεμιᾶς τῶν ἄλλων κινήσεων κοινωνοῦσιν. (3) οὔτε γὰρ αὐξέσθαι ἀναγκαῖον τὸ κατὰ πάθος κινούμενον οὔτε μειοῦσθαι, ὡσαύτως δὲ καὶ ἐπὶ τῶν ἄλλων, ὥσθ' ἑτέρα ἂν εἴη παρὰ τὰς ἄλλας κινήσεις ἢ ἀλλοιώσεις. (4) εἰ γὰρ ἦν ἡ αὐτή, ἔδει τὸ ἀλλοιούμενον εὐθὺς καὶ αὐξέσθαι ἢ μειοῦσθαι ἢ τινὰ τῶν ἄλλων ἀκολουθεῖν κινήσεων· ἀλλ' οὐκ ἀνάγκη.

with the five of them, there is a problem for alteration because it might be accompanied by some of the other changes. Aristotle's argument here establishes that it is not necessary for the alteration to have a concomitant change of any other type. It does not establish anything with necessity. But this is enough for Alexander's purpose, which is to weaken the argument in *De Caelo* and make it possible for the heavenly body to undergo some kind of alteration. This is why he uses Aristotle's argument in the *Categories* to amend Aristotle's argument in the *De Caelo*⁵⁵.

Alexander then develops his own view of the kind of alteration that should be possible in the heavenly bodies and supplies metaphysical grounds for this possibility.

(T9) Alexander *apud* Simpl., *In De Cael.*, pp. 111.31-112.24 Heiberg
 (1) Alexander says that those things which have something contrary to their substance in the sense of form and to their affections, will be by virtue of contrariety in respect of substance both generable and perishable, and subject to both growth and diminution, and by virtue of [contrariety] with respect to affection, subject to alteration. (2) As to all those things that have no contrariety with respect to substance, but are in qualities that have contrariety, while they are not subject to coming to be and growth, nothing prevents them from undergoing alteration and being affected in this way. (3) It should be noted, [Alexander] says, that [Aristotle] proves that they are unalterable not from there being nothing contrary to their accidental quality; and yet he would have made use of this if he thought so, just as he proved them to be not subject to generation by there being nothing contrary [to them]. (4) And, [Alexander] says, for those who say that Aristotle declares the fifth body to be lacking qualities it should be shown also in this way that they do not know what they say: (5) for if

⁵⁵ This is a good example of Alexander's interpretation of Aristotle 'from Aristotle', using this kind of critical exegesis to make an innovative move in the Aristotelian theory, which he otherwise generally supports.

he were to say that it is devoid of qualities, it would have been easiest for his to prove from this that it is unalterable. For that which has no quality to begin with would not change in respect of quality. (6) For I have indicated this, [Alexander] says, for the sake of proving that even if it happens to the body moving in a circle under the sun to be heated by the sun's rotation and thus to transmit to the body under it the heat generated by the movement of the sun, nothing outlandish is attributed to the substance of the body moving in a circle. (7) For it is not always that what is undergoing alteration is perishable, but only as many things as are by their substance capable of undergoing change, and such in whose substance and form there is something that is contrary. (8) For as [Aristotle] himself says, that thing is 'unaffected by all mortal trouble' [*De Caelo* II 1, 284 a 14], but not 'unaffected' without qualification. For it is not the case, if something were contrary to some accidental property, there immediately must be something contrary to it also. (9) Stars, at any rate, have colour, and if every colour is either white or black or mixed, there would be something contrary to the colour itself or their colour would be composed of contraries, but the stars are not therefore perishable, because colour is not in their substance'⁵⁶.

⁵⁶ (1) ὢν μὲν γὰρ, φησὶν ὁ Ἀλέξανδρος, τῇ οὐσίᾳ τῇ κατὰ τὸ εἶδος ἔστι τι ἐναντίον καὶ τοῖς πάθεσιν, ταῦτα διὰ μὲν τὴν κατ' οὐσίαν ἐναντίωσιν ἔσται ὁμοῦ μὲν γενητὰ καὶ φθαρτὰ, ὁμοῦ δὲ αὐξήτὰ τε καὶ μειωτὰ, διὰ δὲ τὴν κατὰ πάθος ἀλλοιωτὰ. (2) ὅσα δὲ μηδεμίαν ἔχοντα κατ' οὐσίαν ἐναντιότητα ἐν ποιότησιν ἔστιν ἐχούσας ἐναντίωσιν, ταῦτα ἀγένητα ὄντα καὶ ἀναυξῆ οὐδὲν κωλύσει ἀλλοιοῦσθαι τε καὶ οὕτως πάσχειν. (3) σημειωτέον δέ, φησί, καί, ὅτι οὐ διὰ τὸ μηδὲν ἐναντίον εἶναι αὐτῶν τῇ συμβεβηκυῖα ποιότητι ἀναλλοιώτα αὐτὰ δείκνυσι· καίτοι ἐχρήσατο ἂν αὐτῶ, εἰ οὕτως ἦετο, ὡσπερ καὶ ἀγένητα ἐδείκνυ τῶ μηδὲν εἶναι ἐναντίον. (4) καὶ τοῖς λέγουσι, φησὶν, ἄποιον Ἀριστοτέλην τὸ πέμπτον σῶμα λέγειν καὶ ἐντεῦθεν δεικτέον, ὅτι μὴ ἴσασιν, ἃ λέγουσιν. (5) εἰ γὰρ ἄποιον ἔλεγεν αὐτὸ εἶναι, ῥᾶστον ἦν αὐτῶ ἐντεῦθεν δεῖξαι, ὅτι ἀναλλοιώτων· ὁ γὰρ μὴ τὴν ἀρχὴν ἔχει ποιότητα, οὐδ' ἂν κατὰ ποιότητα μεταβάλλοι. (6) ἐπεσημηνάμην δέ, φησί, τοῦτο ὑπὲρ τοῦ δεῖξαι, ὅτι, κἂν συμβαίη τὸ μετὰ τὸν ἥλιον σῶμα κυκλοφορητικὸν θερμαινόμενον ὑπὸ τῆς τοῦ ἡλίου περιφορᾶς διαπέμπειν τῶ ὑπ' αὐτὸ σῶματι τὴν ἀπὸ τῆς ἐκείνου κινήσεως γινομένην θερμότητα, οὐδὲν ἄτοπον ἐπιφέρεται τῇ τοῦ κυκλοφορητικοῦ σώματος οὐσίᾳ. (7) οὐ γὰρ πάντως τὸ ἀλλοιούμενον φθαρτόν, ἀλλ' ὅσα κατ' οὐσίαν οἷά τε μεταβάλλειν· τοιαῦτα δέ, ὢν τῇ οὐσίᾳ καὶ τῶ εἶδει ἔστι τι ἐναντίον. (8) ὡς γὰρ αὐτὸς λέγει, ἀπαθὲς ἐκεῖνο πάσης θνητῆς δυσχερείας, ἀλλ'

In this argument, Alexander amends Aristotle's argument in *De Caelo* I 3 and makes it more precise. The connection between alteration, affection, growth/diminution, and coming to be /perishing as outlined in Aristotle's 'reasonable' argument obtains only for those things that are subject to coming to be and perishing. In (T9.1) Alexander explains that those things that have a contrary with respect to both their substance-form and their affections, will be subject to coming-to-be and perishing and growth and diminution because of their substance-form and also to alteration because of their affections which have contrarities.

The question might be raised about 'the things that have something contrary to their substance in the sense of form' that Alexander mentions in (T9.1). How can a substance-form which is the essence of a thing, according to the *Metaphysics*, have something contrary to it?⁵⁷ The easiest, if controversial, example satisfying this formula would be that of the simple bodies. This example is controversial for modern scholars, who deny the hylomorphic account of the elements, but not for Alexander. For him, the hylomorphic view of the elements seems indispensable for a hylomorphic interpretation of Aristotle's distinction between the sublunary substances and the heavenly bodies. Aristotle in *Metaphysics* XII 2, describing the distinction between the three kinds of substance, mentions the «matter for whence and whither» as a different kind of matter «of eternal substances, those which, though not generable are movable by locomotion»⁵⁸. We know that Alexander must have

οὐχ ἀπλῶς ἀπαθές· οὐ γάρ, εἰ τῷ συμβεβηκότι τινὶ ἐναντίον τι εἶη, ἤδη καὶ αὐτῷ ἀνάγκη ἐναντίον τι εἶναι. (9) τὰ γοῦν ἄστρα χρώμα μὲν ἔχει, εἰ δὲ πᾶν χρώμα ἢ λευκόνῃ μέλαν ἢ μικτόν, εἶη ἂν ἡ ἐναντίον τι αὐτῷ τῷ χρώματι ἢ ἐξ ἐναντίων τὸ χρώμα αὐτῶν συγκείμενον, ἀλλ' οὐ διὰ τοῦτο φθαρτὰ τὰ ἄστρα, ὅτι μὴ ἐν τῇ οὐσίᾳ αὐτῶν τὸ χρώμα'.

⁵⁷ Having a contrary is denied of substance in *Categories* 5 (3 b 24-32), but the ability to receive contraries, while staying one and the same numerically is said to be its special characteristic (*Categ.* 5, 4 a 10-21).

⁵⁸ *Metaph.* XII 2, 1069 b 24-6: πάντα δ' ὕλην ἔχει ὅσα μεταβάλλει, ἀλλ' ἑτέραν· καὶ τῶν αἰδίων ὅσα μὴ γενητὰ κινητὰ δὲ φορᾶ, ἀλλ' οὐ γενητῆν ἀλλὰ ποθὲν ποι. (I follow the translation of Judson [see above, n. 9]).

taken this remark seriously, since in two school treatises he defends different aspects of the view according to which there is heavenly matter, a different kind from the sublunary one⁵⁹. Alexander's discussion of the sun heating in his *De Caelo* commentary further elaborates on the hylomorphic interpretation of this distinction between the two kinds of substance. The most interesting part of this discussion, which also serves as the ontological basis of his solution to the physical puzzle of the sun heating, consists in his discussion of two different concepts of form corresponding to the two different kinds of substance.

On Alexander's account, the substance-forms of the four sublunary elements are ordered sets of elemental qualities: a couple of tangible qualities capable of acting and being acted upon (hot/dry, hot/moist, cold/dry and cold/moist) and one of the two qualities accounting for natural motion (heavy or light). Thus, the substance-form of fire, and the essence of fire, is the combination of these three elemental qualities: hot/dry (acting and passive) and light⁶⁰. Each simple body can undergo coming to be and perishing being acted upon by an active contrary quality. Moreover, the increase and decrease of the elemental masses is accounted for by the mechanism of 'prevalence' in the interaction of their elemental constituents⁶¹. Applying the same formula to living things would prove more difficult. But Alexander's aim here is to demarcate the sublunary things - all of which are made of these generable and perishable simple bodies - from the things heavenly.

In (T9.2) Alexander describes heavenly things as having no contrariety in respect of substance but having qualities which have contrarities. Heavenly bodies are ungenerable and imperishable, but «nothing prevents them from undergoing a qualitative change and being affected in this way», i.e. in a way that has no links whatsoever with

⁵⁹ Alexander's *Quaestiones* 1.10 and 1.15, see Sharples (above n. 26) and Fazzo, *Aporia e Sistema* (above, n. 29).

⁶⁰ See Alexander's treatise *De Anima*, pp. 3.21-5.12 Bruns.

⁶¹ See *GC* II 4.

generation and destruction and growth and diminution. Alexander says (in **T9.3**) that since Aristotle does not explicitly rule out this kind of change in his argument in *De Caelo* I 3, he considers it as licensed.

In (**T9.4**) Alexander addresses certain thinkers who call Aristotle's fifth body qualityless. We find such an interpretation in Atticus' criticism of Aristotle where he uses it to make a polemical claim that because Aristotle's first body lacks any quality and thus is not a body at all.

(**T9.4a**) Atticus, Fr. 5 Des Places, part. (= Eusebius, *Praep. Evang.* XV 7, 2)

(1) So, a Peripatetic will not only not contribute anything to the demonstration of which the Platonists make use that the first bodily natures are four, but will oppose it, practically alone. (2) At any rate, since we say that each body is either hot or cold, or dry or moist, or soft or hard, or light or heavy, or rare or dense, and since we find that there is nothing else which would partake of any of these except the four; (3) for if [something] is hot it is fire or air, if cold, water or earth, if dry, fire or earth, if moist, water or air; and if soft, air or fire, if hard, water or earth, and light and rare, fire and air, and heavy and dense, water and earth; (4) and since we accept for all the other simple powers that there is no other body. (5) This man alone resists saying that there can be a body which does not share in any of these, a body, neither heavy, nor light, nor soft, nor hard, nor moist, nor yet dry, well-nigh saying, a body which is not a body. (6) For he has left the name for it but removed all of the powers by virtue of which it would be a body⁶².

⁶² (1) Εἰς τοίνυν τὴν ἀπόδειξιν τοῦ τέτταρας εἶναι τὰς πρώτας τῶν σωμάτων φύσεις, ἧς δὴ χρεῖα τοῖς Πλατωνικοῖς, οὐ μόνον οὐκ ἂν συντελοῖ τι ὁ Περιπατητικός, ἀλλὰ σχεδὸν καὶ μόνος ἐναντιοῖτ' ἄν. (2) Λεγόντων γοῦν ἡμῶν ὅτι πᾶν σῶμα ἢ θερμὸν ἢ ψυχρὸν, ἢ ξηρὸν ἢ ὑγρὸν, ἢ μαλακὸν ἢ σκληρὸν, ἢ κοῦφον ἢ βαρὺ, ἢ ἀραιὸν ἢ πυκνόν, καὶ εὐρισκόντων ὅτι οὐκ ἂν ἕτερον εἴη τι τὸ μεθέξον τούτων τινός παρὰ τὰ τέτταρα. (3) εἰ μὲν γὰρ θερμὸν ἢ πῦρ ἢ ἀήρ, εἰ δὲ ψυχρὸν, ὕδωρ ἢ γῆ, καὶ εἰ μὲν ξηρὸν, πῦρ ἢ γῆ, εἰ δὲ ὑγρὸν ὕδωρ ἢ ἀήρ, καὶ εἰ μὲν μαλακὸν ἀήρ ἢ πῦρ, εἰ δὲ σκληρὸν ὕδωρ ἢ γῆ, καὶ κοῦφον μὲν καὶ ἀραιόν, πῦρ καὶ ἀήρ, βαρὺ δὲ καὶ πυκνόν, ὕδωρ καὶ γῆ. (4) καὶ ἐκ τῶν ἄλλων δὲ ἀπασῶν τῶν ἀπλῶν δυνάμεων κατανοούτων ὡς οὐκ ἂν εἴη παρὰ ταῦτά τι σῶμα ἕτερον. (5) οὗτος

Atticus is Alexander's antagonist on many issues of doctrine⁶³. This text is remarkable in several respects. Perhaps most strikingly for a modern reader, Atticus' presentation of the Platonist 'demonstration' of the four elements seems to be borrowed from Aristotle's *GC* II 2: the list of elemental qualities and the tally of qualities and elements are a shortened version of Aristotle's explanation there. This is of interest not only as an example of appropriation by a thinker of the opposing or criticised theories⁶⁴, but also because this use of Aristotelian explanation of the four elements is used by Atticus, the ardent critic of 'harmony between Plato and Aristotle', for the interpretation of the four elements in the cosmos of the *Timaeus*⁶⁵.

ἀνθίσταται μόνος, φάσκων δύνασθαι σῶμα εἶναι τούτων ἄμοιρον σῶμα, μήτε βαρύ, μήτε κοῦφον, μήτε μαλακόν, μήτε σκληρόν, μήτε ὑγρόν, ἀλλὰ μήτε ξηρόν, μονονουχὶ λέγων σῶμα οὐ σῶμα. (6) Τὸ μὲν γὰρ ὄνομα καταλέλοιπεν αὐτῷ, τὰς δὲ δυνάμεις, δι' ὧν σῶμα πέφυκε γίνεσθαι πάσας ἀφήρηκεν.

⁶³ See P. Moraux, *Der Aristotelismus bei den Griechen, Bd. 2: Von Andronikos bis Alexander von Aphrodisias*, De Gruyter, Berlin - New York 1984, pp. 564-82, on Alexander's engagement with Atticus' arguments, *Quaest.* 1.18, *Mantissa 2 (De Intellectu)*, pp. 66-70 Sharples; M. Rashed, A "new" text of Alexander on the soul's motion, in R. Sorabji (ed), *Aristotle and After* (above, n. 41), pp. 181-95; *Alexander of Aphrodisias: Supplement to On the Soul*, ed. R.W. Sharples, Duckworth, London 2004, pp. 24-44.

⁶⁴ And perhaps not so much: striking though it is, such use is not atypical: compare the account of the cosmic elements in Ocellus Lucanus II 6-22 Harder (considered to be the earliest extant quotation from Aristotle *GC*). Galen is another example of an avowed Platonist who is using the Aristotelian account of the elements in his work (of course, Galen is much less concerned with cosmology as such).

⁶⁵ It may be noted that in taking the cosmology of the *Timaeus* as the only one that is authentically Platonic, Atticus disregards the tradition which includes the *Epinomis* as a school source. In his own day, his position seems closer to the Platonist mainstream (see G. Boys-Stones, *Platonist Philosophy 80 BC to AD 250*, Cambridge U.P., Cambridge 2018, p. 193). But in the schools of later antiquity the difference between the sublunary and the heavenly regions will be emphasised and this will lead to emphasising the difference between the heavenly and the sublunary versions of the four elements. In Proclus' discussion of the *Timaeus*, the 'literalist' position that he describes and for which seems to have Atticus as a source although he is not named («there are only four elements, Aristotle is wrong and following the doctrines of the Barbarians introducing the fifth element») seems to be in minority (Proclus, *In Tim.*, 2, p. 42.9-17 Diehl). This development may have been influenced by Alexander's account, as I hope to show in the sequel to this paper.

For Alexander, the most important challenge of this passage is, of course, not the use of Aristotle, but the presentation of Aristotle's 'first body' in (T9a5-6) as lacking any bodily qualities. Alexander argues that had Aristotle thought of the heavenly body as devoid of any sensible qualities, he could have proven its unalterability most easily by saying that what has no qualities to begin with cannot change in respect of them (T9.5).

In the rest of the (T9), Alexander argues that it is not implausible to attribute alteration to the heavenly body as long as the qualities with respect to which it undergoes alteration are accidental, and as long as the alteration does not lead to the change of status of the heavenly body from the imperishable to perishable. (T9.6) is of particular interest in that here Alexander mentions being heated as one of the qualitative changes that happen in the heavenly realm. The fact that it is one of the sublunary elemental qualities should not worry us, according to Alexander, because in the sublunary world the quality of heat is a part of essence of the primary bodies, but in the heavenly region it can never get to the level of essence and substance, always remaining an accident (T9.7). In (T9.9) colours are mentioned as another example of qualities that heavenly body has, whose possession does not make it perishable.

In (T9.8) Alexander explains that in Aristotle's argument in *De Caelo* I 3, the alteration and affection should be understood in a qualified way, the point Alexander already signalled in (T8a). He now supports this with the quotation from *De Caelo* II 1, where Aristotle says that heavenly body is 'impassive to all mortal trouble' (284 a 14). Alexander takes this to mean that heavenly body is not impassive without qualification and in some way can be subject to affection, as long as this affection does not involve 'mortal trouble'. According to Alexander, it is possible for Aristotle to talk about a special kind of affection which characterises the heavenly body and is different from the sublunary affection in that unlike the latter it is never associated with perishing or decrease. Alexander explains that the fact that an accident of a heavenly body has a contrary does not mean that this

body itself has a contrary. This explanation spells out and generalises the point made in (T9.2). One thing that is not entirely clear from this passage is how Alexander defines the substance-form of the heavenly body as different from that of the sublunary bodies.

We find an answer further in his commentary on *De Caelo* II 7 reported by Simplicius. Here Alexander deals with the problem of the special nature of heavenly body and also of its hylomorphic structure.

(T10) Alexander *apud* Simpl., *In Cael.*, pp. 442.22-443.18 Heiberg (= Fr. 147c Rescigno, part.)

(1) And let me quote also this from Alexander. (2) When Aristotle says that the heavens heat the [bodies] beneath them by friction, Alexander says «How could this be true, if they are not tangible? (3) So, he says, since every tangible thing is such in accordance with some contrariety, and the first things in accordance with the first contrarities, and the first tangible contrarities are, as has been demonstrated in the second book *On Coming to be and Perishing*, heat and coldness and dryness and moisture, I inquired whether the body that moves in a circle has its form in accordance with these or in accordance with others. (4) For if it is in accordance with some of these, it is in accordance with some of the four. (5) And if it is in accordance with others, first it would seem absurd that the first among the bodies [has its form] not in accordance with the first [contrarities]. (6) Next, even so, if it [has its form] in accordance with some tangible contrariety, it is not everlasting. For there will be something contrary to it. (7) Perhaps then, he says, we should say that it is tangible and has its form in accordance with a tangible quality, but not in accordance with a contrariety. For things subject to coming to be and perishing [have their forms] in accordance with tangible contrarities because they are enmattered and must change into each other, but this [body] is not such, and has its form in accordance with the tangible quality of circular motion, which has no contrary. (8) For if the heaviness and the lightness are tangible qualities, as [Aristotle] said enumerating the tangible contrarities [GC II 2, 329 b 18-20], then circular movement, which is the form

of that body, should be tangible too. (9) For heaviness and lightness are not the forms of the bodies subject to coming to be and perishing because they are neither acting nor acted upon. For they are not predicated by virtue of acting or of being acted upon by another, as [Aristotle] said [GC II 2, 329 b 22], but bodies subject to coming to be and perishing are acting and being acted upon by each other. (10) Movement in a circle is acting, but not acted upon because it has no contrary by which to be acted upon. (11) For the things acted upon by it are not acted upon as contraries; it is reasonable that it is the form of that body. (12) For it would be thin in the sense of rare, whose contrary is the dense, and it would have more and less of this [property], the spheres more and the stars less. For these latter seem to be more compressed, and this compression does not drive them out of their being because this kind of rarefaction and condensation follow upon the circular movement, and this latter is unchangeable. (13) And colours and any such [properties] that belong to them, would do so as coincidental and external and following upon that quality». So Alexander⁶⁶.

⁶⁶ (1) Παρακείσθω δὲ καὶ ταῦτα τοῦ Ἀλεξάνδρου. (2) εἰπόντος γὰρ τοῦ Ἀριστοτέλους τῆ τρίψει θερμαίνειν τὰ ὑπ' αὐτὰ τὰ οὐράνια, "πῶς ἂν εἶη τοῦτο" φησὶν "ἀληθές, εἰ μὴ ἀπτά εἶη; (3) ἐζήτησα οὖν, φησὶν, ἐπειδὴ πᾶν ἀπτόν κατὰ τινα ἐναντίωσιν τοιοῦτον, καὶ τὰ γε πρῶτα κατὰ τὰς πρῶτας, πρῶται δὲ ἀπταὶ ἐναντιώσεις δεικνύνται ἐν τῷ δευτέρῳ Περὶ γενέσεως καὶ φθορᾶς θερμότης καὶ ψυχρότης καὶ ξηρότης καὶ ὑγρότης, εἰ κατὰ ταύτας εἰδοποιεῖται καὶ τὸ κυκλοφορητικὸν ἢ κατ' ἄλλας. (4) εἰ μὲν γὰρ κατὰ τούτων τινάς, τῶν τεσσάρων τινάς, (5) εἰ δὲ κατὰ ἄλλας, πρῶτον μὲν ἄτοπον δόξει τὸ μὴ κατὰ τὰς πρῶτας τὸ πρῶτον τῶν σωμάτων. (6) ἔπειτα καὶ οὕτως, εἰ κατὰ τινα ἀπτήν ἐναντίωσιν, οὐκ αἰδίον· ἔσται γὰρ τι αὐτῷ ἐναντίον. (7) μήποτε οὖν, φησί, ῥητέον ἀπτόν μὲν αὐτὸ εἶναι καὶ εἰδοποιεῖσθαι καὶ αὐτὸ κατὰ ἀπτήν ποιότητα, οὐ μὴν κατὰ ἐναντίωσιν. τὰ μὲν γὰρ ἐν γενέσει καὶ φθορᾷ κατὰ ἀπτάς ἐναντιώσεις, ὅτι ἐνούλα τε καὶ μεταβαλεῖν αὐτὰ εἰς ἄλληλα ἀνάγκη, τοῦτο δὲ οὐ τοιοῦτον, εἰδοποιεῖται δὲ ποιότητι ἀπτῆ τῆ κυκλοφορίας, ἣ οὐδὲν ἔστιν ἐναντίον. (8) εἰ γὰρ ἢ βαρύτες καὶ ἢ κουφότες ἀπταὶ εἰσι ποιότητες, ὡς εἶπεν ἐξαριθμούμενος τὰς ἀπτάς ἐναντιώσεις, εἶη ἂν καὶ ἢ κυκλοφορία ἀπτή, ἣ ἔστιν εἶδος ἐκείνου τοῦ σώματος. (9) ἢ μὲν οὖν βαρύτες καὶ ἢ κουφότες οὐκ ἦν εἶδη τῶν ἐν γενέσει σωμάτων, ὅτι μήτε ποιητικὰ μήτε παθητικὰ ταῦτα· οὐ γὰρ τῷ ποιεῖν ἢ πάσχειν ὑφ' ἑτέρου λέγονται, ὡς εἶπε· τὰ δὲ ἐν γενέσει σώματα ποιητικὰ καὶ παθητικὰ ὑπ' ἀλλήλων. (10) ἢ δὲ κυκλοφορία ποιητικὴ μὲν οὔσα, οὐκέτι δὲ καὶ παθητικὴ τῷ μὴ ἔχειν τι ἐναντίον, ὑφ' οὗ πείσεται. (11) οὐδὲ γὰρ τὰ πάσχοντα ὑπ' αὐτῆς ὡς ἐναντία πάσχει· εἰκότως εἶδος ἔστιν ἐκείνου τοῦ σώματος. (12) εἶη δ' ἂν

Alexander begins with the aporia at (T10.2): if the heavenly body produces heat by friction it must be tangible, and then it must be so either in the same way as the four sublunary elements or differently. Being tangible in the same way as heavenly bodies means being constituted by primary elemental qualities, hot/cold and dry/moist (T10.3). The wording of the question Alexander asks in (T10.3) is important: whether the body that moves in a circle has its form (*εἰδοποιεῖται*) in the same way as the four sublunary elements or in some different way. The question is not whether or not the heavenly body can have such properties in any way whatsoever. We have already seen above that Alexander is ready to allow heavenly body to have some of these qualities, e.g. heat, as accidents. The question here is whether the heavenly body may have the four primary elemental qualities as parts of its form, for this is what it means for it to have its form as the four sublunary bodies. Alexander does not say this explicitly, but we can presume safely that at (T10.4) this solution is ruled out.

The next scenario Alexander considers is the one where the heavenly body would have some other combination of properties which have contraries as its form (T10.5-6). He raises two objections against it: the heavenly body is the first elements and it would be odd if its form were not constituted by the primary contraries (T10.5), and even if this is granted, the scenario will not work still because this form will include qualities that have contraries, and therefore the heavenly body will have something contrary to itself, which will deprive it of its eternity (T10.6).

καὶ μανὸν τοῦτο ὡς ἀραιὸν λεγόμενον, ᾧ ἐναντίον τὸ πυκνὸν ἦν, καὶ ἤττον καὶ μᾶλλον ἂν ἔχοι τοῦτο, μᾶλλον μὲν αἱ σφαῖραι, ἤττον δὲ τὰ ἄστρα· δοκεῖ γὰρ ταῦτα πεπιλῆσθαι μᾶλλον, ἤτις πίλησις οὐδὲ ἐξίστησιν αὐτὰ τῆς οὐσίας τῷ ἔπεσθαι μὲν τὴν τοιαύτην μάνωσιν καὶ πύκνωσιν τῇ κυκλοφορίᾳ, ταύτην δὲ ἀμετάβλητον εἶναι. (14) χρσαὶ δὲ καὶ εἴ τινα τοιαῦτα ὑπάρχει αὐτοῖς, ὡς συμβεβηκότα ἂν καὶ ἐξῶθεν καὶ ἐπόμενα ἐκείνῃ τῇ ποιότητι ὑπάρχοι". καὶ ταῦτα μὲν τοῦ Ἀλεξάνδρου.

The solution Alexander proposes is stated in (T10.7): heavenly body has a form constituted by the tangible quality, but not by a contrariety, which would make it generable and perishable and subject to all the elemental transformations, but by the tangible quality ‘moving in a circle’, which has no contrary.

Alexander explains that sublunary elements are tangible because they are constituted, each, by a pair of elemental qualities each of which has a contrary and can be acted upon by a contrary. This is how each sublunary body is perishable. But not all contraries must have a property of acting and being acted upon by each other. Alexander cites as an example the properties of lightness and heaviness which Aristotle says in *GC* II 2 neither act nor are acted upon. Alexander’s demonstration draws on Aristotle’s proof of the primary elemental qualities in *GC* II 2. Aristotle there makes a list of the most manifest tangible characteristics, all of which come in the pairs of contraries: «Contrarities according to touch are these: hot cold, dry moist, heavy light, hard soft, sticky brittle, rough smooth thick thin»⁶⁷. By method of elimination, Aristotle arrives at the two most basic pairs of contraries (hot/cold, dry/moist). The pair ‘heavy/light’ is the first to go, because it lacks the character of acting and being acted upon which is present in other pairs: «Of these heavy and light are neither acting nor acted upon, for these [expressions] are used not on account of acting in some way on another thing or being acted upon by another thing. But the elements must be acting and acted upon each other. For they mix and change into each other»⁶⁸.

⁶⁷ *GC* II 2, 329 b 17-19: Εἰσὶ δ’ ἐναντιώσεις κατὰ τὴν ἀφήν αἰθε, θερμὸν ψυχρόν, ξηρὸν ὑγρόν, βαρὺ κοῦφον, σκληρὸν μαλακόν, γλίσχρον κραῦρον, τραχὺ λεῖον, παχὺ λεπτόν.

⁶⁸ *GC* II 2, 329 b 19-23: Τούτων δὲ βαρὺ μὲν καὶ κοῦφον οὐ ποιητικά οὐδὲ παθητικά· οὐ γὰρ τῷ ποιεῖν τε ἕτερον ἢ πάσχειν ὑφ’ ἑτέρου λέγονται. Δεῖ δὲ ποιητικά καὶ παθητικά εἶναι ἀλλήλων τὰ στοιχεῖα· μίγνυται γὰρ καὶ μεταβάλλει εἰς ἄλληλα.

Alexander in his argument in (T10) uses the role of the light and the heavy not invoked by Aristotle in *GC*, but very prominent in the two last books of the *De Caelo*. Both terms there refer to the two types of natural movements, ‘the heavy’ to the downward and centripetal, and ‘the light’ to the upward and centrifugal⁶⁹. The aethereal body, Alexander claims, is tangible and has a form in accordance with a tangible quality, namely, ‘movement in a circle’, *κυκλοφορία*. This is an unusual example of a tangible quality. But if ‘light’ and ‘heavy’, which are also referring to two kinds of movement, natural movement in the sublunary cosmos, are listed as tangible qualities by Aristotle himself, it is not implausible to consider movement in a circle, another kind of movement characterising a different cosmic nature, as a tangible characteristic of sorts (T10.8). There is, however, a difference: whereas the light and heavy are neither acting nor acted upon, the circular motion of the heaven is described by Alexander as acting, although not acted upon (T10.10). Alexander argues that since the sublunary things it acts upon are not acted upon as its contraries, it is reasonable to conclude that it is the form of the heavenly body (T10.11).

Alexander’s description in (T10.12) of the qualities which heavenly body can have makes it clearer what he means by circular motion as the form of the heavenly body. The body of the heavens which has a material substrate of its own, different from the sublunary matter in that it is not receptive of opposites⁷⁰, can be more and less condensed in its different parts, for instance, stars being more and spheres less condensed. This qualitative variation does not involve the reception of opposites. This latter is blocked by the form of the heavens which is to be understood as the whole system of heavenly motions that defines the positions of all the stars and spheres with respect to the whole

⁶⁹ On the difference between the two types of deduction of the elements, see J. Longrigg, *Elementary Physics between the Lyceum and the Stoa*, «Isis», 1975, pp. 211-29, part. p. 214.

⁷⁰ See *Quaest.* 1.15.

and to each other. The qualities of the heavenly body which do not bear on its substance-form are thus fixed where they are. Alexander lists among these qualities, along with density and rarity, the colours of different stars. Now, what would count as alteration, qualitative change involving a *sui generis* affection, in the setting like this?

In his *Meteorology* commentary, Alexander argues, using his interpretation of *De Caelo*, that the substance of the heavens is not entirely impassive, even though it cannot undergo change in the way in which this happens in the sublunary world made by four elements.

(T11) Alexander, *In Meteor.*, pp. 18.28 - 19.9 Hayduck

(1) Perhaps after all the divine body is not entirely impassive: for neither did he prove in the first book *On the Heavens* that it is unalterable, even though he proposed this, but rather that it is ungenerable and imperishable, and similarly, not subject to increase, but he did not prove in a similar way that it is unalterable, as we have indicated also in our commentary on that book; and it is his habit to say that divine body is impassive not in unqualified way, but to add «with respect to any mortal troubles» (*De Caelo* 284 a 14); for it is not subject to this kind of affection. (2) And these are the affections which come to be in the transformation with respect to form, and divine bodies are not susceptible to these transformations and affections, but not therefore also to any affection [at all]. (3) For, motion is also some sort of affection, and divine bodies are not unsusceptible to it. (4) Moreover, if to receive light from another thing is to be affected in a certain way, then the moon would be affected in a certain way by the sun, given that it has its light from it. (5) Therefore there is nothing absurd if a divine body adjacent to the sun should be affected in a certain way by its motion, not so as to be set on fire, but so as to cater by means of this affection to the body which is under it so that it will be heated by the sun's motion and kindled⁷¹.

⁷¹ (1) ἴσως δὲ οὐδὲ πάντῃ ἀπαθὲς τὸ θεῖον σῶμα· οὔτε γὰρ ἐν τῷ πρώτῳ Περὶ οὐρανοῦ ἀπέδειξεν αὐτὸ ἀναλλοίωτον, καίτοι προθέμενος, ἀλλ' ἀγένητον μὲν αὐτὸ καὶ

In (T11.1) Alexander states the idea we have seen explained in the previous passage from the *De Caelo* commentary: Aristotle in *De Caelo* has not proved that the heaven is unalterable, but only that it is ungenerable and imperishable, i.e. eternal. This leaves room for the alteration. We have already seen in the previous section what kind of alteration this is going to be: the media transmitting some tangible effect such as burning or electric charge will not themselves be affected by them. Here we discover some further details of this effect that is being transmitted without an affection. Alexander avoids an outright statement here and hedges his account of the way in which the heavenly body under the sun is affected by citing the uncontroversial examples of what could be treated as affections of the heavenly body. The first such example is the motion itself, it is «a kind of affection» (πάθος τι) (T11.3). Another example is heavenly bodies receiving the light of other heavenly bodies, for instance the moon receiving the light of the sun. (T11.4) It follows from this that there is nothing impossible if the heavenly body under the sun (i.e. under the sphere carrying the sun) be affected in a certain way, but not to such an extent as to catch fire. This latter affection, being heated to the point of burning, will be the effect produced by the sun via the medium of the underlying heavenly body in the sublunary sphere (T11.5). We can conclude from this that the affection of the heavenly body under the sun is the heavenly equivalent of heating produced by the rotation of the sun sphere (as in T9.6 above). Its

ἄφθαρτον ἔδειξεν, ὁμοίως καὶ ἀναυξές, ἀναλλοίωτον δὲ οὐκέθ' ὁμοίως ἀπέδειξεν, ὡς καὶ ἐν τῷ εἰς αὐτὸ ὑπομνήματι ἐπεσημηνάμεθα, ἔθος τε αὐτῷ λέγειν τὸ θεῖον σῶμα οὐχ ἁπλῶς ἀπαθές, ἀλλὰ προστιθέναι τὸ πάσης θνητῆς δυσχερείας· τῶν γὰρ τοιούτων παθῶν ἀπαθές. (2) ἔστι δὲ ταῦτα τὰ πάθη κατὰ τὴν κατ' εἶδος μεταβολὴν γινόμενα, ἧς μεταβολῆς καὶ πάθους ἀνεπίδεκτα τὰ θεῖα, οὐ μὴν διὰ τοῦτο καὶ ἄπαντος πάθους. (3) ἢ τε γὰρ κίνησις πάθος τι, ἧς οὐκ ἀνεπίδεκτα· (4) ἀλλὰ καὶ εἰ τὸ φῶς ἀλλότριον λαμβάνειν πάσχειν τί ἔστιν, ἢ σελήνη εἴη ἂν πάσχουσα τι ἀπὸ τοῦ ἡλίου, εἰ γε παρ' ἐκείνου τὸ φῶς αὐτῆς. (5) οὐδὲν οὖν ἄτοπον καὶ ὑπὸ τῆς τοῦ ἡλίου κινήσεως πάσχειν τι τὸ γειννιῶν αὐτῆς τοῦ θείου σώματος, οὐ μὴν οὕτως πάσχειν ὥστε ἐκπυροῦσθαι, ἀλλὰ διακονεῖσθαι διὰ τούτου τοῦ πάθους τῷ ὑπ' αὐτὸ σῶματι, ὡς θερμαίνεσθαι τε αὐτὸ ὑπ' αὐτῆς καὶ ἐκπυροῦσθαι.

difference from the sublunary heating consists in its having no effect at all on the form or matter of the heavenly body itself except insofar as it becomes capable of transmitting this affection further on and ultimately to the sublunary region. Heating in the sublunary region always involves the prevalence of the hot over the cold. In the heavenly body there is no cold to prevail upon, therefore the 'heat' produced by the sun cannot be released in its natural form until it arrives into the sublunary region. The 'heating' of the heavenly sphere Alexander sometimes talks about means making it conducive to heating the underlying sublunary sphere. This is also purely 'productive' or 'active' heating, in accordance with the productive character of the form of the heavenly body. This is the upshot of Alexander's thesis according to which Aristotle's heaven does not admit of any change with respect to its substance-form or essence (which is its circular motion), but does admit of alteration with respect to its qualities which are not essential.

Concluding remarks

How exactly does Alexander think of the mechanism of heating on the basis of this hylomorphic analysis? It should be possible to reconstruct the main steps of his reasoning. The sun, being of the right density and of the right speed, produces an effect of heating in the sphere below it. The effect must be produced by the sun, rather than the whole sun sphere⁷², because the sun possesses greater density which enables it to 'rub' the sphere below and 'heat' it in a special impassive way. This effect should not be imagined as the actual heating of the sphere, but merely as producing in it an ability to transmit this heating effect further on. Alexander speaks about the heavenly body being heated in his *De Caelo* commentary (T9.6 above) and in the

⁷² This is an objection raised by Paul Moraux in Moraux, *Der Aristotelismus bei den Griechen* (above, n. 1), pp. 279-80.

commentary on *Meteorology* at (T11.5 above) he says that the heavenly body that transmits the heat is affected by it, but not in such a way as to catch fire, but only to transmit it to the sublunary body below which will already be heated and set on fire.

It seems also that for Alexander, as for Aristotle, it is important that the sun is not too far removed from the sublunary world. The transmission by the spheres does not seem to have an amplifying power. What rubs against the air then is not the sun itself but the effect produced by the sun in the lowers heavenly sphere. It is much more efficient in heating the cosmos than this lowest sphere itself. This is a very elaborate, scheme, not to say tortuous, but it does preserve Aristotle's tenet, in line with the wider concerns Alexander himself has about the interpretation of the action of the heavens on things sublunary. For Alexander scholars this argument is particularly valuable because it explains his motivation for the hylomorphic theory of elements – sublunary and heavenly.

