CHAPTER 1

THE CONTEXT AND THE PROJECT OF PROCLUS' *ELEMENTS OF PHYSICS*

1.1 Proclus' *EP*

While older scholarship has mostly focused on Neoplatonist metaphysics, leaving the impression that late-antique Platonists were only interested in this and related areas, more recent publications have also shed light on their preoccupation with natural philosophy.[1] These publications have demonstrated that the Neoplatonists had a genuine interest in thinking about the physical world, while still emphasising its dependence on the intelligible realm.[2] Crucially, Proclus regarded the study of physics as an indispensable preparation for metaphysics (*PT* 1.2.10.25–11.4). A good example for Proclus' interest in this area is – besides the commentary on the *Timaeus* – his work on kinematics, that is, the study of physical motion,[3] *Elements of Physics*. Although the latter has been little studied, it is here that Proclus' engagement with Aristotle's natural philosophy strongly manifests. It allows us to assess Proclus' views on the latter which elsewhere are quite critical and dismissive, such as in his infamous statements on Aristotle in the prologue of the commentary on the *Timaeus* (see Introduction).

EP is based on Aristotle's *Physics* 6 and 8 as well as *De caelo* 1 and deals primarily with the question of motion and its ultimate origin.[4] Hence its alternative name *On Motion* which – judging by

[1] Cf. especially the collection of articles in Chiaradonna and Trabattoni (2009) and Horn and Wilberding (2012). On Proclus specifically, cf. Martijn (2010a); Opsomer (2012b), (2017) and (2020b).

[2] This point is emphasised in Proclus' prologue to *In Tim*. (1.1.1–20.12 [1.1.1–14.3]).

[3] Cf. White (1992: 32): 'Kinematics deals with motion of bodies without reference to either masses or the forces acting on them. That is, kinematics is the study of the geometrically or topologically possible motion of a body or system of bodies.'

[4] Proclus possibly produced a commentary on other parts of *Phys*., such as the discussion of place at 4.1–5, which is used by Simplicius. Cf. d'Hoine (2016: 378).

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the content of the treatise – seems to be the more accurate title. Interestingly enough Proclus neither names nor discusses Aristotle's definition of motion from *Phys*. 3.1 in the treatise. To my knowledge, the definition is entirely absent from his extant oeuvre. Demonstrating that the eternal motion of the cosmos is caused by an unmoved mover is the culmination of the treatise – which smoothly connects physics with metaphysics. The goal is to sum up the fundamentals of Aristotelian kinematics, which it presents as a unitary and independent body of knowledge, and to make them accessible to beginners. Thus, *EP* was presumably related to the Aristotelian curriculum in the Neoplatonist school in Athens and was studied while reading Aristotle's works on natural philosophy.[5] This does not entail that Proclus endorses *unqualifiedly* everything he includes in this work; some aspects need to be explained in depth in a more advanced and Platonist context. Additionally, the propaedeutic character of the work accounts for the lack of references to it in other Proclean works (just as in the case of *ET*). Due to this, a confusion about its dating has arisen. While earlier scholarship tended to regard *EP* as a youthful work, stemming from a 'pre-Platonic' phase of the philosopher when he was only versed in Aristotelian philosophy,[6] it is nowadays understood to be chronologically, and not just stylistically and formally, related to *ET* to which it is in a certain way complementary.[7] While it seems likely that *EP* was written before *ET*, as Proclus would have used the axiomatic method for natural philosophy – for which Aristotle was in a restricted way an example – and then would have moved on to apply the method to metaphysics, this issue is impossible to settle. Like *ET*, *EP* is designed as a textbook written in an axiomatic or geometrical manner (*more geometrico*) that is influenced by Aristotle and Euclid. That is, it posits certain principles and builds on these various theorems.

[5] Cf. Section I.1 n. 3.

[6] Cf. Ritzenfeld (1912: VII): 'Proclum Institutionem physicam … eo tempore quo una cum Syriano Aristotelis Physica legebat ab eo incitatum scripsisse' and (1912: VIII): 'cum auctor nondum in philosophia Platonica vigebat vel suam sententiam proferre audebat'. Falcon (2001: 22) endorses this view.

[7] Cf. Dodds (1963: xvii–iii, 201); Nikulin (2003: 197–8). Luna and Segonds (2012a: 1562) are more sceptical of this argument.

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Due to its proximity to the Aristotelian original and perceived lack of originality, *EP* has received little attention in scholarship. The text has been established by Ritzenfeld (1912), although Boese (1958: 13–14) has proven the latter's *stemma codicum* to be wrong and incomplete. The first article on this work by Nikulin (2003) provides a helpful overview but lacks clarity and intelligibility at some points. The most comprehensive discussions remain Opsomer (2009: 193–203) and, especially, (2020b). While the former paper focuses specifically on Proclus' argument for the existence of the unmoved mover in *EP*, the latter concerns its method and formal characteristics. Most recently, Kiosoglou (2022) offered an analysis of Proclus' usage of theorems and analysed more closely *EP* §§1.1–2 and §2.7.[8] While these articles have deepened our understanding of the treatise, a closer analysis of Proclus' exegetical background and method is still outstanding, as is also an English translation. Such an analysis clarifies Proclus' engagement with Aristotle's kinematics and its influence on his natural philosophy. It also offers us an excellent example of Proclus' use of the axiomatic method which he employs also in *ET*.[9] From a more general perspective, a closer look at *EP* allows us to draw conclusions regarding the exegesis of the *Physics* and the *De caelo* before the significant commentaries of Simplicius and Philoponus and the relation of *EP* to these later works.

To this end, I focus on Proclus' use of Aristotle in *EP* to elucidate the presence of Aristotle both regarding the content as well as the presentation and the method of the treatise. Thus, I offer first an analysis of the content as well as of the exegetical and philosophical background of this treatise (Section 1.2). Here, I show how Proclus – far from a mindless compiler – was influenced by a specific exegetical tradition and certain philosophical convictions in restructuring and interpreting Aristotle's work. I also emphasise the importance of *De caelo* for Proclus' project, which has not been appreciated in scholarship so far. Moreover, I show how he circumvents more contentious issues which he chooses to discuss in an advanced work, such as the commentary

[8] For other brief discussions of *EP*, cf. O'Meara (1989) and the introductory essay by Reale in Faraggiana di Sarzana (1999: xlv–lviii).

[9] On the methodology and the structure of *ET*, cf. Opsomer (2022).

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on the *Timaeus*. In the third section, I focus on Proclus' method and argumentative structure (Section 1.3). As I demonstrate, Proclus uses Aristotle's scientific ideal outlined in the *Posterior Analytics* as a model for presenting non-mathematical material in an axiomatic manner. I then offer a close analysis of the principles and some of the theorems mentioned.

1.2 The Content and the Background of *EP*

In the following, I briefly outline the content of *EP* (1.2.1), before moving on to an analysis of its exegetical background (1.2.2) and its omissions from the Aristotelian original as well as its relation to other Proclean writings (1.2.3).

1.2.1 Summary of EP

In *EP* Proclus restructures in two books Aristotelian doctrine from *Physics* 6 and 8 and *De caelo* 1. Two main motivations guide Proclus. He arranges the arguments in an axiomatic manner in order (a) to provide an accessible overview of Aristotle's theory of motion and (b) to prove the necessary existence of the unmoved mover as cause of the cosmos' motion.[10] Each book starts with a series of definitions and hypotheses, followed by a number of theorems. In a theorem, a proposition precedes a short proof, mostly a *reductio ad absurdum*/*impossibile*, whereby the logical impossibility of the contrary proposition is demonstrated. The result is then summarised in a conclusion.

The first book opens with six definitions which are regarded as self-evident and indemonstrable. The definitions are discussed in the then-following thirty-one theorems or propositions which are – for the most part – deduced from them. Book 1 mainly summarises central insights from *Physics* 6, dealing with topics such as divisibility and continuum (§§1–7), velocity (§§8–10), time (§§11–18) and motion (§§19–31). Common Aristotelian doctrines such as the infinite divisibility of magnitude, motion and time (§11) or the

[10] I discuss the unmoved mover's relation to self-moving souls in Chapter 2 and its causality in Chapter 4.

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indivisibility of the now (§16) are discussed. In treating these topics, Proclus preserves the order of *Physics* 6, whereby each proposition deals with a different chapter.[11] Proclus occasionally adds theorems that have no obvious counterpart in Aristotle in order to strengthen the axiomatic structure (e.g., §1; §3) just as he adduces new arguments to buttress the propositions (e.g., §14.14.24–6; §16.16.21–6). Yet, he also omits certain passages from *Physics* 6, such as the anti-Zenonian excursus. Book one concludes with the proposition that the indivisible is unmoved: 'Everything quantitatively without parts is in itself unmoved' (§31.26.29–30: πᾶν τὸ ἀμερὲς ἐν ποσῷ ἀκίνητόν ἐστι καθ' ἑαυτό).[12] This already points towards the goal of *EP*, preparing the argument for the existence of the prime mover.

The second book consists of six hypotheses,[13] eight definitions and twenty-one theorems. It focuses mainly on the properties of motion, particularly on the eternal circular motion of the cosmos or heaven (§§1–6) and shows via a lengthy discussion of infinite power (§§7–8; §§11–15) that the first mover of this motion cannot be a body. Rather, the cause must be an eternal (§18) and indivisible (§21), that is, non-physical, substance, possessing infinite power (§21) in order to cause the cosmos' eternal motion. In doing so it remains itself unmoved (§19).[14] The work thus concludes with the fundamental proposition: 'The prime mover of the circular motion is indivisible' (§21.58.11–12: τὸ πρῶτον κινοῦν τὴν κύκλῳ κίνησιν ἀμερές ἐστιν). Since what is indivisible is unmoved (§1.31) it follows that the prime mover is unmoved. Proclus thereby reaches his goal.

Book two adheres less strictly to its Aristotelian source by mixing content from *De caelo* 1.2–7 and *Physics* 8 as well as rearranging the order of the arguments of these books. For instance, Proclus demonstrates first that circular motion has no opposite (§4) and then that the thing in circular motion is ungenerated and indestructible (§5), whereas Aristotle proceeds the

[11] For the references, see Ritzenfeld (1912). [12] Translations of *EP* are mine.
[13] Traditionally these are counted as definitions which I show to be false in Section 1.3.3.1.
[14] For an analysis of §19 where the causal priority of the unmoved mover is established, cf. Section 2.5.1.

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other way around. Yet, Proclus proves here to be an attentive reader, as Aristotle actually presupposes in his argument for the indestructibility of the heaven the claim that circular motion has no opposite (*DC* 1.3.270a19–20). Proclus also intervenes in the Aristotelian material by omitting more narrative passages (e.g., Aristotle's insistence on the importance of a discussion of the infinite at 1.5.271b1–17) and certain arguments (e.g., in proving that something moving in a circle is finite Proclus uses only two of the six arguments Aristotle provides in *DC* 1.5). Some of these differences can be explained by Proclus' exegetical and philosophical background, as I make clear in the next section.

From this summary it emerges that *EP* is primarily a physical work where the role of the unmoved mover is essential but only dealt with at the outset. This is because the unmoved mover belongs to the metaphysical realm and should be properly discussed in a metaphysical work, as in fact Proclus does elsewhere.[15] This σκόπος is also useful for bringing Aristotle and Plato together, given that Proclus elsewhere makes extensive usage of Aristotle's doctrine of the unmoved mover.[16] By focusing less on the nature of the prime mover, Proclus remains true to his Aristotelian model, *Physics* 8, where the prime mover receives a mostly negative description – unlike the more positive account in *Metaphysics* 12 – and primarily serves to explain the origin of eternal motion.[17] Thus, although the scope of the work is to prove the existence of the unmoved mover, the argumentation shows a genuine interest in physical issues, especially related to kinematics, and is not just a means to an end. It is thus misguided to try to explain the form and content of *EP* by focusing solely on the unmoved mover, as Nikulin (2003: 187) seems to suggest: 'Only if justification of the existence of the prime mover, in which Proclus closely follows Aristotle, is the ultimate purpose of the whole treatise, can it be explained why the treatise has the form that it has'. Clearly, the reader is supposed to grasp basic doctrines of Aristotle's theory of motion. In this way, the proof of the unmoved mover's existence as well as the accessible and comprehensive presentation of Aristotelian kinematics are Proclus' twin concerns in *EP*.

[15] Cf. also Simpl. *In Phys*. 1117.5–12, 1359.5–9.
[16] This is especially the case in *ET* §14 and §20; cf. Chapter 2.
[17] Cf. Section 4.2.

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1.2.2 Exegetical Background

Proclus' *EP* did not arise out of thin air. Rather, the treatise is the product of an – overwhelmingly, but not exclusively, Platonist – exegetical tradition on Aristotle's *Physics* and *De caelo*. To some extent, Proclus follows in the footsteps of his master Syrianus who wrote commentaries on both works.[18] The main studies on *EP* are mostly silent on its exegetical context. While Nikulin (2003) says almost nothing about the exegetical background of the work, already Ritzenfeld (1912) in his commentary had pointed to some overlaps with Simplicius. Unfortunately, the latter did not further develop these findings. Most recently, Opsomer (2020b) has taken up Ritzenfeld's lead, emphasising the similarity between Proclus and Simplicius: '[S]everal close parallels with Simplicius' *Commentary on the Physics* can only be explained by the fact that both works belong to the same tradition of commentary and exegesis (it cannot be excluded that Simplicius read Proclus' text, but that is impossible to prove)' (84).[19]

While Opsomer is content in his article to point out a few similarities between Proclus and Simplicius with regard to specific passages, I attempt in the following to go beyond this by explaining how a common exegetical tradition shaped the content and form of *EP*. This rather general background which transcends more specific parallels should not be underestimated, as it allows us to situate *EP* in a certain context and to shed light on some of its striking features, such as the combination of the *Physics* and the *De caelo*. Let us briefly consider the exegesis of both works in Neoplatonism.

Regarding the *Physics*, it is only with Neoplatonism that it achieves its status among Platonists as one of Aristotle's most significant works.[20] Plotinus makes copious references to the work and engages with it critically, adopting some of its basic concepts, while simultaneously putting emphasis on the physical world's dependence on metaphysical principles. The latter claim is seen to

[18] For a collection of fragments, cf. Cardullo (2000). [19] Cf. also ibid., 95.
[20] As Chiaradonna (2021: 164) remarks: 'Before Plotinus, Aristotle's *Physics* shines, so to speak, for its absence in Platonist debates.' For the rich exegetical background of Simplicius' *In Phys*., cf. Golitsis (2008: 65–79); Menn (2022b).

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be – to certain degrees at least – at odds with Aristotle.[21] His successor Porphyry was the first Neoplatonist to engage in proper Aristotelian exegesis, as evidenced by his commentary on the first four books which were known in antiquity as *Peri archōn* (Περὶ ἀρχῶν).[22] After Alexander, he is the most important source in Simplicius' commentary on the *Physics*.[23] Most importantly, however, it seems that Porphyry also wrote a summary (*sunopsis*/σύνοψις) of the last four books known as *Peri kinēseōs* (Περὶ κινήσεως).[24] This summary[25] was, I believe, in a certain regard a precursor of Proclus' *EP* since we find already there the idea of summarising the theory of kinematics of the last books of the *Physics* (although Proclus focused only on books 6 and 8).[26] Porphyry's 'agenda' in the summary thus proved influential. But since no fragments survive it is impossible to establish the exact relationship between these works. Given that Proclus arranges his treatise as a *stoicheiōsis* (στοιχείωσις) I assume that the presentation and formal structure of the two works differed significantly

[21] Cf. Chiaradonna (2021: 170–1). See my discussion of Proclus' *In Tim*. 1.9.14–10.18 [I 6.21–7.16] in the Introduction.

[22] Besides Porphyry (*ap*. Simpl. *In Phys*. 802.7–13), this division of *Phys*. is adopted by Simplicius (*In DC* 226, 19–20), Philoponus (*In Phys*. 2.15–17, 3.7–10) and Olympiodorus (*In Meteor*. 7.12–14). Nevertheless, at *In Phys*. 4.11–16, 6.4–10, 801.13–16 and 923.7–8, Simplicius claims that only books 6–8 are one continuous treatise Περὶ κινήσεως, while 1–5 form Περὶ ἀρχῶν. According to him, this division was upheld by Andronicus and Theophrastus (*In Phys*. 923.8–10), although the latter merely states that book 5 belonged to *Phys*. At any rate, this confusion between a 4 + 4 or 5 + 3 division probably arose from the later addition of book 7 – which was initially an independent treatise – to *Phys*. Thus, originally, the three books 5, 6 and 8 formed Περὶ κινήσεως. Given that *In Phys*. is usually dated after *In DC* (cf. Golitsis 2008: 18, n. 38), it seems that Simplicius has changed his mind at some point after *In DC* and adopted the 5 + 3 division of the books of *Phys*. Generally, on this contentious issue, cf. Ross (1936: 1–7).

[23] Cf. Menn (2022b: 10; 12).

[24] For references cf. Them. *In DA* 16.19–31 (who himself produced extant paraphrases of *Phys.* and *DC*) and Simpl. *In Phys*. 802.7–13. On Porphyry's exegetical work on *Phys*., cf. Karamanolis (2006: 270–87).

[25] To what does such a σύνοψις amount? Moraux (1985: 232) explains: 'L'auteur se bornait à indiquer sommairement la marche des idées, à rappeler les thèses essentielles et à résumer en quelques mots les arguments présentés en leur faveur. Sans doute un pareil "aperçu" était-il plus bref encore qu'une "paraphrase"'. Cf. also Chiaradonna (2021: 176).

[26] Presumably, Proclus does not use book 7 because he thinks it is not conducive to the argument he sets up due to its overlaps with book 8. Hence, he prefers to jump from book 6 to 8 – a reading that is quite natural given that the end of 6 fits to the beginning of 8.

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but not, however, the fundamental idea of presenting the content in a succinct and accessible manner.

Moving on to the *De caelo*, it can be established that, while it never acquired the prominent role of the *Physics* among the Neoplatonists, it garnered significant attention. Again, Plotinus seems to have played a key role in popularising the *De caelo* by making extensive use of some of its central doctrines, especially in *Enn*. 2.1–2.[27] At any rate, he influenced Proclus who cites Plotinus' interpretation of the *De caelo* (e.g., *In Tim*. 2.48.1–5 [1.237.22–7]). Moreover, Proclus was acquainted with the Peripatetic works on the *De caelo*, as his knowledge of, for example, Xenarchus shows (*In Tim*. 2.321.1 [1.425.22]). While he himself never wrote a commentary, it is clear from the references in Simplicius' commentary on *De caelo* – the only fully extant commentary on the work – that he commented on some passages in detail, probably insofar as they were in tension with Platonic doctrine (especially *DC* 3.7–8).[28] These seem to have been part of Proclus' early *Investigation of Aristotle's Objections to the* Timaeus (see Chapter 2).

This exegetical tradition accounts for some of Proclus' choices in respect to the form and the content of *EP*. Most importantly, Proclus regards the prime mover in *Physics* 8 as being consistent with the elemental theory of the cosmos' circular motion in *De caelo* – a claim which has been contested in more recent scholarship. This agreement of both works is not a Proclean innovation. In fact, according to Simplicius (*In DC* 3.9–10, 5.35–8), all ancient exegetes agreed that the *De caelo* followed the *Physics* – based on Aristotle's own claims at *Meteor*. I.1 – and complemented its account.[29] Thus, both treatises essentially expressed the same doctrine which is in line with the Neoplatonists' systematic understanding of Aristotle.[30]

[27] On the Aristotelian background of Plotinus' cosmology, cf. introduction in Wilberding (2006).

[28] Cf. also Rashed (2007: 255–62) on scholia on *DC* which refer to Proclus' critique.

[29] This is due to the – at times – obvious dependency of *DC* on *Phys*., as apparent in the discussion of continuity in *DC* 1.1 which is clearly connected to *Phys*. 6. Moreover, Aristotle often explicitly refers back to *Phys*. in *DC*; cf. Guthrie (1939: xxviii).

[30] Cf. David/Elias *In Cat*. 123.7–9: δεῖ αὐτὸν πάντα εἰδέναι τὰ Ἀριστοτέλους, ἵνα σύμφωνον δείξας τὸν Ἀριστοτέλην ἑαυτῷ τὰ Ἀριστοτέλους διὰ τῶν Ἀριστοτέλους ἐξηγήσηται.

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From a modern perspective, this position is shaky at best, as many scholars not only tend to assume a development between the *De caelo* and the *Physics* but also an irreconcilable difference between the two.[31] This developmental interpretation is so widespread that it is simply called 'the traditional view' by Judson (1994: 155). According to this reading, the unmoved mover is absent in the *De caelo*.[32] Instead, the circular motion of the heaven in *De caelo* 1–2 is self-caused and, hence, a type of self-motion. As such the heaven's motion requires no further explanation and is causally responsible for all other manifestations of motion in the cosmos. This position would be then rejected in *Physics* 8 where Aristotle asserts that self-motion *stricto sensu* is impossible and that the motion of the heaven must be ultimately caused by an external, separate unmoved mover. In a next stage the theory of the unmoved mover is further elaborated in *Met*. 12.6–10, especially in regard to the unmoved mover's causality.[33]

The Neoplatonists were neither oblivious to discrepancies in or between Aristotle's works – arguably this is the main reason for writing commentaries – nor were they completely immune to developmentalism. Simplicius, for instance, is happy to admit that *Physics* 7 likely represents an earlier stage in Aristotle's writing of the *Physics* (see *In Phys*. 1036.17–1037.3).[34] Yet, at the same time their systematic fervour is strong, and they maintain that Aristotle has a consistent stance and a uniform doctrine. That the unmoved mover of *Physics* 8 is ultimately responsible for the circular motion of the heaven as outlined in *De caelo* 1 seems obvious to Proclus in *EP*, where he combines doctrines from both works and stresses that there needs to be an unmoved principle as cause of the heaven's motion (§2.19).[35] The same goes also for

[31] Classic accounts of this stance are found in Ross (1936: 94–102) and Guthrie (1939: xv–xxvi) (who nevertheless emphasises that *DC* can be reconciled with the doctrine of an unmoved mover). Building on these authors, Judson (1994) defends a developmentalist view.

[32] Accordingly, apparent references to the unmoved mover can be interpreted otherwise, while actual ones are simply later additions which bear no significance for the main doctrine of *DC*. Cf. Guthrie (1939: xxi–v).

[33] For an interesting but on the whole less convincing critique of this interpretation, cf. Kosman (1994).

[34] *Pace* Guthrie (1939: xxi) who claims that Simplicius is 'innocent of development-theories'.

[35] While this explains the relationship between *DC* 1 and *Phys*. 8, the position of *Met*. 12 regarding these two still requires clarification. For a discussion, cf. Chapter 4.

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Simplicius who claims that the unmoved mover is referred to in *De caelo* (*In DC* 271.5–21) and, thus, part of Aristotle's doctrine there. The interest in systematicity is especially pronounced in Proclus' *EP* since the main motivation was to offer a succinct summary of Aristotle's theory of motion for beginners. Thus, the form and goal of the treatise do not permit elaborate or subtle discussions of the relationship between *Physics* 6 and 8 as well as between *Physics* 8 and *De caelo* 1.

Although *De caelo* 1 is a constitutive element of *EP* 2, where almost all principles (i.e., twelve of fourteen) and two-thirds (i.e., fourteen) of the theorems are based on it, it remains unclear why it is used so extensively there. Focusing just on *Physics* 8 seems to be the more natural option, given that one purpose of *EP* is to prove the existence of the unmoved mover. This is evidenced also by Simplicius who in commenting on *Physics* 8 makes a few passing references to *De caelo* without dwelling on its arguments. I suggest that Proclus integrates the *De caelo* material for two main reasons. On the one hand, the form and the issues of *De caelo* 1 coincide significantly with those of *Physics* 6 and 8. Formally, *De caelo* 1 includes many arguments written in a mathematical style just like *Physics* 6 and, to a lesser degree, *Physics* 8.[36] Proclus himself is aware of this formal similarity, as becomes clear from *In Tim*. 2.47.16–48.11 [1.237.17–238.4], where he mentions Aristotle as imitating in the *Physics* and the *De caelo* the axiomatic method of Plato. In regard to content, there are also important overlaps. For instance, Proclus takes Aristotle's proof from *DC* 1.6 that infinite bodies (would) have infinite powers in *EP* §2.7 and then adds as a following proposition 'finite bodies have finite powers' based on *Phys.* 8.10. More generally, while *De caelo* establishes the circular motion of the cosmos, *Physics* 8 tackles the problem of the eternity of that motion as well as its origin. On the other hand, I want to emphasise that Proclus' apparent intention was to give his audience a suitable overview of Aristotelian kinematics. This pedagogical element of comprehensiveness and accessibility guides Proclus. Given the significance of theories of simple motion, the cosmos' circular motion,

[36] On the similar argumentative structures in these works, cf. Section 1.3 of this chapter.

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and the cosmos' finitude in antiquity, it is less surprising that Proclus turned to *De caelo* 1 where these issues are extensively dealt with. Due to the assumed doctrinal coherence between the two works it seemed quite natural to Proclus to combine material from *De caelo* 1 with *Physics* 6 and 8.

Thus, starting from the very idea of writing a summary of Aristotle's kinematics to the combination of the material, Proclus' *EP* has been shown to be significantly dependent on a long commentary tradition. This impression will then be substantiated by the content of the treatise in Section 1.3. In the following, I analyse more closely how Proclus' own views shaped what he *excluded* from *EP*.

1.2.3 Proclus' Editorial Choices

While remaining relatively close to the original, Proclus also leaves out crucial discussions from the two Aristotelian treatises. More contentious issues such as self-motion (see Chapter 2) or the precise nature of the fifth substance/element are not part of *EP*, although they are, in fact, extensively treated by Aristotle in *Physics* 8 and *De caelo* 1. Since Proclus stops including material from *DC* 1.8 onwards, he makes mention neither of Aristotle's arguments for the uniqueness of the cosmos at *DC* 1.8–9 nor of his lengthy elaboration at *DC* 1.10–12 on the terms '(un)generatedness' and '(in)destructibility' which was clearly directed at Plato. Notably, these issues are dealt with elsewhere, especially in his now lost *Investigation of Aristotle's Objections to the* Timaeus and in *In Tim*. which preserves some of Proclus' objections.

Since scholarship has mostly overlooked these omissions in *EP* and the discussion of these issues elsewhere, the relationship between *EP* and other Proclean works appears somewhat obscure. Although Nikulin (2003: 190) and Opsomer (2009: 195–6, n. 32) discuss the case of self-motion, they otherwise offer no analysis of why Proclus omits other topics and what this, in turn, tells us about *EP* and its connection to other writings. This is the first attempt at offering a more comprehensive discussion of this relationship. How is *EP* connected to other Proclean treatises and what relevance does it have for them? Is the doctrine of *EP* really an

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'integral part of [Proclus'] physics' (Opsomer 2009: 193)? As I demonstrate in this section, Proclus presents to the student in the introductory *EP* those parts of Aristotle's kinematics that can be embraced by a Platonist, while simultaneously leaving out more controversial and complex passages. However, in more advanced works such as his commentary on the *Timaeus*, he points out the limitations of some of the doctrines in *Physics* 8 and *De caelo* 1, and even the tension between them and the correct Platonist teachings. This will be shown by evaluating the evidence on the nature of the heaven (1.2.3.1) and its ungeneratedness and indestructibility (1.2.3.2) in *EP* and the commentary on the *Timaeus*.

Before I consider the examples, it is worth bearing in mind that this procedure of subordinating Aristotle to Plato fits Proclus' more general views on their relation. As I have shown in my discussion of the prologue of his commentary on the *Timaeus* (1.9.14–10.18 [1.6.21–7.16]), Proclus explains that Aristotle's natural philosophy is inferior to Plato's since the former imitated the latter in his physical works but focused too much on material explanations. Proclus mentions Aristotle's discussion of motion and its origin favourably which explains why he summarised it in *EP* (9.17–18 [6.25–6]). Most importantly for my current purposes, Proclus states here that Aristotle agrees with Plato on the heaven's ungeneratedness and the fifth substance (10.2–3 [6.31–2]). The impression we get from this passage is one of agreement on some central issues but negligence in studying them properly due to Aristotle's non-metaphysical approach to them.

1.2.3.1 The Fifth Element

Let us first consider Proclus' treatment of Aristotle's claim that the heaven is constituted of a distinct fifth element (e.g., *DC* 1.2.269a13–18). Surprisingly enough, Proclus makes no reference to this in *EP*. Instead, he employs the intentionally vague expression *ta kuklō kinoumena* (τὰ κύκλῳ κινούμενα) when referring to the heaven (e.g., §§2.1–2, §2.5.). At no point does he identify τὰ κύκλῳ κινούμενα with a distinct fifth element, aether, as Aristotle does in *DC* 1.3, although he offers an extensive list of characteristics such as bodily simplicity (*EP* §2.1), difference from bodies

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moving with rectilinear motion (§2.2), or lack of weight and lightness (§2.3). Why does Proclus leave out its elemental constitution which plays an important role in *De caelo*? While one reason for choosing this expression is certainly the kinematic context of *EP*, I argue that the main motivation for this omission is made manifest in Proclus' commentary on the *Timaeus*. As Proclus demonstrates there, he disagrees with Aristotle on the heaven's constitution – just as numerous Peripatetics and Platonists did before and after him.[37] In this way, the conciliatory attitude of *EP*, where less controversial features of the heaven are listed, can be contrasted with some passages in his commentary on the *Timaeus* where Proclus strikes a different tone in reference to Aristotle's elemental theory. Proclus explicitly criticises Aristotle's concept of a fifth element:

> [Objection] But perhaps the marvellous (θαυμαστός) Aristotle will contest our account by positing that not all visible things are so through participation in fire (πᾶν τὸ ὁρατὸν πυρὸς μετουσίᾳ), for the chorus of stars and the mighty sun itself are not [in his view] things composed of fire even though they are visible.
>
> [Response] But one might respond to him by saying that enmattered (ἔνυλον) fire is one thing but immaterial (ἄυλον) fire is another – that is, it is immaterial because compared to the matter of the things in the sublunary sphere it is immaterial – and the one kind is destructible (φθαρτόν) while the other is indestructible (ἄφθαρτον). While one kind is mixed (συμμιγές) with air, the other is pure (καθαρόν). And generally speaking, because fire has many forms (πολλὰ εἴδη), perhaps Aristotle will concede to this account and listen to the theologians who call the sun 'fire, channel of fire' and 'dispenser of fire' and all other such names. (3.13.2–12 [2.9.7–18])

Proclus here turns to Aristotle's claim that the visibility of the stars and heaven is not due to their composition of fire but, we are to

[37] Cf. Proclus' criticism of Aristotle's theory of aether at *In Tim*. 3.13.2–21 [2.9.7–27], his doxography at 3.58.3–61.11 [2.42.9–44.23], and the summary of his own position at 3.67.17–70.2 [2.49.12–50.32]. Proclus accepts that the stars have a simple motion at *In Tim*. 3.59.20–1 [2.43.19–20] which clearly connects it to *EP*. For a comprehensive discussion of Proclus' objections, cf. Baltzly (2002). It is noteworthy that Philoponus produced a scathing attack on the theory of aether; cf. Wildberg (1988). For the critical views of Aristotle's successors, Theophrastus and Strato, as well as of the first-century BC Peripatetic Xenarchus, cf. Falcon (2001: ch. III) and also Baltzly (2002: 267–71). While Theophrastus' position is difficult to reconstruct, Strato definitely rejected the concept of a fifth element (fr. 85). On the Neoplatonists, cf. Cardullo (2009: 99–114). Atticus also polemicised against Aristotle on this issue; cf. frs. 5–6.

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add, due to being composed of aether – the fifth element.[38] This view is wrong according to Proclus. In fact, Proclus responds, the element of fire differs in the sublunary sphere from the fire in the heaven, since there are different kinds of fire (πολλὰ εἴδη πυρός). That is, the element of fire has different gradations, depending on whether it is part of the sublunary sphere or of the heaven. Not only is the fire of the heaven indestructible (ἄφθαρτον) and in a certain sense immaterial (ἄυλον),[39] but it is also pure (καθαρόν). Hence, the stars and the heaven are in part made up of this pure and superior form of fire. Proclus then recommends to Aristotle – in an almost comical way – to consider the sayings of the 'theologians', that is, the *Chaldaean Oracles* (fr. 60 des Places), who apparently back up Proclus' and Plato's view of the elemental constitution of the heaven.

Objections like these amount later in the commentary to an explicit rejection of the fifth element, based on Proclus' exegesis of *Timaeus* and more general reflections.[40] For instance, Proclus points out the problem of explaining the diversity of appearances when positing only one element as constitutive of the heaven: some parts of the heaven are transparent, others solid or luminous and so on (*In Tim*. 3.60.1–61.11 [2.43.20–44.23]). Aether could not account for these different phenomena. According to Proclus, the heaven, including the stars and planets, is made up of a purer or a higher form of fire in which the other three elements pre-exist κατ' αἰτίαν since fire is their cause (3.60.1–3 [2.43.20–3]).[41] He thus rejects Aristotle's assertion of a distinct and unmixed fifth element.

However, this does not mean that Aristotle was completely wrong in Proclus' eyes since he correctly pointed out that the heaven's substance does differ significantly from the four

[38] Aristotle claims this at *DC* 2.7. Important is also *Meteor.* 1.3 where he generally rejects the view that the heaven is made up of fire.

[39] Cf. *In Tim*. 3.14.2–5 [2.10.3–7].

[40] Cf. *In Tim*. 3.59.10–12 [2.43.9–11]: ἀλλ' εἰ μὲν ἄλλο τὸ στοιχεῖον ἐκεῖνο παρὰ τὰ τέσσαρα, πῶς φησιν ὁ Πλάτων ἐκ τῶν τεττάρων εἶναι τὸν ὅλον κόσμον; As Baltzly (2002) points out, this argument from authority is buttressed by more general reflections.

[41] On κατ' αἰτίαν and the triad it forms with κατὰ μέθεξιν and καθ' ὕπαρξιν, cf. *ET* §65 with Dodds' commentary.

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sublunary elements. In this way, even Proclus accepts talk of a fifth substance, insofar as the term refers to the purity and specific combination of the four elements in the heaven:

> Therefore, the heaven is a fifth substance (οὐσία) besides these four elements, since it is a combination from the simple elements. For in the heaven the elements are not the same [as they are here] but are rather the highest forms of them and the four elements of all things are unmixed and are bounded in relation to one another by their appropriate forms. (*In Tim.* 3.68.7–11 [2.49.25–9])[42]

It is in this specific sense that Plato and Aristotle agree according to Proclus, as he states at *In Tim.* 1.10.2–3 [1.6.31–2] ([Aristotle] τῷ Πλάτωνι συμφώνως, καθόσον ἀγένητον τίθεται τὸν οὐρανὸν καὶ πέμπτης οὐσίας).

From this presentation of Proclus' complicated discussion in his commentary on the *Timaeus* it emerges why Proclus decided to stick to the superficial term τὰ κύκλῳ κινούμενα in *EP* instead of outlining his own elemental theory and complex views on what Aristotle precisely gets right or wrong. While the latter discussion goes beyond the limited purpose of *EP*, it is necessarily complementary to it as it shows us how the characteristics of the heaven established in *EP* are further elaborated in a more advanced work on Plato. In this sense, one can establish a continuity between these two works.

1.2.3.2 Ungeneratedness and Indestructibility

Besides Aristotle's treatment of the elemental nature of the heaven, Proclus also leaves out in *EP* the discussion of *DC* 1.10–12 about the notions of '(un)generatednes' and '(in)destructibility'. This is in spite of his adoption of Aristotle's insight that τὰ κύκλῳ κινούμενα are ungenerated and indestructible (§2.5).[43] Aristotle's discussion was in part directed at Plato's *Timaeus*, as he makes explicit (*DC* 1.10.280a27–32). Aristotle understands the *Timaeus* as proposing simultaneously a temporal generation *and*

[42] Simplicius maintains that this purer combination can be regarded as a 'fifth element' and thus sees Plato and Aristotle, as usual, in harmony (cf. e.g., *In DC* 12.28–30, 16.20–21, 66.33–67.5, 85.7–15, 130.31–131.1).

[43] In §2.5 Proclus takes over Aristotle's claim (*DC* 1.3.270a14–22) that generation and destruction imply changing from one opposite to another – which is impossible for the heaven since it has no opposite due to its circular motion.

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indestructibility of the cosmos.[44] This is absurd, Aristotle maintains, as every generated being has the potentiality to be destroyed or to perish and it is impossible for this potentiality not to be realised in an infinite stretch of time. Again, in the commentary on the *Timaeus* Proclus shows us what he really thought about Aristotle's analysis by objecting to it in at least two passages (2.70.2–73.10 [1.252.11–254.18]; 2.133.4–16 [1.295.27–296.12]).[45] I briefly discuss the second one which is part of a larger section (2.131.11–133.16 [1.294.28–296.12]).

In this substantial section, Proclus contrasts Plato and Aristotle and points out their differences, while simultaneously showing that they do not conflict with each other entirely: 'in this respect at least, the two men do not engage in conflict, but they do differ' (2.131.11–12 [1.294.28–9]: καὶ ταύτῃ γε οἱ ἄνδρες οὐ μάχονται, διαφέρουσι δ' ὅμως).[46] He goes on to say:

> Since the splendid (δαιμόνιος) Aristotle copiously prattles all over the place (ἄνω καὶ κάτω θρυλῶν) about the reciprocations of the generated and the destructible and of the ungenerated and the indestructible, we should remind him that much earlier Plato too agrees with these fundamental propositions (τοῖς ἀξιώμασιν) when he writes in the *Republic* on the one hand that 'for everything that has come into being destruction follows', and in the *Phaedrus* on the other that what is ungenerated is also immortal. How, then, is it possible that he [Plato] would ascribe generation to the universe and not introduce destruction [for it] as well, or that he would ascribe destruction to that which is moving in a disharmonious and disorderly manner without also giving it generation before its destruction? But in actual fact he has devised for the universe [a form of] generation which was different and has adapted [a form of] everlastingness [for it] which was appropriate for the manner of its generation. (*In Tim*. 2.133.4–16 [1.295.27–296.12])

Proclus' strategy in defending Plato against Aristotle is as simple as it is common: Aristotle was not an attentive reader of Plato. The latter already pointed out in earlier works, namely in the *Republic*

[44] On this most controversial question of ancient Platonism, cf. Baltes (1976–8, I and II) who collects and discusses the relevant passages from the Old Academy to Proclus. For the latter, cf. Roth (2006). An excellent summary of this debate in Middle Platonism with a helpful bibliography is provided by Boys-Stones (2018: 184–211).

[45] Cf. Baltes (1976–8: II, 3–7; 66–73).

[46] Likewise, Proclus maintained earlier: δοκεῖ δέ μοι **διαφερόντως** ἐν τούτοις ὁ Ἀριστοτέλης τὸν δεύτερον **αἰτιάσασθαι** λόγον . . . (2.70.2–4 [1.252.11–12]). On the latter, cf. Baltes (1976–8: II, 3–7).

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and the *Phaedrus*, that generation implies destruction just as ungeneratedness implies indestructibility.[47] Since the cosmos is corporeal and generated – albeit not in time like sublunary beings but rather in the sense of having an external cause[48] – it is essentially destructible. However, as Proclus clarified earlier (2. 130.17–131.11 [1.294.9–28]), through the demiurge's providence the cosmos acquires its eternal existence. Thus, Proclus claims that in one sense the cosmos is generated and destructible, that is, by being dependent on a cause and corporeal, while in another it is not, that is, by not being generated in time and by being kept in eternal existence by the demiurge.

The tone of the passage is rather condescending towards Aristotle, as particularly the expression ἄνω καὶ κάτω θρυλῶν and the reminder ὑπομνηστέον of Plato's works prove. I thus disagree with Baltes (1978) who calls this dispute 'very polite' (70: 'sehr höflich'). Proclus' use of δαιμόνιος in addressing Aristotle – as above *thaumastos* (θαυμαστός, 3.13.2 [2.9.7]) – has also an ironical tinge.[49] Proclus seems to be interested to show that Aristotle and Plato actually agree on the reciprocal implication of ungeneratedness and indestructibility, as he makes clear with the expression συγχωρεῖ here, in *In Tim*. 1.10.2–3 [1.6.31–2], and in endorsing Aristotle's view on this issue in *EP* §2.5. Nevertheless, he does not shy away from maintaining that Aristotle *misunderstood* Plato. This is made clear by the tone of the passage and, especially, by the rhetorical question asked at 2.133.10–13 [1.296.6–9].

Proclus' attitude can be contrasted with Simplicius' who in his comments on *DC* 1.10–12 is at pains to point out that Aristotle did not, in fact, misunderstand and criticise Plato, as Proclus and Alexander suggested, but objected only to a superficial and fallacious reading of the *Timaeus*:[50] 'Aristotle's objections affect

[47] Hermias makes the same point and emphasises that Aristotle demonstrated this too at *In Phdr*. 122.30–123.10.

[48] On the two types of generation, cf. *In Tim*. 2.70.8–14 [1.252.16–22], 2.121.2–6 [1. 287.18–23]. It seems that the basic meaning of being generated is having a cause: πᾶν τὸ γενητὸν ἀπ' αἰτίας γίγνεται. τὸ μὴ ἀπ' αἰτίας ὑφεστὸς οὐκ ἐστι γενητόν (*In Tim*. 2.46.9–10 [1.236.23–4]). Proclus regards this as one of five basic principles of Plato's natural philosophy.

[49] Cf. Section I.3.2 n. 42.

[50] Cf. also Simpl. *In Phys*. 1359.38–1360.17, esp. 1359.38–40: 'But this wonderful man [Aristotle] seems to me clearly to refuse to apply the term 'generation' to eternal things,

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neither the theologians nor Plato, but rather those who interpreted the doctrines of the ancients in such a way as to suppose that, while the world was generated at a particular time, it was none the less indestructible. This is really absurd and well refuted by Aristotle' (*In DC* 296.26–30; tr. Hankinson).

Although Proclus and Simplicius both effectively endorse and were influenced by Aristotle's teaching on this issue – albeit with certain qualifications – they disagree on whether Aristotle actually meant to criticise Plato. This is a significant difference between Proclus' and Simplicius' approaches to Aristotle which we encounter often in their reactions to Aristotle's criticisms of Plato.[51] Moreover, Proclus even points out that there is a certain danger emanating from Aristotle's discussion in *DC* 1.10–12, as people might be misled into believing that Plato actually does not regard the cosmos as eternal.[52] This, again, makes clear why the discussion of the cosmos' (un)generatedness was kept to a bare minimum in *EP*.

Proclus' and Simplicius' view can be contrasted with earlier Platonists, such as Plutarch (*De an. procr.* 1013D–1017C; *Quaest. Plat.* 4) and Atticus (fr. 4.41–2), who were less influenced by Aristotle and had no qualms with holding the view that the cosmos is temporally generated *and* indestructible.[53] A view that Proclus and Simplicius reject based on their Aristotelianised reading of the *Timaeus*. Proclus subjects both to criticism in his commentary on the *Timaeus* (esp. 2.106.3–11 [1.276.30–277.7], 2.257.5–19 [1.381.26–382.12]) for their doctrine of the cosmos' temporal

because the imagination easily suggests a temporal origin for the things that are said to be generated' (tr. McKirahan). Simplicius maintains like Proclus that the cosmos was generated outside of time. For a discussion, cf. Golitsis (2017: 219). On Simplicius' harmonisation of *DC* with *Tim.*, cf. Guldentops (2005); Hoffmann (2012); Gavray (2018).

[51] For a more comprehensive analysis, cf. Section 3.4.2.

[52] Cf. *In Tim.* 2.119.12–14 [1.286.20–1]: 'It is therefore not the case that Plato destroys the everlasting nature of the universe, as some think who have followed the basic principles of Aristotelianism (Ἀριστοτελικαῖς ὑποθέσεσιν)'. At *In Met.* 80.21–3 Syrianus makes the more general point that unsophisticated students might be led astray by Aristotle's criticisms of Plato.

[53] This, of course, does not mean that their understanding of the cosmogony was not influenced by their general views on the *Timaeus* and other doctrinal commitments. On both, cf. Baltes (1976: I, 38–69). Besides these two, Boys-Stones (2018: 187–8) (following Baltes (1976): I) also mentions Harpocration and Philo as endorsing the view that the cosmos is temporally generated.

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generation (2.106.4–5 [1.277.1]: κατὰ χρόνον τὴν γένεσιν). I discuss similar examples, such as the relationship of the unmoved mover and self-mover and the nature of self-motion in the next two chapters. There too it emerges that the Middle Platonists were less knowledgeable of Aristotle's doctrines and his objections to certain Platonic views. Additionally, even if they knew these objections, they did not regard Aristotle as high an authority as the Neoplatonists and consequently did not saw the same pressing need to respond to Aristotle's criticism. This clearly shifts with the Neoplatonists who not only integrate Aristotle's teaching much more consistently into the Platonist system than before, but also take Aristotle's criticisms against Plato more seriously.[54] How they deal with these criticisms differs however, as seen in the case of Proclus and Simplicius.

1.2.3.3 Conclusion

What do these two passages from the commentary on the *Timaeus* tell us about Proclus' use of *De caelo* in *EP*? Above all, they exemplify how Proclus in *EP* makes a conscious choice as to what is – and what is not – worth summarising in an introduction to Aristotelian kinematics. In his adoption of the Aristotelian material, Proclus leaves out certain issues which he either rejects (e.g., the fifth element as an unmixed distinct element) or cannot properly address (e.g., the precise meanings of the terms 'ungeneratedness' and 'indestructibility') in a work such as *EP*.[55] It would be less useful and even counterproductive to include in *EP* doctrines which Proclus views critically and which require further qualification from a Platonist view. This emphasises the introductory character of *EP*, which is not suited for more subtle discussions and, hence, limited in its explanatory

[54] Already Atticus claims that 'Aristotle seems to have influenced them [i.e., other Platonists] to shift their position as well: they could not meet his criticism of Plato's doctrine, and didn't want to impute to Plato a doctrine shown to be wrong' (fr. 4.32–5); Translations of Atticus are by Boys-Stones (2018).

[55] In the latter camp falls also Aristotle's arguments for the uniqueness of the cosmos (*DC* 1.8–9). While Proclus leaves them out in *EP*, he references a part of the argumentation at *In Tim*. 2.362.15–363.7 [1.455.15–29]. But there, Aristotle's discussion is just a corollary and an addition to Plato's superior argument for the cosmos' uniqueness based on the paradigm (363.8–12 [455.29–456.5]).

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power. But, on a more fundamental level, it also points towards the limitations of Aristotle's own works, as Proclus believes that his natural philosophy is in important regards inferior to Plato's (*In Tim*. 1.9.14–10.18 [1.6.21–7.16]). Instead, *EP* offers the student a foundation from which she can later progress to intricate issues which are treated in their proper context (e.g., in the commentaries on Plato).

For instance, in *EP* Proclus establishes that τὰ κύκλῳ κινούμενα κατὰ φύσιν – that is, the cosmos – is ungenerated and indestructible (§2.5), based on an argument from *DC* 1.3.270a12–24. While Proclus embraces this insight, it clearly needs to be qualified, as the cosmos is in an important sense generated and destructible as well, as seen. Such an explanation, however, falls outside the limited scope of *EP* and is presented in his commentary on the *Timaeus* which was the penultimate dialogue in the Platonic part of the Neoplatonist curriculum. Another example is the eighth proposition from book 2: 'Powers of bodies which are finite in magnitude are not infinite' (i.e., finite bodies have finite power).[56] Again, in *EP* Proclus makes use only of the Aristotelian arguments, but in the advanced commentary on the *Timaeus* he further backs it up with Platonic doctrine (e.g., 2.91.15–18 [1.267.12–14], 2.109.3–5 [1.279.7–8.], 2.131.17–18 [1.295.3–4], 3.169.17–19 [2.123.2–4]).[57] This procedure of deepening or qualifying certain basic doctrines resembles the relationship of his other στοιχείωσις, *ET*, with the commentary on the *Parmenides* and *Platonic Theology*.[58] In the latter two, teachings from *ET* can appear quite differently and much more elaborate. Just as in the case of *EP*, the reason is, of course, the introductory character of *ET* and the more advanced nature of the other treatises.

[56] In his use of δύναμις, Proclus distinguishes between power and potentiality (*ET* §78–9); cf. Section 3.4.4.2. While the cosmos *qua* finite magnitude has a finite power, it has at the same time an infinite potentiality to come to be: 'everything that always comes to be has an infinite potentiality of coming to be' (§85). This is necessary for it in order to exist for an infinite time and to receive the infinite power from the intellect.

[57] Proclus praises Aristotle for demonstrating 'in a clear and noble fashion (σαφῶς καὶ γενναίως), [that] no body that is limited has unlimited power' (*In Tim*. 2.71.12–14 [1.253.9–11]). Cf. Section 4.3.3.3.

[58] As Opsomer (2021) shows, *PT* 3.2 builds clearly on *ET*.

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1.3 The Form and Method of *EP*

The selection of the content clearly illuminated Proclus' exegetical background and own views. But what about the form and the method of *EP*? Proclus chose for *EP* three specific models in devising these: (1) Euclid's *Elements*, (2) Aristotle's *Posterior Analytics*, and (3) *Physics* and *De caelo*. Proclus consciously followed these in order to achieve a high degree of systematicity and accessibility in presenting the material. While the impact of (1) and (3) has been well-established, the influence of (2) has not been properly investigated. Opsomer (2021: 138) already made clear that Aristotle played an important role, next to Euclid. My aim in this section is to further develop this insight by considering the Aristotelian background – with emphasis on the *Posterior Analytics* – of Proclus' axiomatic method in *EP*.[59] Although Proclus already encountered in *Physics* 6 – to a certain degree at least – an application of this method, he followed Euclid's example as well as the general scientific theory of the *Posterior Analytics* to further axiomatise the text. Establishing the precise origin of Proclus' axiomatics helps us understand the history of this method, as Proclus was the first to write completely axiomatised works on physics and theology, that is, metaphysics.[60] Crucially, he was later to be followed in these two domains by Newton and Spinoza. I would like to note here that this *historical* picture does not necessarily coincide with *Proclus'* understanding of the origin of the axiomatic or geometrical method: in his commentary on the *Timaeus* he often credits Plato with employing a geometrical method in the dialogue.[61] This is because – as Proclus clarifies in the proem – the *Timaeus* is conceived as a Pythagoreanising work by Plato which allows him to use a more mathematical approach to the subject matter.[62] Now before

[59] On Proclus' method in *EP* more generally, cf. also O'Meara (1989); Nikulin (2003), 193–4. and Netz (2017), 386–8.

[60] Cf. Opsomer (2020b: 85; 96). For the specific background of *ET*, cf. Opsomer (2021). Although unmentioned by Opsomer, already Alexander in his commentary on *Met*. 3–4 conceived metaphysics (i.e., the science of being *qua* being) as a demonstrative science based on axioms. On this, cf. Bonelli (2010).

[61] Cf. especially *In Tim*. 2.34.17–35.11 [1.228.25–229.11], 2.45.17–47.8 [1.236.8–237.9]; *PT* 1.4.19.6–22. For a thorough discussion of Proclus' views on Plato's 'geometrical method' see Martijn (2010a: ch. III) and (2014: 153–4).

[62] For Proclus this Pythagorean approach to theology occurs through images and implies the use of mathematics, as he emphasises at e.g., *PT* 1.4.20.8–12; *In Eucl*. 22.9–16.

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I discuss the Aristotelian influence, it is necessary to mention briefly the Euclidean background.

1.3.1 Euclidean Influence

In naming his work *stoicheiōsis* (στοιχείωσις), Proclus already provides us significant cues about his intentions. In one sense, Proclus uses in his title the term στοιχείωσις in the more general meaning of 'introductory handbook' or 'summary' of a certain philosophical subject.[63] Works like these included a systematisation of elementary doctrines – just like Proclus' *EP* and *ET*.[64] More importantly, however, Proclus specifically alludes to the Στοιχεῖα of the mathematician Euclid whose geometrical-axiomatic method he formally adopts in his presentation.[65] Euclid's work is part of a genre of mathematical literature with strict formal and methodological characteristics.[66] Proclus associates himself consciously with this genre and adopts its conventions. His acquaintance with Euclid's works is exemplified by his commentary on Euclid's *Elements* I (*In Eucl.*) which supplemented his teaching activity in mathematics.[67]

To put it simply, a mathematical στοιχείωσις or στοιχεῖα – there is no clear terminological distinction[68] – contains besides certain preliminary principles, which will be discussed in Section 1.3.3.1, several elements (στοιχεῖα).[69] These στοιχεῖα are most basic theorems, from which further theorems or propositions are deduced. The different propositions form discrete (i.e., linguistically not directly connected) entities and are presented in a standardised

[63] The Greek ending -ωσις indicates an activity or process for which I am unable to find a suitable English equivalent. Latin *elementatio* and German *Grundlegung* come close to it.

[64] For references to such philosophical works, stretching back to Epicurus, cf. Hatzimichali (2011: 73–5); Opsomer (2020b: 85–6).

[65] On the Euclidean influence on *EP*, cf. Martijn (2014) and Opsomer (2020b).

[66] On the characteristics of '*Elementarliteratur*' and its origins in fifth century BC Greece, cf. the authoritative work of Asper (2007: esp. 94–212).

[67] On *In Eucl.*, cf. Hartmann (1909); Heath (1956: 29–31); Morrow (1970). O'Meara (1989: 156–209) stresses Proclus' dependence on Iamblichus in his commentary. Proclus also discusses the geometrical method briefly in *PT* 1.10.45.20–46.2.

[68] This is evidenced by Proclus' reference to Euclid's *Elements* as στοιχείωσις (*In Eucl.* 74.11).

[69] For Proclus, science as a whole is divided into two parts, one being concerned with the principles, the other with what arises from these principles (*In Eucl.* 200.22–201.3).

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and impersonal language. As pointed out by Asper (2007: 114–34), these three characteristics of discreteness, standardisation and impersonality are the main stylistic features of the genre and are found in *EP* (as well as *ET*).

As Proclus emphasises in *In Eucl.* 71.13–17, the theorems of a στοιχείωσις must be ordered according to their *simplicity*, *fundamentality* and *proximity* to the first principles. These most basic theorems are foundational for the development of further theorems in the work. It should be made clear that not all theorems in a στοιχείωσις are στοιχεῖα but only the most fundamental ones which are being 'implicated in them [i.e., theorems] all and providing demonstrations for many conjunctions of qualities' (72.11–13; tr. Morrow). The other theorems are only στοιχειώδη (elementary) and not relevant for the whole domain of a science.[70] In *EP* it is hard to distinguish between these kinds of theorems, as they are not explicitly marked as such. Presumably, one way of distinguishing them would be to separate theorems that are involved in other theorems from those that are otherwise not used and merely corollaries.

The purpose of a στοιχείωσις, according to Proclus (70.19–71.21), is to offer a systematic presentation of a certain science as well as to present it in an accessible manner to the student.[71] Proclus adopts the features described above to a significant degree in his own στοιχειώσεις, *ET* and *EP*, which – unsurprisingly – share argumentative and terminological similarities.[72]

1.3.2 *Aristotle's Axiomatic Method and Proclus' Commentary on Euclid's* Elements

There are aspects about Proclus' application of the axiomatic method in *EP* which are absent in Euclid. While Euclid uses the method for mathematics, Proclus employs it in different domains and believes it can be universally used for any science. Moreover, Proclus actively reflects on the nature of the method – a

[70] There is a third type which does not fit either designation and is even less important than the elementary theorems. On this distinction, cf. Kiosoglou (2022: 157).
[71] Opsomer (2020b: 89–90) argues convincingly that the latter aspect is more important.
[72] Cf. Kiosoglou (2022: esp. 158).

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self-consciousness which is missing in Euclid. One can legitimately ask whether these elements are derived from Aristotle. As I argue, Proclus' grounding in Aristotle's *Posterior Analytics* accounts for the universal applicability of the axiomatic method in Proclus by devising a general understanding of what science is and how it should be presented. Its influence on *EP* was decisive – just as Euclid's *Elements*, and Aristotle's *Physics* 6–8 and *De caelo* 1.

Proclus' engagement with Aristotle's theory of science in the *Posterior Analytics* has been neglected and not properly investigated in scholarship on *EP*.[73] The *Posterior Analytics* was generally important for the Neoplatonists, being regarded as the 'culmination of the logical treatment' (τέλος τῆς λογικῆς πραγματείας) (Philop. *In APo*. 1.5; tr. McKirahan), that is, Aristotle's *Organon*, which in turn was considered preparatory for Platonic dialectic.[74] Proclus' knowledge of the *Organon* is well attested both by his biographer Marinus (*VP* §9.33–6) and his extant works. As often, Proclus' reading of the *Posterior Analytics* was possibly shaped by Syrianus with whom he read Aristotle's works.[75] We know that Proclus had written a commentary on the *Posterior Analytics* which accounts for his use of it in his surviving works.[76] Most important among these is again his commentary on Euclid's *Elements* where Proclus uses Aristotle to clarify the principles of science.[77]

While Euclid uses a purely mathematical method, Aristotle bases his axiomatics on his syllogistic logic which has consequences for the structure of a science and its principles.[78] The fundamental idea, however, remains in both the same: a science

[73] Cf. Netz (2017: 387; 391, n. 36); Opsomer (2020b). On the influence of Aristotle's theory of science on Proclus' *In Tim*, cf. Martijn (2010b).

[74] Cf. d'Hoine (2016: 379). On the Neoplatonist use of *APo*, cf. de Haas, Leunissen and Martijn (2010). On Proclus specifically, cf. Helmig (2010) and Martijn (2010b).

[75] In his commentary on *Met*. 3–4 Syrianus discusses scientific principles (especially axioms) at great length and in reference to *APo* (e.g., *In Met*. 19.25). Cf. Longo (2005) and (2010).

[76] On this commentary, cf. Luna and Segonds (2012a: 1559–62). In the three surviving testimonies Proclus reacts to Alexander's exegesis, demonstrating his acquaintance with the latter's commentary.

[77] For a discussion of Aristotle's presence in *In Eucl*., cf. Giardina (2010); Romano (2010). MacIsaac (2014) criticises the focus on Aristotle by the latter two publications and, in contrast, emphasises the role of Plato in Proclus' theory of principles.

[78] This is pointed out clearly by Hintikka (1981: 137–9;143).

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x should be based on certain indemonstrable principles from which the (whole) domain of x can be deductively disclosed. It is in this sense that I use axiomatic and axiomatisation in the following. The requirement for indemonstrable principles is supposed to prevent an infinite regress which would occur if a given science had to demonstrate everything (*APo* 1.2–3; *Met*. 4.3). As Proclus puts it:

> [N]o science demonstrates its own first principles (τὰς ἑαυτῆς ἀρχὰς ἀποδείκνυσιν) or presents a reason for them; rather each holds them as self-evident (αὐτοπίστως), that is, as more evident than their consequences. The science knows them through themselves, and the later propositions through them. This is the way the natural scientist (φυσιολόγος) proceeds, positing the existence (ὑποθέμενος εἶναι) of motion and producing his ideas from a definite first principle. (*In Eucl*. 75.14–20; tr. Morrow)

As Proclus' example of the φυσιολόγος makes clear, he is here not just referring to the specific case of mathematics and therefore is not describing Euclid's procedure in the *Elements*. Rather, his *general* reflections on the principles of science as being indemonstrable presuppose Aristotle's theory in the *Posterior Analytics* and *Met*. 3.2 with which they agree. For instance, in *On Providence* §6, Proclus cites Aristotle approvingly for claiming that one must proceed from common notions to the theorems to be demonstrated.[79] It should be noted that Proclus does not refer here to an *absolute* indemonstrability of principles (i.e., it is *generally* impossible to demonstrate scientific principles) but rather to a *relative* indemonstrability (i.e., a *specific* science does not demonstrate its own principles).[80] Moreover, his proximity to Aristotle is also evidenced by the claim that the natural scientists posits the existence (ὑποθέμενος εἶναι) of an object in his field of study which fits Aristotle's understanding of a hypothesis as making an existence claim (*APo* 1.2.72a18–24).

[79] Cf. also the references to Aristotle's axiomatic method in *De prov.* §28; *In Alc*. 274.32–275.7.

[80] Cf. *In Eucl*. 182.14–20: 'But Aristotle, as we have said earlier, maintains that a postulate is demonstrable . . ., whereas the axiom is as such indemonstrable and everyone would be disposed to accept it, even though some might dispute it for the sake of argument' (tr. Morrow). This is a common distinction, found in Alexander as well as in Syrianus (*In Met*. 65.17–19). Cf. Longo (2005: 160–1).

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What then are these principles from which a science proceeds? Both Aristotle and Euclid are commonly assumed to accept a similar threefold division of principles:[81]

Euclid (*Elements* I)		Aristotle (*APo* I.2.72a14–24[82])
(1) definitions (ὅροι)	:	(1) definitions (ὁρισμοί)
(2) common notions (κοιναὶ ἔννοιαι)	:	(2) axioms (ἀξιώματα)
(3) postulates (αἰτήματα)[83]	:	(3) hypotheses (ὑποθέσεις)

In both Euclid and Aristotle, (2) common notions/axioms are general (e.g., law of non-contradiction or law of equals from equals), while (1) definitions and (3) postulates/hypotheses are science specific.[84] While the notions of axioms and definitions are quite straightforward and overlap, hypotheses and postulates differ. According to Aristotle, hypotheses are existence claims that posit the existence of something, for example, points (*APo* I.2.72a23–4; I.10.76b3–5). This is not the case with Euclid's postulates. For instance, Euclid's first postulate in *Elements* I 'Let the following be postulated: to draw a straight line from any point to any point' (tr. Heath) clearly presupposes the existence of points as well as lines and does not assert their existence. However, the similarity of Euclidean postulates and Aristotelian hypotheses lies in their function as both 'introduce things into the realm of discourse of a science' (McKirahan 1992: 139).

Regardless of the relationship of these classifications, more relevant for my current purpose is what Proclus thought about their relation. Crucially, he seems to allude to a congruence between the two (*In Eucl.* 76.4–77.2) by using his own terminology for the tripartite division:

[81] This, at least, is the view of H. D. P. Lee (1935) and McKirahan (1992: 134–5). For the latter, the reason is that 'Aristotle's classification of principles is based on the mathematics he knew and … Euclid's principles in *Elements* I are organized with Aristotle's classification in mind' (133). In contrast, Hintikka (1981) and Mueller (1991) propose other types of principles for Aristotle and hence a different relation to Euclid's principles. Barnes (1993: 143) claims that Aristotle has different classifications which are not completely in accordance with each other.

[82] On this passage, cf. McKirahan (1991: 41–3); Barnes (1993: 99–101); Detel (1993: 40–1).

[83] This refers only to Euclid's first three postulates, since P4–5 differ in character.

[84] The dichotomy between common and specific principles is emphasised at *APo* I.32.88b27–9. Cf. Mueller (1991).

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(1) axioms (ἀξιώματα)
(2) hypotheses (ὑποθέσεις)
(3) postulates (αἰτήματα)

Proclus' unusual terminology in referring to the principles matches neither directly Aristotle's nor Euclid's use. This, in turn, has led to an extensive debate in scholarship.[85] Crucially, Proclus appeals to Aristotle as an authority for distinguishing these three principles (e.g., *In Eucl*. 182.14–20), clearly having the discussion of the *Posterior Analytics* in mind. But how well can Proclus have understood Aristotle who plainly states that definitions are *not* hypotheses, since definitions point out what something is, but do not make existence claims (*APo* 1.2.72a23–4; 1.10.76b35–77a4)? *Prima facie*, it seems that Proclus mistakenly takes Aristotelian definitions to be 'hypotheses'.[86] Connected to this, is then Proclus' choice of calling Aristotelian hypotheses 'postulates'. Has Proclus simply misunderstood Aristotle's teaching on scientific principles or is his terminology a result of a specific philosophical background?

I take it that the latter is the case. Proclus presents us in this and related passages a Platonising interpretation of Aristotle and not an objective summary of Aristotle's theory in the *Posterior Analytics*, as some scholars have assumed.[87] The names of the principles are indicative of this, as Proclus simply uses his own terminology and imposes it on Aristotle.[88] This Platonic background explains Proclus' peculiar terminology in the passage above. Proclus' aim is to find support in Aristotle for his tripartition of principles. As he shows numerous times in his commentary, the ancients struggled to distinguish between different principles which is reflected in differing usage of the terms axiom, definition and so on.[89] Hence, this terminological instability and lack of clarity in Proclus is also

[85] For his distinction of these principles in dependence on Aristotle, cf. also *In Eucl*. 178.2–184.10, 188.7–9, 194.4–9. On the terminology, cf. Morrow (1970: 140, n. 1); Martijn (2010a: 92–5); Romano (2010); MacIsaac (2014).
[86] As maintained by Heath (1956: 122).
[87] This has been correctly emphasised by MacIsaac (2014: 50) against, e.g., Giardina (2010) or Romano (2010).
[88] *Pace* Hartmann (1909: 54) who claims that Proclus uses Euclid's and Aristotle's terminology.
[89] Besides his comments on Aristotle, he mentions e.g., Archimedes (181.16–20), Geminus (181.24–182.6), and the Stoics (193.20–194.4).

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due to the conflicting evidence of his authorities. This is made clear by the apparent hypothesis – definition mix up.

Proclus regards definitions – like other principles – in the specific sciences as necessarily hypothetical, that is, provisional.[90] For Proclus almost all sciences, including their principles, are hypothetical: 'for there is only one unhypothetical (ἀνυπόθετος) science, the other sciences receiving their first principles (τὰς ἀρχάς) from it' (75.9–10; tr. Morrow).[91] This unhypothetical science is – based on Plato's *Republic* (e.g., 6.510b–511d; 7.533b–d) – dialectic which Proclus treats in *ET* and whose role lies in furnishing the principles of lower sciences (*In Eucl.* 8.21–10.14). Unlike other sciences which are characterised by discursive thinking, dialectic is only accessible through νοῦς and νόησις (*In Eucl.* 11.9, 42.12–18). To a certain degree this accounts for why Proclus often – but not exclusively –[92] employs the term 'hypothesis' for 'definition' (ὅρος, ὁρισμός) in *In Eucl.* All definitions are hypothetical and can be thus called 'hypotheses', but not all hypotheses are definitions since the term hypotheses can also refer to other principles. This explains why Proclus sometimes uses hypotheses for all three types of principles and not only for definitions.[93]

Let us briefly conclude. Proclus shows in the preface to his commentary on Euclid's *Elements* an awareness not just of Euclid's but also of Aristotle's axiomatic procedure in the *Posterior Analytics*. Proclus' engagement with the latter is seen in four areas where Proclus' practice in *EP* differs from Euclid and/or is directly based on Aristotle. (1) Proclus takes over the idea from the *Posterior Analytics* of applying axiomatics to non-mathematical sciences. This ultimately culminates in his axiomatisation of theology in *ET*. (2) Moreover, Proclus engages with Aristotle's theory of principles and takes over his understanding of hypotheses as

[90] For the startling problem of how axioms can be simultaneously hypothetical and self-evident, cf. MacIsaac (2014).

[91] Cf. also *In Eucl.* 31.11–22, especially 19–22: 'In this sense, then, he says, because mathematics uses hypotheses, it falls below the unhypothetical and perfect science'.

[92] Proclus also uses the term 'definition' (ὅρος, ὁρισμός, λόγος), cf. 81.26, 93.20, 178.7–8, 418.18. On his use, cf. MacIsaac (2014: 58–67, esp. 62): 'His principal use within mathematics of *horos* and its cognates in the sense of boundary is to speak generally about boundaries giving determinate existence to what would otherwise be boundless or indeterminate.'

[93] E.g. *In Eucl.* 9.25–10.1 seems to refer to all principles. Cf. also ibid. 11.22–5.

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existence claims (*In Eucl.* 75.14–20) – even though he sometimes calls them postulates. In the next discussion two more points will emerge clearly. (3) Following Aristotle's advice that axioms can be sometimes left out, Proclus does not mention them – unlike Euclid. (4) In his reflections on the nature of *reductiones* – which he uses throughout *EP* and even supplements (if they were not included in the original) – Proclus is inspired by the account of the *Posterior Analytics*. These characteristics offer evidence for my thesis that Aristotle's *Posterior Analytics* had a lasting and productive impact on Proclus' axiomatic project and should be considered in treatments on the origin of the axiomatic method in Proclus.

1.3.3 Aristotle's Mathematical Style and Proclus' EP

Besides his acquaintance with Aristotle's model of science – particularly with his theory of scientific principles and model of scientific discourse from the *Posterior Analytics* – Proclus also encountered in *Physics* 6, 8 and *De caelo* 1 texts which already contained mathematical style arguments and evidenced a certain level of axiomatisation.[94] This 'mathematisation' is especially pronounced in *Physics* 6, on which Proclus mostly bases *EP* 1, and to a lesser degree in *Physics* 8[95] and *De caelo* 1, which Proclus uses in *EP* 2. The reason why Aristotle adopted this style there is not entirely transparent. For instance, Owen (1986: 164) explains the mathematical and axiomatic character of the *De caelo* and the *Physics* – partly – with Aristotle's proximity to the Academy (and thus regards these works as early). Yet, the most attractive explanation for the presence of these features is proposed by Jope (1972)

[94] Except for *Meteor.*, these types of arguments are absent from Aristotle's works. On the mathematical character of *Phys.* 6–8, cf. Le Blond (1939: 196–7). Vitrac (2002: 248–55) points out that *Phys.* 6 'est véritablement le plus "mathématique" des Livres de la *Physique* d'Aristote' (250) since it contains twenty arguments (from a total of thirty-eight) designed in the mathematical style. According to Vitrac, *Phys.* 8 has only three such arguments, while *DC* 1 contains five. I believe there are in fact more such arguments and that Vitrac has too restricted and anachronistic a notion of a 'mathematical style argument' since he takes Euclid as an example. On the types of arguments in *DC*, cf. Elders (1966: 53–8).

[95] Importantly, Aristotle claims at the beginning of book 8 (251a8–16) that it is necessary to restate the definitions (τὰ διωρισμένα) from earlier parts of *Phys.* and then mentions the definition of motion. This is a clear indication that book 8 builds on earlier principles which it presupposes.

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who sees in *Physics* 6 an example of the axiomatic-deductive system envisaged in *Posterior Analytics* 1. He focuses on the fact that Aristotle explains in *Physics* 6 motion and time in reference to continuity which is a mathematical characteristic. But, Jope argues, insofar as Aristotle studies motion and time *qua* continua and, thus, physical things in relation to a mathematical property, his approach is that of a subordinate, and not ordinary, science. Subordinate sciences, such as harmonics or optics, study the physical *qua* mathematical, and are only able, according to Aristotle, to provide demonstrations of the 'that' (τοῦ ὅτι) but not of the 'why' (τοῦ διότι). That is, they describe *that* something is the case but are unable to point out *why* that is. The latter is only reserved to mathematics itself which studies the mathematical *qua* mathematical.[96] That Aristotle offers primarily demonstrations τοῦ ὅτι, not τοῦ διότι, will be important in Section 1.3.3.2.

It is apparent that Proclus was aware of the theory of an axiomatic science as well as of the axiomatic structure of the Aristotelian original. Proclus only had to accentuate already present features and add logical rigour to the arguments. He then structured the text into discrete entities, that is, propositions, as in Euclid. In many cases, Proclus' restructuring of the original text did not require great interventions. He thus axiomatised even less structured parts of the Aristotelian text – which does not mean that we have a flawlessly axiomatic work, as will become clear.

In the following I show how in *EP* Proclus puts this axiomatic model of science into practice by comparing some examples from *EP* with their Aristotelian original. I first discuss some peculiarities of the principles which have not been sufficiently discussed in scholarship (1.3.3.1) and then turn to the theorems (1.3.3.2).

1.3.3.1 Principles

In *EP* Proclus posits in total twenty principles: six definitions in the first book, six hypotheses and eight definitions in the second. Almost all are taken directly from the Aristotelian original, the precise references being provided by Ritzenfeld (1912). In my analysis I focus on those aspects which are either relevant for

[96] On this difference, cf. *APo* 1.13.78b35–79a3.

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Proclus' axiomatisation of Aristotle's kinematics or constitute significant departures from the original source. The six definitions of the first book are:

(Def. 1.1) Συνεχῆ ἐστιν, ὧν τὰ πέρατα ἕν.
Continuous are those things whose limits are one.

(1.2) Ἁπτόμενά ἐστιν, ὧν τὰ πέρατα ἅμα.
Contiguous are those things whose limits are together.

(1.3) Ἐφεξῆς ἐστιν, ὧν μηδὲν μεταξὺ ὁμογενές.
Next-in-succession are those things which have nothing of the same kind in between them.

(1.4) Πρῶτός ἐστι χρόνος κινήσεως ὁ μήτε πλείων μήτε ἐλάττων τῆς κινήσεως.
The primary time of a motion is the time which is neither more nor less than the motion.

(1.5) Πρῶτός ἐστι τόπος ὁ μήτε μείζων τοῦ περιεχομένου σώματος μήτε ἐλάττων.
The primary place is the place which is neither more nor less than the encompassed body.

(1.6) Ἠρεμοῦν ἐστι τὸ πρότερον καὶ ὕστερον ἐν τῷ αὐτῷ τόπῳ ὂν καὶ αὐτὸ καὶ τὰ μέρη.
Resting is that which itself and its parts is before and after in the same place.

First, it should be remarked that the first three definitions are not formulated in accordance with the subject matter, that is, the γένος of the specific science, as demanded by Aristotle himself (*APo* 1.7, 1.28). That is, since the subject matter is physical science it requires appropriate principles (in this case definitions) that do not stem from another science.[97] But defs. 1–3 are actually definitions used in mathematics and lack the specific, physical character that one would expect. Since they are close to the Aristotelian original (*Phys.* 5.3 and 6.1) – Proclus directly takes them over – this problem can be traced back to Aristotle who himself refers to defs. 1–3 explicitly as definitions (*Phys.* 6.1.231a22). However, this does not mean that Proclus is not conscious of the requirement for science-specific definitions. When he discusses whether Euclid's definition of a point is adequate, he claims that 'the scientist in a special area . . .

[97] Proclus clearly shows at *In Eucl.* 33.2–10 an awareness of Aristotle's prohibition of kind-crossing (*APo* 1.7).

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has the responsibility of examining and expounding only that indivisible nature which is appropriate to his first principles' (93.11–15). For instance, the geometrician studies the point, whereas the arithmetician the monad. Proclus presumably takes 1.1–3 over in this form because these broader definitions allow him to insert the relevant physical term, that is, '[a] magnitude/time/motion is continuous when its limits are one'. Additionally, these first three definitions also situate Proclus safely in the Neoplatonist exegetical tradition since the wording of defs. 1.1–3 is, in fact, closer to Simplicius than Aristotle.[98] For instance, the expression ὁμογενές in def. 1.3 is found in Eudemus, Alexander and Simplicius, but it is absent in Aristotle who uses the term συγγενές (which Simplicius also correctly cites).[99]

Defs. 4–6 concern time, place and rest, and have their own peculiarities. Unlike the earlier definitions, they are clearly subject-specific and less general. While def. 6 is straightforward, a few remarks on the other two are necessary. Def. 5 on primary place is a combination of two principles established by Aristotle at the beginning of his discussion of place: the first expresses the idea that place is the 'first thing surrounding that of which it is place', while the second claims that 'primary place is neither less nor more than' the thing it surrounds. Def. 4 on primary time is not found explicitly in Aristotle's text and has been modelled after def. 5. I take it that Proclus, following Aristotle, uses the expression πρῶτος χρόνος/τόπος in these two definitions to indicate that he talks about the time or place which includes neither more nor less than the object or process to which it belongs. That is, a time which stretches more or less than the duration of a process, such as walking from a to c instead of a to b, is only secondary. Analogously, the same applies to place where, for example, a dog can be primarily located in a seat and secondarily in car and so on.

It is noteworthy that defs. 4 and 5 are not taken from *Physics* 6 but from book 4.[100] This is peculiar, since Proclus' primary

[98] As Opsomer (2020b: 84, n. 3) noted, the formulations are very close to Simpl. *In Phys*. 597.25–6, 890.29, 926.3.

[99] Simplicius employs the term at *In Phys*. 928.14 *et passim* and cites Eudemus at *In Phys*. 928.29 and Alexander at 929.10, 15 where the same term occurs.

[100] Def. 4: 4.11.219a13–14; Def. 5: 4.4.210b34–5 and 211a1–2. Def. 7 is taken from book 6 (3.234b5–7, 8.239a14–16, 239a26–8).

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concern in *EP* 1 is to offer an axiomatisation of book 6. He adds, I submit, these definitions because he believes the three definitions listed by Aristotle at the beginning of *Physics* 6 are insufficient for deriving all doctrines of the book. This shows us how Proclus takes over the already axiomatic structure of the Aristotelian original and further perfects it. Although *EP* deals primarily with motion, it does not contain a definition of motion (or of place). Likewise, while time is defined in def. 2.7 ('Time is a number of the motion of the heavenly bodies'), its definition remains dependent on the concept of motion which we lack. In this way, the concepts and definitions of motion and place are already presupposed, since they are included in the defs. 1.4–6 and 2.7.

I now turn to the principles of book 2 which are more numerous.

(Hyp. 2.1) Πᾶν σῶμα φυσικὸν κινητόν ἐστι κατὰ τόπον.[101]
Every physical body is moveable in place.

(2.2) Πᾶσα κίνησις τοπικὴ ἢ κύκλῳ ἐστὶν ἢ ἐπ' εὐθείας ἢ μικτὴ ἐκ τούτων.
Every locomotion is either circular or linear or a combination of both.

(2.3) Πᾶν σῶμα φυσικὸν μίαν ἐκ τούτων κίνησιν κινεῖται.
Every physical body moves with one of these motions.

(2.4) Πᾶν σῶμα φυσικὸν ἢ ἁπλοῦν ἐστιν ἢ σύνθετον.
Every physical body is simple or composite.

(2.5) Πᾶσα κίνησις ἁπλῆ ἁπλοῦ σώματός ἐστιν.
Every simple motion is of a simple body.

(2.6) Πᾶν σῶμα ἁπλοῦν μίαν κατὰ φύσιν κινεῖται κίνησιν.
Every simple body moves according to its nature with one motion.

(Def. 2.1) Λόγον ἔχειν πρὸς ἄλληλα τὰ τάχη λέγεται, ὃν τὰ διαστήματα ἔχει, δι' ὧν τὰ κινούμενα κινεῖται.
The relation of the velocities to each other is the relation of the distances through which the moving things move.

(2.2) Βαρύ ἐστι τὸ ἐπὶ τὸ μέσον κινούμενον.
Heavy is that which moves towards the middle.

(2.3) Κοῦφόν ἐστι τὸ ἀπὸ τοῦ μέσου κινούμενον.
Light is that which moves away from the middle.

[101] Hyp. 2.1 differs importantly in its formulation from *DC*: πάντα γὰρ τὰ φυσικὰ σώματα καὶ μεγέθη καθ' αὑτὰ κινητὰ λέγομεν εἶναι κατὰ τόπον (1.2.268b14). Proclus leaves out καθ' αὑτά and thus presents the bodies and magnitudes no longer as self-moving. This is an interesting change and fits generally to Proclus' omission of self-motion in *EP*. On the latter, cf. Section 2.5.1.

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(2.4) Κύκλῳ κινεῖσθαι λέγεται τὸ ἀπὸ τοῦ αὐτοῦ πρὸς τὸ αὐτὸ φερόμενον συνεχῶς.
Circular motion means moving continually away from the same point towards the same point.

(2.5) Ἐναντίαι κινήσεις εἰσὶν αἱ ἀπὸ τῶν ἐναντίων εἰς τὰ ἐναντία.
Contrary motions are from the contrary to the contrary.

(2.6) Ἓν ἑνὶ ἐναντίον.
One thing is (only) contrary to one other.

(2.7) Χρόνος ἐστὶν ἀριθμὸς κινήσεως οὐρανίων σωμάτων.[102]
Time is a number of the motion of the heavenly bodies.

(2.8) Μία κίνησίς ἐστιν ἡ κατ᾽ εἶδος ἀδιάφορος καὶ ἑνὸς ὑποκειμένου καὶ ἐν συνεχεῖ χρόνῳ γινομένη.
A single motion is a motion which is unchanged in its form, directed at one object, and takes place in a continuous time.

According to the standard edition by Ritzenfeld and the opinion of most scholars,[103] Proclus mentions in *EP* only definitions – six in the first book and fourteen in the second. He thus leaves out the other two principles – axioms and postulates/hypotheses – which he clearly recognised, as seen above. But, as I argue here, this impression is wrong. Based on their content, the manuscript tradition of *EP*, and other remarks in Proclus' and other Neoplatonists' oeuvre, it can be safely established that Proclus conceived the first six principles in fact as hypotheses.

If we look at the content of the first six principles, it becomes quite obvious that these are not definitions, as they do not define *what* something is – unlike the other principles.[104] Rather, they seem to have the character of hypotheses by making certain assumptions, that is, they posit *that* something is or, more precisely, that every being of a certain class is in a certain way. The quantifiers πᾶν/πᾶσα clearly separate them linguistically from the other principles and provide the impression that they are structured

[102] The addition οὐρανίων σωμάτων is un-Aristotelian. It is presumably a Platonising influence echoing *Tim*. 39d1 where time is the motion of the planets.

[103] Cf. Ritzenfeld (1912: 3; 30); O'Meara (1989: 177); Nikulin (2003: 185); Opsomer (2020b: 90). In a private discussion, Opsomer made clear that his view on the nature of the first six principles of book 2 has changed.

[104] Def. 2.6 clearly does not have the character of a definition. At *In Tim*. 2.48.2–7 [1.237.23–9] Proclus calls it rightly a hypothesis as does also Simplicius at *In DC* 12.10. I assume Proclus must have made a mistake in *EP* when he adds it to the definitions or later changed his mind in *In Tim*.

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like premises for (Barbara-type) syllogisms. For instance, hyp. 2.1 claims that every physical body is moveable in space without offering a definition of a physical body by answering the question 'What is x?'. However, the proper definitions of *EP* 2 do exactly that. For instance, 'What is heavy?' – 'Heavy is that which moves towards the middle' (def. 2.2).[105]

Evidence from the manuscript tradition also suggests that the first six principles should be termed 'hypotheses'. Ritzenfeld (1912: 70) remarks on the definitions of book 2 that (some) editions call the first six hypotheses. He refers here primarily to the *editio princeps* by Simon Grynaeus (1531), called b in his critical apparatus. Grynaeus' edition is based on codex (Z) and attests on page 28 ὑποθέσεις instead of ὅροι for the first six definitions. It is thus possible that (Z), which Ritzenfeld does not seem to have consulted (presumably because it was no longer extant),[106] offered this version as well. Unfortunately, since Ritzenfeld's *stemma codicum* is incomplete – he has consulted only eleven of the over thirty codices known to him – as well as faulty, as demonstrated by Boese (1958: 13–14),[107] it is impossible to determine here the consequences for a reconstruction of the original text.

The strongest argument, however, for calling these six principles hypotheses instead of definitions, which has been – to my knowledge – ignored so far, stems from Proclus himself. In his commentary on the *Timaeus* he claims that Aristotle demonstrates the indestructibility of the cosmos based on certain hypotheses (2.48.2 [1.237.23]: ὑποθέσεις) and cites Plotinus approvingly who also employs the term hypotheses for these principles.[108] Proclus mentions five hypotheses (2.48.5–8

[105] Although def. 2.1 stands out linguistically through its usage of λέγεται, it still is a definition, as it describes what the relation between different velocities is (i.e., the relation between the different distances traversed by different moving things).

[106] Nevertheless, Ritzenfeld (1912) conjectures that (Z) was 'simillimus' to the extant N (Monacensis 502). Regardless of the accuracy of this claim, it should be noted that N includes no separate headings for the principles.

[107] Via his reconstruction of William of Moerbeke's Latin translation Boese shows that the Greek original of this translation shares variants with both main families reconstructed by Ritzenfeld and therefore does not fit his *stemma*.

[108] Proclus cites (imprecisely) *Enn*. 2.1.2.12–13: Ἀριστοτέλει μὲν οὖν οὐδὲν πρᾶγμα, εἴ τις αὐτοῦ τὰς περὶ τοῦ πέμπτου σώματος **ὑποθέσεις** παραδέξαιτο (*In Tim*. 2.48.3–5

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[1.237.27–238.1]) of which the first three correspond to the principles 2.5, 2.6 and 2.2. Simplicius adopts this usage of the term as well in his commentary, counting six hypotheses which Aristotle uses to determine the heaven's eternity. Some of these match Proclus' hypotheses.[109]

There is thus a unanimous awareness in Plotinus, Proclus and Simplicius of the fact that Aristotle builds his demonstrations in *De caelo* 1 (in part) on hypotheses and not just on definitions. This Neoplatonist interpretation is based on Aristotle's own usage of the term, as he refers to some of the propositions appearing as definitions in *EP* 2 repeatedly as hypotheses (e.g., at *DC* 1.3.270b3 and 1.7.274a34, and b11: τὰς πρώτας ὑποθέσεις). While Aristotle uses the term *hupothesthai* (ὑποθέσθαι) and its variants in a more general sense of statements that have to be assumed without being demonstrated, it is clear that the Neoplatonists were inspired by his terminology. Together with an analysis of their content as well as the manuscript tradition, it seems highly probable that the first six principles of *EP* 2 should be considered as hypotheses and not definitions, as commonly assumed.

It is, however, beyond doubt that Proclus leaves out axioms in *EP*. Why? Presumably, Proclus found axioms too obvious to be stated explicitly, just as Euclid does not list, for example, the law of excluded middle as a common notion. Aristotle himself claims that not all principles have to be necessary stated, mentioning specifically the case of axioms which can be left out due to their familiarity (*APo* 1.10.76b16–21). Moreover, while *some* principles are necessary for Proclus, it does not mean that their threefold division must be respected in each science. In this way, Proclus sticks rather to Aristotle's precepts in the *Posterior Analytics* than to Euclid's *Elements,* where some axioms occur.

1.237.25–7]). Plotinus does not explicitly mention these hypotheses (cf. Wilberding (2006: 122–6)), hence the reconstructions by Proclus and Simplicius (who cites the same passage at *In DC* 12.6–16, 115.30–116.2).

[109] Cf. *In DC* 12.6–11. He later (115.30–116.2) adds two more, positing eight in total. Cf. also *In DC* 228.8–10. Hankinson (2009) discusses the fourth and fifth hypothesis in detail. Leggatt (1995: 14, n. 26) counts as many as fourteen hypotheses in *DC* 1.

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1.3.3.2 Theorems

Based on these definitions and hypotheses Proclus then constructs several theorems. The adherence to the axiomatic method is less strict than one might expect since most theorems include unstated premises which are neither based on the principles nor on the preceding theorems.[110] Interestingly, this lack of axiomatisation can be already traced back to Aristotle's original text. But as we have seen, Proclus has also added principles to make the presentation more axiomatic. To make this clear I discuss a few examples. As I show here, Proclus (1) further completes the formalisation already present in the Aristotelian original and, specifically, (2) adds *reductiones ad impossibile* (εἰς τὸ ἀδύνατον/διὰ τοῦ ἀδυνάτου ἀπαγωγαί) which serve to foster the axiomatic structure of the text.

Let us start with discussing a few formal features by looking at *EP* §1.19 which is based on *Phys.* 4.4.234b10–20:

Πᾶν τὸ κινούμενον μεριστόν ἐστιν.

Ἔστω γάρ τι κινούμενον ἐκ τοῦ A εἰς τὸ B. ἢ οὖν ἐν τῷ A μόνον ἐστὶν ἢ ἐν τῷ B ἢ ἐν ἀμφοτέροις ἢ ἐν οὐδετέρῳ ἢ τὸ μὲν αὐτοῦ ἐν τῷ A, τὸ δὲ ἐν τῷ B. ἀλλ' εἰ μὲν ἐν τῷ A, οὔπω κινεῖται· εἰ δὲ ἐν τῷ B, οὐκέτι κινεῖται· εἰ δ' ἐν ἀμφοτέροις, καὶ οὔπω κινεῖται καὶ οὐκέτι κινεῖται· εἰ δ' ἐν οὐδετέρῳ, οὐκ ἔσται ἐκ τοῦ A εἰς τὸ B ἡ κίνησις. [οὐδὲ μεταξὺ αὐτῶν] ἀνάγκη ἄρα τὸ μὲν αὐτοῦ ἐν τῷ A εἶναι, τὸ δὲ ἐν τῷ B· διαιρετὸν ἄρα τὸ κινούμενόν ἐστιν.

Every moving thing is divisible.

For let something be moving from A to B. Then either it is in A alone or in B or in both or in neither or one part is in A and another in B. But if it is in A, it is not yet in motion. If it is in B, it is no longer in motion. If it is in both, it is both not yet and no longer in motion. But if in neither, there will be no motion from A to B. Necessarily, it is partly in A and partly in B. Therefore, the moving thing is divisible. (§1.19.18.6–15)

Based on his Aristotelian source, Proclus wants to establish here that every entity in motion must be physically divisible.[111] Two things strike the reader at first sight. First (1) is the repetition of the proposition at the end of the passage which is common to mathematical works and present also in Aristotle. Proclus, thus,

[110] Opsomer (2020b: 97–100) provides examples for this.
[111] Cf. Simpl. *In Phys.* 962.24–6.

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imitates here Aristotle directly and only accentuates a tendency already encountered in the latter.[112] A conspicuous difference is (2) the shift from μεταβάλλον in Aristotle to κινούμενον in *EP* which can be explained by Proclus' preference for terms derived from κινέω and not from μεταβάλλω.[113] Since there does not seem to be a conceptual difference between the terms in *EP*, it seems that Proclus simply tries to make the terminology more unitary. It should be also mentioned that Proclus adds a diagram at §1.19.18.8–9 which is missing in Aristotle. It is a matter of debate whether there were diagrams in the original manuscripts of the *Physics*.[114] Aristotle's use of lettered variables certainly suggests a visual model in form of a diagram. It comes thus to no surprise that Proclus makes extensive use of diagrams in *EP* which are transmitted to us.

Not only diagrams but also variables seem absent in the Aristotelian original. Yet, this is not generally the case in the *Physics* (or in the *De caelo*, for that matter), as Proclus only completes the formalisation that is otherwise present in Aristotle. This is evidenced by the sentence following the *Physics* passage quoted above where he states that 'if the whole AC is in motion, its parts AB and BC will also be in motion (234b23–4). And then Aristotle himself uses the third person imperative which is a typical feature of the mathematical works to prove his point: 'accordingly, let the movement of the parts be M1–2 of AB and M2–3 of BC' (234b24–5).

Thus, two of the three central characteristics of a στοιχείωσις (see Section 1.3.1) – standardisation and impersonality – occur already in the Aristotelian original. Proclus only had to accentuate these formal characteristics by completing the formalisation and add logical rigour to the arguments by spelling them out in a clear manner. In many cases Proclus' restructuring of the original text did not require great interventions. This resemblance is also reflected in the types of arguments employed. In *EP* Proclus uses

[112] As emphasised by Netz (2017: 387) and Opsomer (2020b).
[113] His usage of μεταβάλλω is almost confined to five theorems: 1.21–4 and 1.27.
[114] Cf. Netz (1999: 15) and (2017: 377). Diagrams are also well attested for other Aristotelian works such as *MA*, where they have been (re-)introduced by Primavesi in his new edition. Cf. Primavesi and Corcilius (2018).

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in his proofs primarily *reductiones*. So far, this strong reliance on *reductiones* in *EP* – even in the passages and arguments added by Proclus – and their purpose in this work have not been sufficiently explained. Although Opsomer (2020b: 93–6) discusses this important aspect, he focuses in his explanation exclusively on evidence from Aristotle's *Prior Analytics* 1.23.41a21–37 and 1.44.50a29–38.[115] While this is undoubtedly right, in the following, I argue that the background of the *Posterior Analytics* played a more significant role – as witnessed also above in the case of principles.

The first example of a *reductio* is encountered in §1.2. Proclus had established in §1.1 that two points are not contiguous since contiguity requires the ends of two (or more) things to be together.[116] This, however, is not possible in the case of points since they have no parts and thus no ends which could be together. Now, in §1.2 Proclus wants to establish that two points can also not be continuous:

Δύο ἀμερῆ συνεχὲς οὐδὲν ποιήσει.

Εἰ γὰρ δυνατόν, ἔστω δύο ἀμερῆ τὰ AB καὶ ποιείτω συνεχὲς τὸ ἐξ ἀμφοῖν. ἀλλὰ πάντα τὰ συνεχῆ ἅπτεται πρότερον· τὰ ἄρα AB ἅπτεται ἀλλήλων ἀμερῆ ὄντα, ὅπερ ἀδύνατον.

Two partless things will not form something continuous.

For if it were possible, let A and B be two partless things and let them form something continuous from each other. But all continuous things touch each other earlier; then, A and B touch each other, although they are partless, which is impossible.

The argument is simple. Proclus first assumes the positive hypothesis that the two points A and B are continuous. However, this cannot be the case since continuity requires contiguity, that is, A needs to be contiguous with B in order to be continuous. But, as §1.1 has shown, it is impossible for two points to be contiguous. Therefore, they are also not continuous.

This argumentative style is again influenced by the Aristotelian original – here *Phys.* 6.1.231a24 – as well as Euclid's *Elements*

[115] Cf. also the brief remarks in Nikulin (2003: 185).

[116] Interestingly, Proclus himself constructs § I.1 as it is not found in *Phys.* 6. This exemplifies how he makes the argumentation more axiomatic and accessible to the student. Cf. Kiosoglou (2022: 154–8).

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since both use *reductiones* extensively.[117] Yet, the use of demonstrations by *reductiones* is puzzling since both Aristotle and Proclus deny their explanatory power. As is well known, Aristotle claims in *the Posterior Analytics* that knowledge is attained by demonstrations in the form of deductions. (In)famously, the premises of these demonstrations have to meet certain criteria among which are 'prior to and explanatory of the conclusion' (*APo* 1.2.71b22). Neither criterion, however, is met by *reductiones*, as is shown in a condensed argument in *APo* 1.26,[118] where Aristotle argues that direct negative demonstrations are superior in their explanatory power over indirect negative demonstrations, that is, *reductiones*. Direct negative demonstrations proceed from premises prior to the conclusion, while *reductiones* proceed from premises posterior to the conclusion. The sense of priority is priority in nature (87a17). But if the premises of a *reductio* are not prior to the conclusion, it does not meet the necessary requirements of a scientific demonstration laid out in *APo* 1.2.[119] Still, a *reductio* can be considered a demonstration in a more general sense. For, in *APo* 1.13, Aristotle points out that besides the genuine form of demonstration which provides an explanation of the reason why (τοῦ διότι), that is, Why does A hold of B?, there is another type of demonstration which reveals a property or fact (τοῦ ὅτι): Does A hold of B? While the former is to be preferred, the latter plays an indispensable role in acquiring knowledge and is often presupposed by the demonstration of the explanation, as he makes clear in *APo* 2.1.89b27–31.[120] Consequently, Aristotle holds that knowledge of facts is temporally prior to knowledge of causes.[121] Thus while *reductiones* are

[117] The Aristotelian background has been emphasised by Opsomer (2020b: 95). Proclus offers his own views on this type of argument at *In Eucl*. 254.21–256.8. According to Proclus *In Eucl*. 73.21–2, some writers of *Elements* made more, others less, use of *reductiones*.

[118] An erudite analysis of *APo* 1.26 is offered by Malink (2020) to whom this discussion is indebted.

[119] Cf. Malink (2020: 94).

[120] Cf. also 2.2.89b38–90a1, 2.8.93a17–19.

[121] This is particularly the case for Aristotle's biology; cf. *HA* 1.6.491a10–12; *PA* 1.1.639b6–11, 640a13–16, 1.5.645a36–b3. In *HA* the focus lies on acquisition of facts. Yet, Aristotle does not remain on this level: in *IA*, for instance, he intends to provide causal explanations based on the facts collected in *HA* (1.704b8–11). On this division, cf. Lennox (1987).

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not demonstrations *stricto sensu*, since they do not provide explanations, they are demonstrations in a more general sense, since they produce knowledge (i.e., provide proof) of the fact.[122]

A *reductio ad impossibile* does not provide the cause of a conclusion and is thus not explanatory. That was and still is the common understanding of Aristotle's views.[123] Proclus shares this view, displaying again his knowledge of the *Posterior Analytics*:

> When geometers reason through the impossible, they are content merely to discover the property (τὸ σύμπτωμα μόνον) [of a given subject]. But when their reasoning proceeds through a principal demonstration, then, if the demonstrations are partial, the cause is not yet clear, whereas if it is universal and applies to all like things, the 'why' at once becomes evident. (*In Eucl*. 202.19–25; tr. Heath, modified)

Why then adopt an argumentative style where *reductiones* are virtually omnipresent? Partly, Proclus' motivation is based on emulating the Aristotelian original[124] and Euclid's *Elements*. Moreover, as mentioned, knowledge of the fact is a requirement for knowledge of the cause – a doctrine with which Proclus was evidently acquainted.[125] In this sense, the style fits quite well to the propaedeutic character of *EP*: it establishes first the facts of kinematics before providing a reason.[126] Moreover, through the *reductiones* it becomes clear that earlier propositions were correct. For instance, in the example discussed above, §1.2, the reason *why* the hypothesis is impossible can be found in the preceding proposition, §1.1.

This example proves why *reductiones* are so useful for Proclus in a work such as *EP*. They point backwards to earlier propositions and fortify the axiomatic structure of the treatise. In this way, the role of the *reductiones* is to buttress the arguments of earlier propositions as well as to hint at the reason behind the *reductio*. Additionally,

[122] Cf. Detel (1993: 545) on the use of both demonstrations in Aristotle's sciences.
[123] For the pervasiveness of this interpretation, cf. the examples provided by Malink (2020: 94–8).
[124] According to Jope (1972: 288), 'because of this dual subject [i.e., mathematics and physics], most of the book's [*Phys.* 6] demonstrations are demonstrations τοῦ ὅτι'.
[125] Philoponus relates a part of Proclus' comments on *APo* 1.13 where this distinction is discussed (*In APo* 181.19–182.7).
[126] Aristotle himself corrects a demonstration τοῦ ὅτι from *Phys.* 6.2.233a21–31 by providing a proper explanation τοῦ διότι at 8.8.263a11–b9.

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I would like to emphasise that Proclus chooses consciously to adopt this argumentative method, as the argument of §1.2, for instance, is not found in the form of a *reductio* in Aristotle. He thus adds further *reductiones* to the text. The scientific theory of the *Posterior Analytics* accounts for the presence of this argumentative feature in the Aristotelian text and, hence, in *EP*. Considering Aristotle's understanding of *reductiones* in the *Posterior Analytics* illuminates not just his practice in the *Physics* and the *De caelo* but also Proclus' familiarity with them and use in *EP*.

1.4 Conclusion

In this chapter, I offered a comprehensive discussion of the content and structure of Proclus' little-known treatise *EP*. This provides us an insight into the reception and the place of Aristotelian kinematics in Proclus. In Section 1.2, I situated *EP* in a larger exegetical tradition of Aristotle's *Physics* and *De caelo* which has been little explored so far, although it explains some of the work's peculiarities. In designing *EP*, Proclus is dependent on this tradition. I also emphasised how, due to its argumentative and conceptual similarity to *Physics* 6 and 8, as well as its importance for kinematics, Proclus believes it is necessary to include material from *De caelo* 1. Moreover, I demonstrated how Proclus excludes certain topics from *EP*. This is mainly due to its introductory nature, but it is also in line with the axiomatic structure of the treatise. These more controversial topics are then discussed in advanced works such as his commentary on the *Timaeus* which further develop the issues treated in *EP* by providing a stronger metaphysical fundament. This emphasises the connection of *EP* to other Proclean works.

Section 1.3 focused on the form and method of *EP*. By analysing the principles of *EP* I demonstrated that Proclus also includes hypotheses in *EP* and not just definitions. An analysis of the theorems showed how Proclus took over the Aristotelian text and further axiomatised it. More generally, I argued for attributing a more important role to Aristotle's *Posterior Analytics* – besides Euclid's *Elements* and Aristotle's *Physics* and *De caelo* – in Proclus' development of the axiomatic method in *EP*. This claim was supported by certain features which are absent in Euclid but

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can be explained by referring to the *Posterior Analytics* and also by Proclus' frequent discussions of the *Posterior Analytics* in his commentary on Euclid's *Elements*. Proclus' use of the axiomatic method in *EP* is thus not only based on the Aristotelian original but also on his own theoretical reflections on its features, such as the nature of principles, the derivation of theorems from principles, use of *reductiones* and so on. Most importantly, there is an awareness that the method can be applied to different non-mathematical sciences, which later paved the way for the use of axiomatics not just in natural philosophy but also in theology.

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