

ELEMENTS AND ELEMENTAL PROPERTIES IN TIMAEUS LOCURUS

1. Introduction

The treatise *On the nature of the world and the soul*, attributed to Timaeus of Locri, is mostly neglected in surveys of the ancient reception of Plato's *Timaeus*. It is the product, however, of a close reading of Plato's text and constitutes an early interpretation of it. It contains a version of Plato's geometric atomism that implies certain theoretically interesting features, especially since it tries to combine Plato's doctrine with an Aristotelian-type hylomorphism. Plato's and Aristotle's philosophy of nature are in many respects antithetical, yet the text of Timaeus Locrus shows that Platonists felt that they could complement Plato's philosophy with elements taken from Aristotle. In this article, we examine the theoretical difficulties this implies and how Timaeus Locrus attempts to resolve them. This is also important for the historiography of ancient Platonism, since, as we show, the text constitutes evidence of an early active engagement with Aristotle's criticism of Plato's theory of the elements.

The author of *On the nature of the world and the soul*, written in an archaising Doric, was already in antiquity known as Timaeus of Locri (henceforth TL),¹ held to be the eponymous character of what in Hellenistic and Early Imperial times was perceived to be Plato's most important dialogue. The precious little information we have about this character, probably fictional, stems (almost) completely from Plato's dialogues.² A biographical tradition on which Cicero³ relies claims that Plato studied with Timaeus. To this person our treatise was attributed pseudepigraphically. The text is

1) We cite from the edition by W. Marg, *Timaeus Locrus. De natura mundi et animae. Überlieferung, Testimonia, Text und Übersetzung*, Leiden 1972, who adopts the line numbering of H. Thesleff, *The Pythagorean Texts of the Hellenistic Period*, Åbo 1965. English translations are taken from, or inspired by, T. H. Tobin, *Timaios of Locri. On the Nature of the World and the Soul*, Chico 1985.

2) Cf. D. Nails, *The People of Plato. A Prosopography of Plato and Other Socratics*, Indianapolis / Cambridge 2002, 293.

3) *Fin.* 5.85; *Resp.* 1.16. See also *Tusc.* 1.17.

written in an artificial language which imitates an ancient form of Doric from the region of Locri. Nowadays it is generally agreed that TL's treatise is an apocryphal work most likely composed between the first century B.C. and the first century A.D., but certainly no later than the beginning of the second century. It was presumably the aim of the author to present the text as the ancient Pythagorean source for Plato's dialogue. This plan fitted with a story that circulated at the time: Hellenistic gossip accuses Plato of composing his *Timaeus* on the basis of a Pythagorean book purchased from Philolaus.⁴

M. Baltes has detected several affinities between TL and the Platonism of the first century B.C., especially with Eudorus' views on psychology and ethics.⁵ TL's treatise fits well with the revival of interest in Pythagoreanism within the Platonic tradition, which occurred in the first century B.C. and is connected with the dogmatic reinterpretation of Plato's dialogues. The other Pseudo-Pythagorean texts originated in the same milieu. TL's text, however, differs from the other *pseudepigrapha* in being the only Pseudo-Pythagorean treatise that, while implicitly presenting itself as the 'Urtext' of a Platonic dialogue, is in fact an interpretative summary of that dialogue. In a sense, without being a real commentary, it comes close to being one, and as such it is the first extended and at the same time detailed interpretation of Plato's *Timaeus* that we possess,⁶ while the other apocryphal texts are not a direct interpretation or commentary on some specific work (with the further exception of Ps.-Archytas *Περὶ τῶν καθόλου λόγων*,⁷ a paraphrase of Aristotle's *Categories*).

4) Cf. Iambl. Vit. Pyth. 199. See also Diog. Laert. 3.9; 8.84–85.

5) See M. Baltes, *Timaios Lokros. Über die Natur des Kosmos und der Seele*, Leiden 1972, 20–26. For the affinities between Eudorus and other Pseudo-Pythagorean texts, especially Ps.-Archytas, see M. Bonazzi, *Eudoro di Alessandria alle origini del platonismo imperiale*, in: M. Bonazzi / V. Celluprica (eds), *L'eredità platonica. Studi sul platonismo da Arcesilao a Proclo*, Napoli 2005, 115–160, and R. Chiaradonna, *Autour d'Eudore. Les débuts de l'exégèse des Catégories dans le Moyen Platonisme*, in: M. Bonazzi / J. Opsomer (eds), *The Origins of the Platonic System. Platonisms of the Early Empire and Their Philosophical Contexts*, Leuven 2009, 89–111.

6) According to Proclus (In Tim. 1.75.30–76.2) Crantor was the first interpreter of Plato (ἐξηγητής), but that does not mean that he wrote the first extensive commentary on the *Timaeus*. Cf. M. Hatzimichali, *Potamo of Alexandria and the Emergence of Eclecticism in Late Hellenistic Philosophy*, Cambridge 2011, 57.

7) See T. A. Szlezák, *Pseudo-Archytas über die Kategorien. Texte zur griechischen Aristoteles-Exegese*, Berlin / New York 1972.

The text contains basically the same material as *Timaeus*' account in Plato's eponymous dialogue: the ordering of the body of the world and of the world-soul, the elemental bodies, the human body and the soul. In its careful rephrasing of core ideas from the *Timaeus*, the treatise allows glimpses of early exegetical activity.⁸ The way in which the dialogue is summarised and the presence of elements that are not found in Plato's text offer significant clues as to how Plato's work was read at the beginning of the Imperial Age, assuming that TL can be reliably dated to that period. What is more, the author pursued his own aims and followed a clear strategy, as we hope to show by looking at a specific issue: the theory of the elements. By taking a stance in exegetical debates and at the same time presenting his interpretation as the original version of Plato's text, he could hope to influence the future understanding of Plato's text.

TL presents an account of the generation and composition of the elemental bodies that reflects the so-called geometric atomism of Plato's *Timaeus*. According to this theory, primary bodies derive from basic triangles, which combine into triangular and quadrangular surfaces. Those are in turn combined into stereometric figures that are supposed to constitute the four elements: fire, earth, water and air.⁹ TL relates this theory, and adds the idea that elemental bodies are composed of matter and form. He thus combines a mathematical, i. e. geometric, approach with a physical one. This combination is highly significant, if we consider that a major criticism addressed by Aristotle to the Platonic theory of the elemental bodies is that a mathematical, i. e. geometrical, approach cannot explain the

8) Cf. A. E. Taylor, *A Commentary on Plato's Timaeus*, Oxford 1928, 655; B. Centrone, *La cosmologia di Pseudo Timeo di Locri ed il Timeo di Platone*, *Elenchos* 2 (1982) 293–324, at 295.

9) For more details, see F. M. Cornford, *Plato's Cosmology. The Timaeus of Plato Translated with a Running Commentary*, London 1937, 210–239; I. Bodnár, *Matters of Size, Texture, and Resilience. The Varieties of Elemental Forms in Plato's Timaeus*, *Rhizai* 5 (2008) 9–34; L. Brisson, *How and Why Do the Building Blocks of the Universe Change Constantly in Plato's Timaeus (52a–61c)?*, in: C. Natali / S. Maso (eds), *Plato physicus. Cosmologia e antropologia nel Timeo*, Amsterdam 2003, 189–205; J. Opsomer, *In Defence of Geometric Atomism: Explaining Elemental Properties*, in: C. Horn / J. Wilberding (eds), *Neoplatonism and the Philosophy of Nature*, Oxford 2012, 147–173; I. Mueller, *Aristotelian Objections and Post-Aristotelian Responses to Plato's Elemental Theory in: Horn / Wilberding (above)* 129–146.

essence and qualities of physical bodies, which do not, according to Aristotle, derive from geometric shapes. It is the qualities of hot and cold, dry and wet, rather than shapes and their properties, which are primitive in Aristotle's physics. It would seem that nothing could be more opposed to the model proposed in the *Timaeus*. Should we read TL's strategy as an attempt just to affirm Plato's theory against Aristotle's criticism, while paying lip service to the latter's hylomorphism; as a crude blend of heterogeneous ideas; or maybe as a more relevant attempt to combine the two doctrines? We will argue that TL indeed intends to disarm Aristotle's objections and integrate the two doctrines. Recent scholarship on the early reception of Aristotle suggests that Pseudo-Pythagoreans may have been among the first Posthellenistic philosophers to have developed an exegetical and critical attitude towards Aristotle, thus prefiguring the more systematic approach that can be witnessed in the later Aristotelian and Platonic commentators.¹⁰

By closely looking at TL's theory of the elements, we can show that there are indeed strong indications that this is the case. TL may have been the first to offer a hylomorphic interpretation of geometric atomism, yet other Platonists soon followed suit.¹¹ Proclus and Simplicius, who did not doubt the authorship of TL and were convinced that this was the original text that inspired the

10) The reception of the Aristotelian scholastic Corpus between 100 BC and 250 AD is discussed in R. Chiaradonna, *Interpretazione filosofica e ricezione del corpus. Il caso di Aristotele (100 a. C. – 250 d. C.)*, *Quaestio 11* (2011) 83–114. Chiaradonna convincingly argues that the first Peripatetic and Platonic interpreters of Aristotle knew only a limited set of esoteric Aristotelian treatises (*Cat.*, *Rhet.*, *Top.*, *DC*, and parts of *Met.*). It was only in the 2nd century that philosophers developed a systematic reading of the esoteric works, which culminated in Alexander of Aphrodisias, who laid the ground-work for the systematic integration of Aristotle in Neoplatonic exegesis. See also J. Mansfeld, *Plato, Pythagoras, Aristotle, the Peripatetics, the Stoics, and Thales and his Followers "On Causes"*, in: J. Mansfeld / D. T. Runia (eds), *Aëtiana. The Method and Intellectual Context of a Doxographer*, Volume 3: *Studies in the Doxographical Traditions of Ancient Philosophy*, Leiden / Boston 2010, 375–413, at 393–394, citing evidence for the view that Aristotle, as Plato's pupil, belongs to one and the same Pythagorean-Platonic *διαδοχή*. This facilitated the inclusion of Aristotle's views in the Pythagorean tradition.

11) Atticus, at the end of the second century, gives a hylomorphic interpretation of the Platonic elements, which he connects with the claim that all four elements can transform into one another: fr. 5.39–41 *Des Places*. The latter claim does not agree with Plato's own view. See also Aristotle's criticism at *DC* 3.7, 306a1–5. Alcinoüs, too, assumes a uniform matter shaped by the polyhedra: 13, 169.4–5.

Timaeus and lent it its Pythagorean flavour, emphatically refer to TL's hylomorphism of the elements in order to substantiate their claim that the Platonic theory of elements is to be interpreted in a hylomorphic sense. These Neoplatonists needed this hylomorphic interpretation of geometric atomism¹² in order to defend the *Timaeus* against a series of arguments that Aristotle levelled at the theory.¹³ Aristotle had argued, for instance, that bodies cannot come to be from planes. He also objected that the theory presupposes the existence of free-floating triangles in the course of elemental transformations, held to be impossible because two-dimensional figures cannot exist separately in nature. These objections become void if one claims that the triangles are themselves material, three-dimensional bodies.¹⁴

2. General differences with Plato's *Timaeus*

Before discussing TL's account of the elements, it is important to point out some characteristics of the text and some general differences with the physical account of the *Timaeus*. TL's treatise is not a dialogue, does not have any prologue, does not have the Atlantis story, but merely contains *Timaeus*' physical account. It begins with the clause: 'Timaeus said this' (Τίμαιος ὁ Λοκρὸς τάδε ἔφα) in an archaic formulaic way. The self-presentation of TL is that of a teacher, clad with authority. There are no references to the status of the account being 'resembling' or 'likely' (εἰκόλης).¹⁵ Where Plato

12) In the list of Neoplatonic testimonia quoted by Marg (n.1 above) 83–113, most of TL's passages dealing with elements are found in Proclus and Simplicius. Simplicius cites TL 215.13–15 (T12), where TL states that all things generated – by implication also the elemental bodies – derive from two principles: form and matter. Cf. In DC 564.4–8; 641.9–14.

13) See Opsomer (n.9 above) for Proclus' and Simplicius' defence of geometric atomism.

14) These objections (bodies cannot come to be from planes, DC 3.8, 306a23–6; free-floating triangles, DC 306a20–23) correspond to the fourth and third objection in Simplicius' numbering (cf. In DC 648.11–23 and In DC 647.1–648.10). Simplicius admits that bodies cannot come to be from planes, but for him Plato's planes are three-dimensional physical entities. See Mueller (n.9 above) for the list of objections (fifteen in all) as numbered by Simplicius, esp. 130 for objection IV and 139–140 for objection III.

15) Cf. Centrone (n.8 above) 298–302.

gives explanations and arguments, TL often makes short assertions, which are statements rather than arguments or explanations. TL omits certain sections, adds others and gives more straightforward accounts of complex doctrines, where Plato uses circumlocutions (probably because of the novelty of what he was saying and for lack of a fixed terminology).

The structure of TL's work is much more straightforward. Plato describes the creation of the world several times, each time from a different perspective, to wit from the perspective of mind, necessity and both of them combined. TL goes through the same material in two main sections: the first part is cosmological, the second is anthropological or ethical. Though TL presents his text as the model for Plato's *Timaeus*, it is in fact based on a specific reading of the dialogue, informed by contemporary philosophical developments and probably also by previous interpretations of *Timaeus*. This will become clearer below.

3. *Matter and bodies*

In the following sections we will look more closely at TL's theory of matter, bodies, the elements, and their properties. There is very little scholarship on this issue. From M. Baltes' commentary one gets the impression that TL uses Aristotelian terminology in order to clarify different parts and aspects of the physical account, whereas the theoretical framework remains Platonic. He implies that this is also the case for the theory of the elements, but does not provide a detailed interpretation. B. Centrone argues that for TL the elements are full-blown bodies, suggesting¹⁶ that in TL bodies are to be understood in the light of what he calls the Aristotelian doctrine of substance. In *Met. Z 3*, 1029a2–5, Aristotle indeed considers three candidates for substancehood (substance as subject): matter, form, and compound. TL declares the elemental bodies, being products (*ἀπογεννώματα*) of matter and form, to be true substances, as compounds, that is (cf. T2).

We think TL's doctrine deserves to be examined more closely. We have selected the passages that are relevant to TL's views on the four elements and their properties. For each passage we give a brief

16) Centrone (n. 8 above) 320–321.

paraphrase, leaving out aspects that are not relevant for our purpose, and listing the corresponding passages from Plato's *Timaeus*, TL's principal source.

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| <p>T1 There are two causes (αἰτίαι) for all things together: reason and necessity. Necessity is the cause of what comes into being under constraint in accordance with the powers of the bodies (δυνάμεις τῶν σωμάτων). Secondary and contributory causes fall under necessity (ἐς ἀνάγκαν ἀνάγεσθαι). (205.5–9)</p> | <p>Tim. 47E3–5 (reason & necessity); 32C8, 33A4–5; 49B7–50B5, 52D2–4; 55E7–C7, 60A8 et passim (powers): 42A5, 60E6 et passim (constraint, βία).</p> |
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TL's treatise opens with the claim (T1) that there are two causes of all things, reason or intellect (νόος) and necessity (ἀνάγκη). This causal division derives from the second part of the *Timaeus* where Plato introduces the principle of necessity (from 47E3 onwards). It is a core idea of the *Timaeus* that the world is a mixture of reason and necessity. Plato explains the works of necessity in this second part, and in a third section deals with the combination of both principles. TL summarises Plato's meandering argument by simply positing the opposition reason-necessity at the very beginning of his text. He will proceed in the same manner for his account of the elements.

Already the description of necessity in T1 contains a reference to the powers (δυνάμεις) of bodies, which anticipates the later account of the elements (these 'bodies' are not necessarily restricted to the four elements, but elements are certainly a type of body and the reference to the properties appears to anticipate the later account of elemental properties). It will indeed be the blind interaction of bodily properties that is the manifestation of the principle of necessity.

Next TL identifies reason with god and the 'nature of the good' and says that the other causal factors, being 'secondary and co-causes' (τὰ δ' ἐπόμενά τε καὶ συναίτια ὄντα), are reducible to necessity. Then he introduces, without explicating the relation with the previous inventory,¹⁷ a further classification of three entities that together constitute the totality of things: idea, matter, and their offspring.

17) In fact TL first distinguishes the three items by the way in which they are cognised.

For the sake of clarity, we first group three passages that contain classifications of cosmological principles or entities: T2, T5, and T6. Only afterwards will we discuss two more specific short remarks on matter, T3 and T4, which are part of the larger cosmological passage T1–T6 (our numbering of the passages follows the sequence in TL).

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| T2 | Matter (τὸν ὕλαν) is the recipient, nurse and generative of the third substance (οὐσίᾳς). It receives the likenesses (τὰ ὁμοιώματα) in itself, stamps itself with them and produces those things that are generated. Matter is everlasting, not immovable, in itself patternless and shapeless, but receiving every pattern. (205.13–206.3) | motion: Tim. 53A2–4; ὑποδοχή, τιθήνη: 49A6; χώρα: 52A8. |
| T5 | These are then the two principles (ἀρχαί): form (εἶδος) has the function (λόγον ἔχει) of the male and the father; matter (ὑλα) of the female and the mother. The offspring of both (τὰ ἐκ τούτων ἔγγονα) occupy the third place. (206.5–7) | Tim. 50C7–D2. See also T13. |
| T6 | Logically (λόγῳ) prior ¹⁸ to the generation of the world there were matter, idea, and god (the ‘demiurge of what is better’). God sees that matter receives ideas and is [thereby] transformed in all kinds of ways, but always in a disordered manner. He orders matter and makes it determinate, so that the elemental bodies are differentiated according to set proportions, and their transformations are not random. (206.11–17) | Tim. 52E5–53A7; 69B2–5; 50D4–5 |

Two of the three items introduced in T2, idea and matter, but not the offspring, have the status of a principle (T5). These principles (ἀρχαί), though distinguished from the ‘causes’ (αἰτίαι) reason and necessity (cf. T1), are nonetheless associated with them (the idea is called νοατάν, which picks up¹⁹ νόον from line 1).²⁰ By their posi-

18) TL says, moreover, that what is older and ordered is better than what is younger and disordered. The consequence would be that precosmic matter, qua being ungenerated, is better than the universe, although matter should be less good, qua being disordered. This may just be an unfortunate, non-intended consequence of the compilation of passages.

19) We cannot assume there to be a clear conceptual distinction between intellect and intelligible, as in later Neoplatonism. This is also the case for other pre-Plotinian Platonists, though not for all. For Plutarch, for instance, see H. Cherniss, *Plutarch's Moralia* in *Seventeen Volumes*, 13,1, 999C–1032F, Cambridge, Mass. / London 1976, 43 n. g; 46–47 n. b. For νοητόν as applied to the first principle, cf. Tim. 48E6.

20) This passage is terminologically close to Tim. 46C7–D1.

tion at the beginning of the account they take the place of Plato's initial distinction between 'that which always is and has no generation, and that which is always becoming, but never is' (Tim. 27D7–28A1), which probably means that TL reinterprets those two as 'idea' and 'matter/receptacle'.²¹ The first of these principles (ἰδέα is the word used in T6, which we take to be equivalent to εἶδος in T5), has the function of the male, the second that of the female (T5); the offspring is no longer a principle, as it is indeed derivative. The offspring of both, i. e. that which is constituted out of matter and form, is identified as the sensible (αἰσθητόν), while it is obviously constituted out of the two others. This triad – matter, form, compound – is different from one that is mentioned later (T6) and that lists three entities that existed already prior to the generation of the cosmos: idea, matter, god, who is also called 'the demiurge of the better'; this priority is specified as being that of the account (λόγῳ γενέσθαι), which denotes some form of ontological or definitional or causal, rather than a chronological, priority. It is impossible, given the lack of context, to determine the precise type of priority TL has in mind, but it is clear what he rejects: the literal interpretation of the *Timaeus*. Idea/form and matter are items common to both lists; the first list has the compound of those as its third member, the second list has god, a creative cause, as its third member.²² Since 'idea' in the second list is distinguished from god, who is the cause of the union of idea with matter,²³ 'idea' cannot simply be identified with intellect/god from the first lines of the text.

The three entities of which Plato says that they exist prior to the universe are being, space (our translation for χώρα), and becoming or generation (Tim. 52D2–4). These obviously correspond to TL's form, matter, and offspring (T5).²⁴ TL understands 'gener-

21) S. Broadie, *Nature and Divinity in Plato's Timaeus*, Cambridge / New York 2012, 202 n. 64.

22) Together these lists amount to the list of four from Phil. 23C4–27C1: (1) limit, (2) the unlimited, (3) their mixture, (4) the cause of the mixture. Obviously, limit corresponds to form, the unlimited to matter. The quoted passage from the *Philebus* is of key importance for the theory of principles developed in the Pseudo-Pythagorean texts, even though it is never directly cited. Cf. B. Centrone, *The Theory of Principles in the Pseudopythagorica*, in: K. I. Boudouris (ed.), *Pythagorean Philosophy*, Athens 1992, 90–97.

23) See also Ps.-Archytas, *De princ.* 19.21–24 Th.

24) It is not this list of entities, however, but that of T6, to which TL attaches the label 'prior to the existence of the world'.

ation' as ontological composition, with matter and form as constituents of compounds and the demiurge as the cause of their union. TL has substituted the Aristotelian term 'matter' for Plato's 'space'. There is a well-known historical precedent for this identification: in *Physics* 4.2.209b11–12, Aristotle urges that Plato's infamous third principle, called, apparently interchangeably, space (*χώρα*), wet-nurse, or receptacle, should be understood as matter. Platonists appear to have accepted this identification unanimously, or have at least accepted that in the *Timaeus* 'space' can be a name for matter.²⁵ Still, its direct application to the *Timaeus*, as in TL, implies a radical shift. TL's 'matter' and 'idea/form' are ontological constituents of bodies, that is, of material substances. The same cannot be said about Plato's 'space' (*χώρα*) and 'being' (*τὸ ὄν*). In the *Timaeus*, 'being' is transcendent, the level of the Forms (called εἶδη at 51D5). Their copies (*μιμήματα* or *ἀφομοιώματα*)²⁶ enter the receptacle, as a result of which sense-perceptible bodies come to be. In the first part of the physical account, before he introduced the receptacle, Plato speaks of the world of becoming and the things in it as copies,²⁷ without describing them as compounds. But even after the introduction of the receptacle, Plato does not give a description of bodies as hylomorphic compounds. This becomes evident if we compare Plato's *χώρα* with TL's matter. Plato's *χώρα* is notoriously obscure.²⁸ Several metaphorical descriptions suggest something like a place or space²⁹ into which copies of the Forms enter, thereby imparting shape to it or also producing reflections in it (49E7–50A1), while other metaphors point to the stuff out of

25) Cf. L. Brisson, *Le même et l'autre dans la structure ontologique du Timée de Platon*, Sankt Augustin 1994, 221–222; K. J. Lee, *Platons Raumbegriff. Studien zur Metaphysik und Naturphilosophie im "Timaios"*, Würzburg 2001, 132–136. The only passage in which Plato uses ὄλη in a sense that comes close to Aristotle's matter is *Phil.* 54C1–4.

26) *Tim.* 50C5; D1; 51A2. TL mentions the ὁμοιώματα at 205.14 (T2).

27) Cf. *Tim.* 48E6.

28) Aristotle criticises Plato's lack of clarity, and notices that the receptacle appears to be a substrate for the elements, whereas the 'surfaces' cannot fulfil this role of 'wet-nurse' or 'matter': *GC* 2.1, 329a13–23. Cf. G. Ryle, *The Timaeus Locrus*, *Phronesis* 10 (1965) 174–190, see 180.

29) On Plato's use of 'space' and 'place' indiscriminately to designate different notions of 'space' (a place occupied by something, a proper place, a region), see T. K. Johansen, *Plato's Natural Philosophy. A Study of the Timaeus–Critias*, Cambridge 2004, 127–128.

which things are made (50A4–B5). We do not have to enter into this complex discussion here, as the notion of $\chi\acute{\omega}\rho\alpha$ plays no role of significance in TL.³⁰ The least one can say is that a straightforward identification with matter is far from obvious. And even if the receptacle or $\chi\acute{\omega}\rho\alpha$ could be considered as prime matter, it could hardly be the matter of a specific compound. It is more precise to say that it is a ‘piece of’ the receptacle that could have that function.³¹ Still, it remains strange to speak of ‘the $\chi\acute{\omega}\rho\alpha$ of this or that substance’.³² Even if we accept that $\chi\acute{\omega}\rho\alpha$ in this sense has the function of an ontological constituent of hylomorphic entities and is therefore indissociable from them, it also appears to have different functions, which would seem to be irreconcilable with that of matter as an ontological constituent of things: for in Plato, $\chi\acute{\omega}\rho\alpha$ appears to exist independently from the qualities (or bodies³³) appearing in it,³⁴ and also appears to be that in which bodies move around.³⁵ TL’s account in T6 thus implies a different and new un-

30) According to Harte’s interpretation of the *Timaeus* (V. Harte, *Plato on Parts and Wholes. The Metaphysics of Structure*, Oxford 2002, 247–264), the regular solids are configurations ‘of’ space, not configurations ‘in’ space. Space, which prior to the presence of the geometric space is literally without shape, can be viewed as the material out of which they are made, provided that this ‘material’ is not thought of as stuff.

31) For the idea, in Plato, of ‘parts’ of the receptacle receiving a specific form, see Tim. 51B4–5, a description of the precosmic manifestations of the elements (not yet ‘this-es’, hence not bodies, but ‘such-likes’, 49D4–E4). The main difference with the cosmic elements, as we understand it, is that through the intervention of the demiurge, parts of the receptacle receive regular geometric shapes. The resulting entities are bodies (cf. 53C4–5). Their traditional qualities (hot, cold, etc.) turn out to be derivative. Some scholars have claimed, starting with A. Silverman, *Timaeus Particulars*, CQ 42 (1992) 81–113, 93–94, that it would be impossible to identify regions or parts of the receptacle prior to the introduction of geometric structures; the receptacle is claimed to be homogeneous, without any provision for places. Hence there could not be any local divisions or demarcations. But apparently, as Tim. 51B4–5 shows, Plato has no qualms about accepting distinct regions prior to the geometrisation of the world.

32) As admitted by B. Morison, *On Location. Aristotle’s Concept of Place*, Oxford 2002, 116.

33) On the receptacle as that which receives bodies, see Tim. 50B6, but see also Morison (n. 32 above) 114–115, who wants to reconcile this idea with the interpretation that the receptacle is nothing but the matter of bodies, and does not receive bodies, but qualities.

34) Tim. 49E7–50A2.

35) Tim. 49E5; 52E4–53A7. Cf. K. Algra, *Concepts of Space in Greek Thought*, Leiden / New York / Köln 1994, 97–98.

derstanding of *χώρα*, as meaning that of which bodies are made. Here it is not space or place, though in other contexts the word continues to have those meanings.³⁶

TL's description of matter corresponds closely to Plato's account of *χώρα*. Matter is called a recipient (*ἐκμαγεῖον*), mother and generator of the third substance (*γεννατικὴν τῆς τρίτης οὐσίας*), i. e. of the offspring (*ἔγγονον*), receiving the likenesses in itself and being stamped with them (T2). This matter is claimed to be coeval with the Forms, but, unlike the Forms, subject to motions, shapeless in itself but receptive of all form. Its eternity implies its indestructibility, yet it does not remain free from changes. Copies of the forms enter it and produce shapes in it, but in its own nature matter remains free of shape and form. These descriptions are not those of the matter of some particular thing, but rather of something like universal matter, very much like what Plato says about the receptacle.

T6 is the only passage in which TL makes mention of the precosmic state. Since the priority is not chronological, the function of the mention of a precosmic state is merely to clarify the analysis. This passage sums up the principles whose interaction explains the world and its contents. Of the principles listed, one, namely matter, is a constituent of bodies. The other constituent is the copies of the Forms – not the transcendent Forms (Ideas) themselves mentioned here, as we already know from T2. The fact that matter belongs to the things existing prior to the cosmos presumably implies that in the world matter never exists on its own. The same is true for the copies of the forms: they need the receptacle (matter and space or place) to exist. What is interesting is that matter and immanent forms are already here constitutive of compounds: the demiurge 'sees' that matter receives ideas already prior to his intervention, that is, prior to the introduction of regular shapes. Because of this precosmic reception of the forms, matter is transformed in a disorderly way (*ἀλλοιούμενα*³⁷ παντοίως μὲν, ἀτάκτως δέ). This probably means that there would be interaction between (copies of) forms and matter independently of the demiurge. But thanks to the demiurge the reception of copies of forms is such that the resulting bodies are orderly and beautiful.

36) Cf. n. 44.

37) This verb can stand for any type of motion: see below, T19.

- T3 Matter is also ‘that which is divisible in the realm of bodies’ and is of the nature of the different. Tim. 35A–B. (206.3–4)

The reference (T3) to ‘divisibility in the realm of bodies’, which is said to be ‘of the nature of the different’, has baffled interpreters. W. Marg, following A. E. Taylor, interprets the sentence in question as saying that the kind of matter of, or in, bodies is divisible and of the nature of the different, suggesting that TL here means ‘secondary matter’, i. e. proximate matter. M. Baltes makes this idea explicit in his commentary.³⁸ The divisibility of secondary matter would make a neat contrast with the eternity of prime matter. However, we do not see a reason to make a distinction here between prime and secondary matter, and think the sentence can be understood in a different way. TL calls matter ‘divisible in the realm of bodies’ and says ‘that it belongs to the nature of the different’. ‘That which is (or becomes³⁹) divisible about bodies’ is an expression taken from the description of the composition of the soul (TL 208.13–15) and could therefore also refer to a constituent of the soul that is (functionally) like the matter of bodies, yet not identical with it, but also to matter in general. TL presumably means that matter in general can be said to be divisible, for instance by the fact that bodies appear in different parts of the receptacle. Divisibility is a property of all matter, even of the constituent of the soul that is designated by the fixed expression ‘divisible in the realm of bodies’ and is functionally like matter (i. e. it receives limit from a limiting principle). The ‘nature of the other’ can then be taken as an idiomatic expression for the second principle in a dualistic system.⁴⁰ These characteristics are the exact opposites of those

38) The passage is 206.1–4 (see T2 and T3): ταύταν δὲ τὴν ὕλαν αἰδιον μὲν ἔφα. οὐ μὴν ἀκίνατον, ἄμορφον δὲ κατ’ αὐταύταν καὶ ἀσχημάτιστον, δεχομένην δὲ πᾶσαν μορφάν· τὴν δὲ περὶ τὰ σώματα μεριστᾶν εἶμεν καὶ τὰς θατέρω φύσιος. Marg (n. 1 above) 119 contrasts the matter κατ’ αὐταύταν to the matter τὴν δὲ περὶ τὰ σώματα μεριστᾶν and translates: “Diese Art des Stoffs nannte er ewig, freilich nicht unbewegt, aber an sich ungestaltet, doch jede Gestalt aufnehmend. Hinsichtlich seines Auftretens bei den Elementen aber sei er teilbar und von der Art der Andersheit.” Cf. Taylor (n. 8 above) 657–658; Baltes (n. 5 above) 41–42.

39) There is ellipsis of the verb. The parallel with Timaeus 35A3 (cf. TL 208.15) suggests that γιγνομένην is to be supplied.

40) In TL’s account of the composition of the world soul the divisible nature is clearly different from what is there called the power of difference, a motive power. A. Ulacco, Die kosmische Seele bei Ps.-Timaios Lokros und den anderen Pseudo-

of the ‘idea’, which is said to be indivisible and ‘of the nature of the same’ (205,11). This means that the ‘idea’ can be understood as ‘belonging to’ the nature of the same, i. e. as being derived from it, whereas matter belongs on the other side of the twofold series (συστοιχία) of principles.⁴¹ TL’s passing remark in T3 shows him to be influenced by the intellectual environment to which he apparently belongs. His introduction of hylomorphism fits very well the general accounts of the principles that we find elsewhere in the Pseudo-Pythagorean corpus. According to these, matter and form belong to the twofold series of principles; they are the physical manifestations of the principles.⁴²

T4 They call matter place and space. χώρα: 52A8, B4, D3; τόπος: 52B4 (206.4–5)

After the remark about divisible substance, TL returns to ‘space’ (T4): ‘They call matter place and space’ (ποταγορεύοντι δὲ τὴν ὕλην τόπον καὶ χώραν). This is a curious remark, yet perfectly understandable if we assume that TL is aware of the fact that ‘matter’ was not the term used by Plato. If ‘other’ people call matter place or space, it should be no surprise that his supposed successor, Plato, would do the same, i. e. deviate from the more common, i. e. Aristotelian, philosophical terminology.⁴³ It should be noted that TL does not equate the three terms. He merely says that matter can also be designated by the two other names. He does not claim that these two can only stand for matter. Implicitly he thus admits that χώρα is equivocal. Further down TL indeed uses the term ‘space’ in such a way that it cannot stand for the matter of bodies, namely

pythagorica: kosmologische und erkenntnistheoretische Aspekte, in: C. Helmig / C. Marksches (eds), *The World Soul and Cosmic Space. New Readings on the Relation of Ancient Cosmology and Psychology*, Berlin (forthcoming), argues that the ‘power of difference’ derives from the ‘nature of the different’, which is an ontological principle.

41) In a similar vein, Plutarch states that difference derives from the dyad (De an. procr. 1024D), just like the irrational (part of the) soul (1026D–E), which on his reading is identical with ‘that which becomes divisible in bodies’. The other συστοιχία is headed by the One. Cf. J. Opsomer, *Plutarch on the One and the Dyad*, in: R. Sorabji / R. W. Sharples (eds), *Greek and Roman Philosophy 100 BC to 200 AD 2*, London 2007, 379–395, see 381–382.

42) Cf. Ps.-Arch. De princ. 19.19–20.

43) Calcidius’ remark at In Tim. 308, p. 309.3–13, sometimes cited as a parallel, actually makes the opposite point.

when he describes bodies as moving, with their matter, towards or into a certain space (χώρα). In these cases the term is equivalent with place, and on two occasions TL associates the two words.⁴⁴

4. *Elemental bodies*

- T7 Since the world is solid as well as tangible and visible, it is composed of earth, fire, and the two intermediate [elemental bodies], air and water. (207.15–16) Tim. 31B4–32C; 53E3–4

TL summarizes Plato's first account of the elements, according to which earth is needed for tangibility, fire for visibility, and the two intermediate elements in order to bind these extremes together.

- T8 The world is put together out of the complete bodies, which exist as wholes in it. No part of matter is left outside. (see also 206.18: ἐξ ἀπάσας τῶς ὕλας) (207.16–17) Tim. 32C5–33B1

The totality of each element is called a 'whole'. The world, itself a whole, is constituted of the four elemental wholes. While Plato says that no 'part' is left outside, TL again uses the word 'matter'.

- T9 On a cosmic scale the elements as wholes have equal strength (ἐν ἰσοδυναμίᾳ), so that none dominates, and no single element either increases or dwindles. Together they form a harmonic combination in accordance with the best proportion. (207.20–22) Tim. 33A2–6; also 31B8–C4; 32B4–8

Explaining why the world does not degenerate, Plato states that there are no 'strong forces' from outside threatening it, but does not mention the equal strength of the elements relative to one another.⁴⁵ Equal strength will turn out to be a key concept for TL.

- T10 Description of geometric proportionality. Only if there is equality of force (ἰσοκρατία), is it possible to compute these proportions.⁴⁶ (207.23–208.4) Tim. 31B8–32C4

44) TL 208.9–10; 222.1–2. See also 219.10 (T24).

45) Ex negativo, the idea can be derived from Tim. 52E2–4, where equality of force is denied of the precosmic state of the world.

46) TL mentions 'adjustments of places and position', obviously a reference to operations performed on the proportions (see below, T21). Hence it is very unlikely that the adjustments are those of cosmic places and positions, for instance of the elements, pace Baltes (n. 5 above) 65.

The remark about the equality of force enabling computability is not clear. M. Baltes suggests that it refers to the problem of establishing how many terms are needed for particular proportionalities.⁴⁷ In the case of the elements this would mean that we need four to fill the slots of the proportion, given the three-dimensionality of the world. Baltes adds the observation that the expression ‘equality of force’ (ἰσοκρατία) – absent from the corresponding passage in the *Timaeus* – has a political origin (just like ἰσονομία, 217.13, T22), adding that the later Platonists use this term precisely in the context of the elements, their transformations and properties.⁴⁸ Yet, unlike TL, they do not make balance of force into the principle of proportionality. We understand T10 as a remark concerning proportions in general, and take TL to mean that the equality of power (ἰσοδυναμία, T9), which can be subsumed under the equality of force (ἰσοκρατία), grounds the equal rights (ἰσονομία) of the proportions (λόγοι), as is explained in T22. Hence the equality or equal force of the terms makes it possible to assess the relation between the proportions (λόγοι), i. e. to compute the analogy (ἀναλογία).

- T11 The Earth is the oldest body under the heavens. Tim. 40B8–C3
 [Implicit premise: while earth is the oldest element.] For: water is never generated without earth (i. e. it needs earth); air is never generated without moisture (i. e. water): and fire cannot sustain itself without matter (i. e. fuel) and moisture. Earth is therefore the root of everything. It is also the basis for everything else, because it holds firm in virtue of its own (centripetal) inclinations. (215.9–13)

In this argument TL plays on the equivocation between the heavenly body Earth and the element earth, thus also making a transition from the astronomical section to an account of the elements.⁴⁹ TL here assumes an order between the elements from older to younger, whereby the priority is not to be understood as chronological (notwithstanding the vocabulary), but as ontological. The order of priority corresponds to the order of the elements from centre to periphery. TL states the priority, but fails to explain why

47) Ibid., 65–66.

48) Cf. Philo, Aet. 116; Alex. Aphr. Mixt. 231.1–4; Procl. In Tim. 3, 2.43.14–18.

49) Cf. Centrone (n. 8 above) 320.

for instance water needs earth. The case of fire is special: TL does not say that fire needs the preceding elements in order to come about, but rather in order to sustain itself. To that aim it needs fuel (ῥύλα) and moisture.⁵⁰ The element earth is the root (ρίζα)⁵¹ of the others as being the oldest element. The Earth is the basis or fundament of the cosmos because of its firm position in the centre, which is assured by the centripetal tendency of earth, the heaviest of the elements.⁵² Thus TL nicely rounds off the argument of this section, returning to Earth whose stable position is explained by the nature of earth.

TL's reason for declaring earth to be the oldest may have been the fact that earth provides tangibility to the world, which can be considered to constitute the primary property of material bodies (T20).⁵³ This would agree with the idea that earth or its tangibility is somehow also a constitutive element or aspect of the other elements, i. e. the root and basis of the others. To say that earth is the root of the other elements can therefore be taken to amount to the claim that it is the element of the elements, or the primary element. Plato uses the phrase 'the root of the triangles' (81C6), probably in the sense of the primitive element out of which the triangles are composed, namely the sides.⁵⁴

T12 The principles (ἀρχαί) of generated things (τῶν γεννωμένων) are: matter as the substratum (ὑποκείμενον) and form as the formula of shape (λόγος μορφῆς). The progeny of these are the bodies: earth, water, air, fire. (215.13–15)

Having announced hylomorphism at the beginning of his text (T2), TL now applies it to the elements, after having described the ordering of the world's body and soul. T12 is the clearest statement

50) The idea that moisture is nourishment for the vital warmth goes back to Ar. De som. et vig. 475b1–2. For the idea that moisture is matter for fire, see Ps.-Ar. Probl. 860a8–11; 861b38–862a1; 875a14.

51) The term root is used by Empedocles, cf. e. g. DK 31 A 70; B 53.

52) We argue below that, just like Plato but unlike Aristotle, TL probably considered all elements to be more or less heavy. See our comments on T26.

53) It may also have been inspired by Aristotle's remark in Met. 1.8, 989a9–12.

54) According to Taylor (n. 8 above) 586.

55) Simplicius (In DC 638.20–25; 564.14–16) suspects that Plato means matter and form when he hints at the principles that are even higher than the triangles out of which the elements are composed, Tim. 53D6–7.

of TL's hylomorphic account of the elements, for which there is no parallel in Plato.⁵⁵ It allows us to interpret the elemental bodies as compounds, deriving basically from form and matter. The reader may wish to get some more details about how hylomorphism plays into the generation of the elements. Yet although TL will go on to offer a more detailed account of the geometrical composition of the elemental bodies, much remains unclear. He will explain that two basic triangles, the isosceles and the scalene, produce the cube, the pyramid, the octahedron and the icosahedron. These polyhedra are simply equated with the four elements. The basic triangles are called their 'elements' or their 'principle of composition' (T14–15). TL may want us to conceive of each primary triangle as itself already a body, the progeny of matter and form; in other words, a combination of a bit of prime matter with a shape. Everything composed of the triangles would then likewise be body. Alternatively, he may think that the first entities to count as bodies and to be hylomorphic are the polyhedral corpuscles equated with the traditional elements. This is at least suggested by T12, by the remark in T13 that all bodies consist of surfaces and the latter of triangles (215.16), and by Plato, *Tim.* 55A2–4. Yet since TL considers the construction of the polyhedra as itself being the physical construction of elemental corpuscles – he does not distinguish between a phase in which mathematical three-dimensional bodies are constructed and one in which these are inserted into the receptacle so as to produce the elements (cf. T14) – he should perhaps be committed to regarding the triangles themselves as hylomorphic compounds. He may not say much about it, but he admits mutual transformations of the elements. In that process, the stereometric bodies come apart, dissolving at least down to the level of the surfaces out of which they are built, possibly however down to the level of the primary triangles out of which these surfaces themselves are constructed. In the course of the transformation processes, triangles or surfaces should be able to exist on their own, something which is easily conceivable in case they are themselves already corporeal. TL remains silent about these famous free-floating triangles. Now, if these are themselves physical bodies, i. e. not strictly triangles but three-dimensional material bodies, the composition of the elements would be straightforward and the independent existence of the triangles would be unobjectionable. This solution will indeed be that of the later Platonists, Iamblichus, Pro-

clus and Simplicius.⁵⁶ In this respect, however, the text of TL remains underdetermined: one could very well read the idea of hylomorphically constituted triangles into it, yet it is equally possible that TL considers the triangles as pure forms, which are then imposed on matter. Or he could even mean that the matter on which they are imposed is itself a hylomorphic composition of an even more primordial matter with a first formal shaping. For lack of evidence it is impossible to decide with certainty which of these possibilities obtains. Using the evidence of T6, however, we vote for the latter possibility. In T6 TL explains that the demiurge takes over a pre-existing matter in order to impose order on it. This pre-existing matter, however, is described as receiving form (*ιδέα*) already prior to this operation, and to be changed (*ἀλλοιουμένων*) in all kinds of ways, in a disordered manner. If the matter that is logically prior to demiurgic intervention, and therefore to the imposition of triangular forms, already participates in form, there would seem to be hylomorphic composition at a level even more fundamental than the primary triangles, so that the triangles too are to be thought of as enmattered prior to their incorporation in polyhedra.

T13 Generation of the bodies from elemental triangles. Description of the triangles. Every body consists of plane surfaces (*ἐπίπεδα*). Every surface consists of triangles. Two types of triangles: the half-square (*ἡ-/ἀμιτετράγωνος*), with isosceles, and the half-equilateral (*ἀμιτρίγωνον*), i. e. a particular type of scalene with a longer side whose square is three times the square of the shorter side. The smallest angle of this triangle is one-third of a right angle. The middle angle is twice that size, that is, two-thirds of a right angle. The largest angle is a right angle. This triangle is a half of an equilateral triangle which has been bisected perpendicularly from its vertex to its base into two equal parts. Each of these types of triangles (isosceles and scalene) is a right-angled triangle, but the isosceles has the two sides adjacent to the right angle equal, while the scalene has the three sides unequal. (215.16–216.7)

Tim. 53C4–8: fire, earth, water and air are bodies. Every body has depth, everything having depth is composed of surfaces, all surfaces bounded by straight lines are reducible to the triangles.

Tim. 54B2–5: two basic triangles: the isosceles and the other, with a longer side whose square is three times the square of the shorter side.

Tim. 53C8–D4; Tim. 54D5–7

56) Cf. Simplicius. In DC 563.30–564.3; In Cat. 271.14–16; Procl. In Eucl. 12.6–13.3.

The claim that every body consists of surfaces which again consist of triangles is here restricted to the four elements, whose generation TL has announced to describe in the preceding sentence. When TL says that all bodies consist of plane surfaces, one should therefore not think that this is a general claim about bodies, including macroscopic bodies, and their constituents. Unlike Plato, who first gives a more general mathematical discussion of stereometric bodies and connects them with the elements afterwards, TL straightaway gives an account of the construction of the elements in mathematical terms.

TL does not follow word for word Plato's description of the reduction from bodies to triangles, but makes the description much simpler by introducing a technical vocabulary, especially when describing the primary triangles.⁵⁷ Yet he also expands the description by specifying the angles of the scalene. He designates the isosceles and the scalene with the terms ἀμπετρίγωνος and ἀμπετρίγωνον (also ἡμι-), that probably derive from Speusippus.⁵⁸ What is completely missing in TL's account is the methodological caution expressed in Plato's *Timaeus*. In 53E4–54B2 Plato argues that the elemental bodies are the most beautiful among the visible bodies. Because of this, we must choose the most beautiful triangles to explain the

57) The tradition contains several examples of similar 'reductions', attributed to Plato or to the Pythagoreans. E. g. Ar. De bono, fr. 2 Ross and Sext. Emp. Adv. Math. 10.259–261. The Tübingen school exploits these texts in order to reconstruct Plato's oral teaching. See, e. g., H. J. Krämer, *Der Ursprung der Geistmetaphysik. Untersuchungen zur Geschichte des Platonismus zwischen Platon und Plotin*, Amsterdam 1964, 45–48, and K. Gaiser, *Platons ungeschriebene Lehre. Studien zur systematischen und geschichtlichen Begründung der Wissenschaften in der Platonischen Schule*, Stuttgart 1963, 107–172.

58) Speus. fr. 28.46–48 Tarán. This fragment stems from Ps.-Iamblichus, *Theol. Arith.* 82.10–85.23, who also refers to Philolaus for the origins of the mathematical doctrines here described (Πυθαγορικών ἀκροάσεων, μάλιστα δὲ τῶν Φιλολάου συγγραμμάτων, 28.3,4). L. Tarán, *Speusippus of Athens. A Critical Study with a Collection of the Related Texts and Commentary*, Leiden 1981, 257–298, argues that these doctrines have nothing to do with Philolaus and, p. 296, that "it is highly improbable that Speusippus' book [sc. *Περὶ Πυθαγορικών ἀριθμῶν*] was still available to him [sc. Iamblichus]". Tarán therefore supposes the whole text quoted by Ps.-Iamblichus as written by an author unknown to us, who was in sympathy with Pythagoreanism. The terms ἡμπετρίγωνος and ἡμπετρίγωνον are also used, in the same context, by: Plutarch, *De def.* 428A3; Procl. In *Eucl.* 383.17–384.4; In *Remp.* 2.43.7; Simplicius, In *DC* 638.30–639.12 uses the same terminology and connects it explicitly with TL. See also TL, T13.

composition of the elemental bodies. The isosceles has only one nature (there is only one type), whereas the scalene has several natures. According to Plato's *Timaeus* we must also choose the most beautiful of these natures, which is the triangle that, if taken twice, forms a third type of triangle, the equilateral triangle (54A6–7). In TL there is no reflection on the lack of certainty of the account, and accordingly beauty is not used as a criterion in the choice of the specific geometric structures that constitute the elements.

T14 The isosceles is the principle of composition (ἀρχὴ σῶστατος) of earth. Indeed four half-squares can be combined into one square, from the square comes the cube, which is the most firm, i. e. stabile (ἔδραιότατον)⁵⁹ and steady (σταδαίον) type of body. The cube has six sides and eight corners. Because of this, earth is the heaviest (βαρύτεατον) and most difficult to move (δυσκίνατον); it is a body that is not transformable into any of the other, because it has nothing in common with the other types of triangle.⁶⁰ Only earth has as its own basic element (ἴδιον στοιχεῖον), the isosceles triangle. (216.6–12)

Tim. 54B8–C3: the fourth element alone comes from the isosceles triangle.

Tim. 55B3–C4: from the isosceles triangle come to be the fourth nature, or kind, of polyhedron, which is composed of four isosceles triangles. These are combined into the square. Six squares form the cube, which has eight corners and six sides.

Tim. 55D6–8: the four polyhedra correspond to the four elemental bodies.

Tim. 55D8–E3: the earth is the least movable (ἀκίνητοτάτη) and the most plastic (πλαστικωτάτη) body and has the most stable bases (ἀσφαλεστάτας).

Tim. 55E3–7: the isosceles triangle, from which earth derives, has the most stable base, because it has equal sides. The square, which derives from the isosceles triangle, is the most stable plain surface.

TL now describes the composition of four (regular) polyhedra from the basic triangles specified in T14 and at the same time connects each of the polyhedra with one of the four elements. The connection of the polyhedra with the elements is not really explained. He merely states here that the first basic triangle is the principle of the composition (σύστασις) of earth. The ensuing explanation shows that triangles of a certain type, here the half-square, are com-

59) See Baltes (n.5 above) 118 for Middle Platonic parallels.

60) This is the only statement in this passage about the mutual generation of the bodies. In Plato's *Timaeus* 54B6–D2, there follows a short description of mutual generation as the result of dissolution of bodies into their constituents and recombinations of the latter.

bined into polyhedra (four isosceles form a square, and six squares form a cube). These are simply identified with the element, in this case earth, which is why TL can say that the isosceles is the principle or first element out of which earth is composed, and not just the principle out of which the hexahedron is composed. TL describes the creation of elements from triangles as a single operation,⁶¹ whereas Plato gives a separate treatment for the composition of the polyhedra, and only after this long section explains the link between each polyhedron and its element. This, as we have argued above (T12), probably has to do with the fact that TL considers the triangles as physical from the outset, as well as everything composed out of them, and has no need for a separate account of ‘ideal’ mathematical entities. Whereas Plato describes the polyhedra, of which he has given a purely mathematical account, as entering and shaping the receptacle in a somewhat mysterious way – which has given rise to diverging interpretations –, TL regards them as separate physical substances in their own right, the ‘offspring’ of the principles matter and form.

TL’s account of the composition of the hexahedron, the shape constituting earth, agrees with Plato’s. According to Plato, the cube is the fourth kind of polyhedron, the first being the tetrahedron, which will be the polyhedron of fire. TL follows a different order: earth, fire, air, and water instead of fire, air, water, and earth. Like Plato TL emphasises the stability and steadiness (we take ἑδραιότατον and σταδαίον to be synonyms), and also the resistance to motion and the heaviness of earth, as well as the impossibility for earth to transform into one of the other elements. The property of stability or steadiness is a property of the polyhedron itself, whereas the heaviness and lack of mobility are presented as ‘deriving’ from the geometric constitution. As M. Baltes points out, the association between stability and heaviness was a common idea in the (Platonic) school.⁶² It is indeed not clear how heaviness is supposed to follow (κατὰ τοῦτο, 216.10) from either the property of steadiness or from the geometric properties of having six sides and eight corners.

61) Centrone (n. 8 above) 322–323. Also Baltes (n. 5 above) 119.

62) Baltes (n. 5 above) 119; see Galen, *Plac. Hipp. et Plat.* 8.3.3.3.

- T15 The other primary triangle, the half-equilateral, is the principle (στοιχείον) of the remaining bodies: fire, air, water. A combination of six half-equilateral triangles produces an equilateral triangle. Four of those combine into a regular pyramid, consisting of four faces and four corners, which is the form (εἶδος) of fire, as being the most mobile (εὐκιναιτότατον) of the shapes and the shape that consists of the smallest number of parts (λεπτομερέστατον). This is followed by the octahedron, consisting of eight faces and six corners, the element (στοιχείον) of air. Third comes the icosahedron, consisting of twenty faces and twelve corners, the element (στοιχείον) of water. This polyhedron is the heavier (βαρύτερον) of the three polyhedra based on the scalene and the one that consists of the larger number of parts (πολυμερέστερον).⁶³ The bodies composed of the same element, i. e. the scalene, are transformable into one another. (216.13–20) Tim. 55E7–56B6;
56D1–57C7

TL now describes the composition of the three remaining elements, analogously to the description of earth, yet starting from a different type of triangle. It is remarkable that TL calls the EWAFs (i. e. the traditional four elements)⁶⁴ ‘bodies’, not ‘elements’ (στοιχεῖα), a term he reserves for the more primitive components of them.⁶⁵ Probably he wants to anticipate Plato’s remark (Tim. 48B6–C1) that ‘the so-called elements are not even syllables’.⁶⁶ The triangles and also the polyhedra are here described as the elements (στοιχεῖα) of the EWAFs. Alternatively he calls a polyhedron the

63) The manuscript tradition is divided between *πολυμερέστερον* and *πολυμερέστατον*, combined with *καὶ βαρύτερον*. The superlative is appropriate in the case of the icosahedron, as it indeed consists of the largest number of components (20 composite triangles, which equals 120 primary triangles), whereas the comparative *βαρύτερον* is explicable by the fact that the icosahedron/water is not the heaviest of all the elements, but only of those that are composed out of the scalene. Baltes (n. 5 above) 121–122 supposes that also in the case of *πολυμερέστατον/πολυμερέστερον* the original form, which is also that of the best manuscripts, was the comparative.

64) We borrow this acronym ‘EWAF’ from I. Mueller, What’s the matter? Some Neo-Platonist answers, in: R. D. Mohr / B. M. Sattler (eds), *One Book, the Whole Universe. Plato’s Timaeus Today*, Las Vegas / Zurich / Athens 2010, 151–163, who in his turn took it from M. Furth, *Substance, Form and Psyche: an Aristotelean Metaphysics*, Cambridge 1988.

65) For this usage, see also Plato, Tim. 54D6–7; 55A8; 55B3–4; 57C9.

66) A possible exception is 223.5.

‘form’ (εἶδος – one could also translate ‘shape’) of an element. In the case of the tetrahedron or pyramid and the icosahedron he connects the shape with the properties mobility and fewness of parts (tetrahedron) and with the large number of parts and heaviness (icosahedron). These properties are not directly attached to the EWAF, but to the constituting polyhedron. No properties of the intermediate polyhedron and element (octahedron/air) are mentioned. It is remarkable that only in the case of earth does TL distinguish between properties of the polyhedron and properties of the EWAF. Its EWAF-properties are heaviness and difficulty of movement, which are contrasted with polyhedra-properties of the remaining elements. This suggests that TL is not very systematic in this respect: we should not attach too much weight to the distinction between levels of properties, all the more so since TL has conflated the two accounts that Plato kept separate, as we have pointed out above. The meaning of the terms λεπτομερέστατον and πολυμερέστερον is not clear. Marg translates the first as ‘[die] feinsten (mit den wenigsten Teilen?)’. We understand it as referring to the number of component particles in composites.

The properties of the polyhedra and the corresponding EWAFs, as given in T15, are then the following:

1. Cube: the most stable and steady (ἐδραιότατον καὶ σταδαῖον)
Earth: the heaviest and the most difficult to move (βαρύτατον καὶ δυσκίνατον)
 2. Pyramid/Fire: the most mobile; consisting of the smallest number of parts (εὐκινιάτοτατον καὶ λεπτομερέστατον)
 3. Octahedron/Air
 4. Icosahedron/Water: consisting of the larger number of parts (πολυμερέστερον καὶ βαρύτερον) and heavier
- T16 The dodecahedron is used as the model (εἰκόν) of the universe, being most like the sphere. (216.20–21) Tim. 55C4–6: god uses the fifth construction for the whole.

Unlike some later authors, TL does not connect the fifth polyhedron with the Aristotelian fifth element, but follows the *Timaeus* in this respect.⁶⁷

67) For the idea that the dodecahedron is close to the sphere, compare Plut. Quaest. Plat. 5, 1003C–D, inspired by Plato, Phaed. 110B5–7.

T17 Elemental bodies are ranked according to smallness of particles (λεπτομέρεια). Fire has penetrated all others, air penetrates all but fire, water penetrates only earth. (216.21–23)

Tim. 58A7–B4: since all things in the universe are compressed and there is no empty space (58A4–7), fire has penetrated in among all things. Air is second in fineness (λεπτότης), and then follow the remaining bodies. Bodies, when joined, let big gaps if they consist of big parts. If generated from small parts, they let minimal gaps.

The classification of the bodies depending on the smallness of particles follows, with some alterations, the Platonic account. As in Plato's *Timaeus*, fire is the most penetrating element and it is followed by air, water and finally earth,⁶⁸ which does not penetrate into any body.⁶⁹ Plato does not mention the idea that water penetrates earth.

Plato uses the avoidance of empty space in order to explain the unceasing motions in the universe: because of the inward pressure (58A7) empty pockets that would be left in the interstices between the elements are immediately filled by smaller elements rushing into the gaps. As O'Brien explains,⁷⁰ Plato is not committed to the absolute absence of void in the cosmos (the impossibility of space being filled up completely by the four types of polyhedral bodies can be demonstrated mathematically), but implicitly admits the existence of transient small pockets of void. In the perpetual movement of elemental bodies, the smallest bodies come to fill the small gaps left by the bigger bodies. The pressure exerted on the whole (its cause is not quite clear, but has to do with the circular revolution of the universe: 58A4–7) combined with the different shapes of the elements (i. e. the presence of inequality: 58A1) thus guarantees the perpetual motion within the universe. Tim. 58A7–B4 ac-

68) See also Ar. Met. 1.8, 989a1–6.

69) TL uses the term 'smallness with respect to parts' (i. e. smallness of number of parts), λεπτομέρεια, where Plato writes 'fineness', λεπτότης. TL may have felt that the term λεπτομέρεια makes the account more precise. Aristotle uses the term in his discussion of Plato's theory of the elements: DC 3.5, 304a14 and 16–17 (*varia lectio*); Top. 5.4, 132b21. See also Ryle (n. 28 above) 180–181.

70) D. O'Brien, *Theories of Weight in the Ancient World. Four Essays on Democritus, Plato and Aristotle. A Study in the Development of Ideas*, Vol. 2, Plato, Weight and Sensation. The Two Theories of the *Timaeus*, Paris / Leiden 1984, 359–365.

cordingly compares the different penetrating force of the four types of elements and connects it with the number of constituent particles for each of them. The meaning of the passage is probably just that fire penetrates more easily, i. e. can slip in between the larger particles, whereas earth, because of its size, cannot do the same with fire. There is no mention here of particles breaking up and transforming into other elements. The same idea is expressed in Tim. 78A2–6.

TL's account is much simpler. In the following paragraph he states that all is filled and there is no empty space (cf. T18). We could of course read Plato's theory into TL, but it is not so clear whether we should. TL does not mention the principle of inequality or instability as an explanation for the perpetuity of elemental motion. His account is moreover much less dynamic. When he says that fire 'has pervaded' all other elements (ἦκεν, imperfect tense, but lexically connoted as perfective), he echoes Plato's διελήλυθε, yet the overall meaning could be different. Reading TL naively, one could very well think he is describing a stable condition of the universe: in this condition fire has penetrated everywhere, air has penetrated all elements, except (the region of) fire, water has penetrated all earth, whereas earth is penetrated by all the others but is not present in any of the regions occupied by the other elements. This could be read as a statement about the cosmological distribution of the elements, with simultaneous presence of different elements in certain regions: a region containing only fire; a region containing fire and air; a region containing fire, air, and water; finally a region containing all four elements. Given the corpuscular structure of the elements, the penetration of one element into a mass of another, amounts, not to a true blend, but to a mere juxtaposition of corpuscles. The immediate context of the passage moreover suggests this cosmological reading: first the form of the world as a whole is mentioned (T17), being dodecahedral or spherical. Then follows this sentence about the manner in which the elements are ordered, and this is followed by the conclusion (T18), which resumes and leads back (δ' ὅν) to the fact that the world is completely filled. This could be understood as a reference to four concentric spheres, three of which hollow, fitted together in such a way that the whole is completely filled. This interpretation also fits in with the fact that his description of earth does not discriminate between the element and the heavenly body (cf. T12). TL could moreover have found

confirmation in the immediate context of the present passage, where Plato mentions the ‘natural places’ to which the elements move as a result of the complex process described here (Tim. 58B8). This interpretation is, however, not the only one possible. One may also understand the passage in the way in which the corresponding passage in Plato is meant, namely as referring to the interaction of elements when masses of elements collide.

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| T18 | All things are full, leaving nothing empty. (216.23) | Tim. 58A4–7: The circuit of the whole (...) when once it has comprehended the kinds (...) allows no room to be left empty. |
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This statement can be understood in accordance with the ‘cosmological’ interpretation outlined above, as referring to the distribution of the elements, without gaps between their cosmic masses, or also as a statement more in line with Plato’s *Timaeus*, as referring to the fact that no lasting empty pockets exist between corpuscles moving between one another. It is not quite clear whether TL is committed to an absolute absence of void or merely to the absence of larger and lasting pockets of empty space. It should be noted that Aristotle criticises⁷¹ Plato for the presence of void as an unavoidable (even if possibly non-intended) consequence of his theory, and that later Platonists assume that Plato rejected cosmic void completely. Also the Stoics, whose cosmology is strongly influenced by the *Timaeus*,⁷² reject inner-cosmic void.⁷³

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| T19 | All things are pushed together by the circular motion of the universe and being pressed closely together; part rubs against part, which produces an incessant alteration towards generation and corruption (ἀλλοίωσιν ποτὶ γενέσιαις καὶ φθοράς). (216.24–217.2) | Tim. 58A2–7; 58B4–C4 |
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The larger section T17–19 summarises the long passage Tim. 57D7–58C4, where Plato points out the necessity to have unequal-

71) Aristotle, DC 3.8, 306b3–9. This is the sixth criticism according to Simplicius’ numbering. For a Neoplatonic reply, see Simplicius, In DC 650.16–657.9. Cf. Mueller (n. 9 above) 141–142; Opsomer (n. 9 above) 151, 155, 161–162.

72) See G. Reydams-Schils, *Demiurge and Providence. Stoic and Platonist Readings of Plato’s Timaeus*, Turnhout 1999.

73) See, for instance, A. A. Long / D. N. Sedley, *The Hellenistic Philosophers*, Cambridge 1987, sections 44A and 44D.

ity in the world, because without inequality there will be no movement. His account shows how things, divided into four kinds of elemental bodies, are engaged in unceasing translational movements and mutual transformations. This idea is the central point of this section of the *Timaeus* passage, but in TL it is merely a passing remark (T19). TL first describes the abilities of elemental bodies to penetrate other elements, according to the degree of ‘smallness of particles’; then he states that there is no empty space in the world; and finally he adds that in the circular motion of the universe all things are pressed closely together, part rubbing against part. The circular motion and the compression produce an incessant ‘alteration towards generation and corruption’. The dynamic account of Plato’s *Timaeus* is here replaced by a more static division into regions, which emphasizes the absence of void and the compression of the corpuscles. Only at the end of the description of the ‘cosmological’ disposition of the elements, if the interpretation outlined above is correct, is the movement of the elemental bodies described.

The incessant movement, which in Plato is named κίνησις, TL calls ‘alteration according to generation and corruption’ (ἀλλοίωσιν ποτὶ γενέσεως καὶ φθοράς), thus combining terms that are familiar from Aristotle.⁷⁴ In *Tim.* 58A1–C4 Plato does not talk about elements dissolving and recombining, but of locomotion exhibited by the polyhedra, which are of different forms and sizes. The idea is that these differences, in combination with an inward pressure that prevents the formation of empty pockets, lead to instability, and this instability is constantly renewed (58C2–3: ἡ τῆς ἀνωμαλότητος διασφρομένη γένεσις): when smaller particles rush into the gaps left between the bigger particles, new gaps arise, which are instantly filled. This is an unending process, i. e. it provides an unceasing motion (58C3, κίνησις). The corresponding passage in TL (T19) is simpler. There is no explicit reference to inequality or instability. Instead, TL writes that the elements are pushed and pressed together by the revolution of the universe, so that they rub against one another, and this produces a never-ending motion (ἀδιάλειπτος ἀλλοίωσις), which leads to (ποτὶ) generation and corruption (γενέσεως καὶ φθοράς). According to Baltes the generation

74) See also J. R. W. Anton, *De origine libelli περὶ ψυχᾶς κόσμου καὶ φύσιος inscripti qui vulgo Timaeo Locro tribuitur quaestio*, Numburgi ad Sal. 1891, 202.

and corruption mentioned here is that of the (macroscopic) compounds, whereas ‘motion’ refers to the elements.⁷⁵ But TL does not specify what it is that is subject to generation and corruption. He may be thinking about generation and corruption in general, i. e. including the generation and corruption of the elementary corpuscles. After all, he has already alluded to elementary transformation in T15.

We have translated ἀλλοίωσις (‘alteration’) as ‘motion’ and taken it to be synonymous with κίνησις as used currently by Plato. Aristotle uses ‘alteration’ in the meaning of ‘qualitative change’, i. e. change according to the quality, with a persisting substratum: something that undergoes an alteration loses or gains a quality. The terms generation and corruption denote a change according to substance, and are therefore clearly distinguished from alteration.⁷⁶ As we have noted above, however, TL often uses the term ἀλλοίωσις (‘alteration’) in the general sense of ‘motion’, which is the term used by Plato at 58A4 (together with φορά) and 58C3. The author may have been aware of the fact that Plato in Theaet. 181D5–6 contradistinguishes just two types of motion: translation (φορά) and transformation (ἀλλοίωσις). In Phys. 8.8, 265a2–6, Aristotle moreover says that the ‘philosophers of nature’ (οἱ φυσιολόγοι) sometimes use the term ‘transformation’ when they mean generation and corruption, which may have given TL the idea – provided he knew this text – of using this term, perceived as archaic. The doxographic tradition attributes to the ‘Pythagoreans’ the view that there is generation and corruption in the true sense, as a result of the change, transformation and dissolution of the elements.⁷⁷ This fits well with the passage at hand, where alteration indeed produces generation and corruption. The relation between the doxographic tradition and TL is uncertain: maybe TL knew it and was inspired by it; possibly, however, this doxographic report is even based on our passage.

Even if TL does not intend ἀλλοίωσις to be understood in the Aristotelian sense, an aspect that probably lingers on in his usage,

75) Baltes (n. 5 above) 126, thinks that Plato’s κίνησις refers to the ‘Entstehung neuer Elemente’, i. e. to the elements dissolving and being reconstructed out of the debris. On our reading, however, Plato here merely talks about the dislocation of elementary corpuscles.

76) Ar. GC 1.4, 319b6–320a7.

77) Aet. 1.24: Dox. Graec. 320a22–26 (Ps.-Plut.) and 320b29–36 (Stob.).

or is even part of the lexical meaning, is the notion of a substratum that remains the same throughout the change. The only occurrence of the terms generation and corruption is in the present passage. Presumably TL takes these terms as indeed referring to substantial change, in accordance with how Aristotle, but also Plato, uses them, without restricting the scope either to elemental or to macroscopic transformations. As far as the *Timaeus* is concerned, the terms generation and corruption only make sense for the world in its cosmic state, where there are stable substances or substance-like entities, whereas ‘alteration’ is a broader term that also applies to precosmic change (where the remaining substratum is the receptacle or matter, as in the case of elemental transformation in the cosmic stage; cf. T6). The transition between the precosmic and the cosmic is marked by the introduction of stable structures through geometrical shapes.

- T20 By making use of these (elemental bodies), the god constructed this world, which is tangible because of earth and visible because of fire. Earth and fire are the two extremes. By means of air and water he bound it together with a most strong bond, proportion, which is able to hold together both itself and what is under its control. (217.3–6)
- Tim. 31B4–8;
32B3–4;
32B8–C2; cf.
also 56C3–7

The section T20–22 summarises Plato’s first account of the elements (31B4–32C4), in which Plato, not yet having explained the geometric structure of the elemental bodies, generally states that the visibility of the world derives from fire and the tangibility from earth. TL also adds the necessity of an intermediary in order to obtain a beautiful proportion. He then describes the relations between the elements, numbers, masses or powers,⁷⁸ in a proportion. He applies this kind of proportion to the body of the world, which being a three-dimensional figure, must have one more intermediary, i. e., one more element in order to tie the extremes together. This justifies the introduction of the two remaining elements, air and water.

Plato deals with the elemental bodies in two, or even three, sections: in the account about the origin of the world viewed from the perspective of reason; in the part where he discusses the world

78) Cf. N. Vinel, Sur les ὄγκοι et les δυνάμεις du *Timée* 31c5. Contre les interprétations modernes, LEC 71 (2003) 51–70.

from the point of view of necessity; and finally in the part in which he discusses the interplay of these two principles, more specifically as it can be seen in the creation of humans. So far, TL has drawn his account of the elements mainly from the second part of the physical account of the *Timaeus*. The present passage, however, corresponds to Plato's first treatment of the elements. Plato's aim in this passage is to show that the world, both its soul and its body, is harmonic and well-proportioned. Accordingly, the body of the world is described as a harmonic constitution of the four elemental bodies. TL has dropped the distinction between reason and intellect as a structuring principle of his account (he states the existence of both principles right at the beginning of his work – contrary to Plato, who introduces necessity only in the middle and quite unexpectedly), and hence offers no different treatments of the elements in this sense. In his own account, TL has first described the geometric constitution of the elements and only later – in the present passage, that is – discusses the proportionality that links one element to the other, and all elements to the whole.⁷⁹ Thus TL removes some of the tension that characterises Plato's *Timaeus*, offering instead a more straightforward presentation, led by the wish to be more systematic and didactic.⁸⁰

This is not the first time TL refers to the proportions that obtain between the elements. At the beginning of his general description of the body of the world he has briefly referred to proportion (T10), but now he gives an accurate description of the type of proportion needed, i. e. of the intermediaries required to tie together two extremes in a stereometric context.

Here, as in the previous passage in which he alluded to the proportions obtaining between the elements (T10), TL links proportions explicitly to the notion of force of power – which is implied by Plato's use of the metaphor of 'binding together': TL does not call this bond beautiful, but rather 'strongest' (κράτιστος); the proportion is said to be 'able to hold together both itself and what is under its power (κρατέμενα)'. It is important for TL that the

79) Cf. Baltes (n. 5 above) 126–127.

80) TL introduces the section with the phrase: "By making use of these elemental bodies, the god constructed this world." This echoes Tim. 68E1–5 and 28A7, and marks a transition between sections that are drawn from different parts of Plato's text.

force exercised by the proportion guarantees the equilibrium (ἰσοκρατία) between the elemental bodies.⁸¹

TL explains the importance of proportionality in two different places: he first gives a general account of the functioning of proportions in T10, where he merely mentions the necessity to have a third term linking two extremes. Here, on the contrary, the concept of proportionality is applied to a three-dimensional world, so that we need two intermediate terms. In Plato, these two steps constitute a single passage.

- T21 If what is bound together were two-dimensional, then one mean would be enough; but, since it is three-dimensional, two will be needed. The demiurge joined together the two extremes by two means, so that, as fire is to air, air is to water; and as air is to water, so water is to earth; conversely, as fire is to water, so air is to earth. The reverse is also true; as earth is to water, so water is to air and air to fire; conversely, as earth is to air, so water is to fire. (217.6–12) Tim. 32A7–B8

The basic idea expressed is the same as that of the corresponding passage in the *Timaeus*, but TL gives a more elaborate account of the analogies. In Plato they are:

fire : air = air : water
air : water = water : earth

which links the extremes in two steps by means of two intermediaries. In fact, Plato merely explains how each of the extremes is linked to the two intermediaries, and leaves it up to the reader to infer how this also links one extreme to the other. TL spells this out:

fire : air = (air : water) = water : earth
fire : water = air : earth [κατ' ἐναλλαγάν from 1]
earth : water = (water : air) = air : fire [ἀνάπαλιν from 1]
earth : air = water : fire [κατ' ἐναλλαγάν from 3]

The operations described conform to the classical definitions of the alternate and the inverse ratio.⁸²

⁸¹) TL 208.3–4; compare the ‘balance of powers’, ἐν ἰσοδυναμίᾳ, of 207.20 (T9) and also 217.13 (T22).

⁸²) Cf. Eucl. El. 5, def. 12 and 13. These operations were already mentioned earlier in TL’s text: 208.2–3.

- T22 And since they are all equal in power (δυνάμει ἴσα), their ratios (λόγοι) are in equality (ἐν ἰσονομίᾳ). This world, then, is one because of this divine bond, the analogy. (217.12–14) Tim. 31C2–4: analogy is the best of bonds.⁸³

Equality of power (ἰσοδυναμία) or equal rights (ἰσονομία) are not notions used by Plato. The way TL uses them, here and in a previous passage (T10), is remarkable. Analogy, the equality of ratios, is useful for establishing equality between unequals. TL, however, emphasizes the idea that in the case of the elements the equality of the elements themselves – to be understood on a cosmic scale, presumably – grounds the ‘equal rights’ (ἰσονομία) of the ratios.⁸⁴ The underlying idea may be that all elements are on a cosmic scale equal in ‘power’, so that there is a cosmic equilibrium and also an equality of each element with every other. This amounts to the idea of cosmic justice, as we find it expressed earlier in the text,⁸⁵ and for instance also in Anaximander.⁸⁶ It could be expressed with the following formula (with Δ for ‘power’): $\Delta_{\text{air}} = \Delta_{\text{earth}} = \Delta_{\text{water}} = \Delta_{\text{fire}}$. As a consequence, not only the ratios described in T21 obtain, but also the values for any ratio between two elements would be identical. In that case the precise analogies outlined above become superfluous as far as the quantities of power, however measurable, are concerned. But TL probably thinks that the analogies specified in T21 provide some kind of ‘qualitative’ bond between the elements and their properties.⁸⁷ The equality of power, mentioned here in T22, amounts to the claim that each element on a cosmic scale, i. e. in its totality, is of equal strength as each of the others.⁸⁸

- T23 Each of the four bodies has many forms. Fire could be: flame, light or bright light. This depends on the inequality of the triangles in each of them (ἀνισότῃα τῶν τριγώνων). In the same way, air could be either clear and dry or damp and foggy. Tim. 58C5–61C2

83) For the expression ‘divine bond’, cf. Plato, Pol. 309C2; 310A4 (not applied to the concept of analogy).

84) Baltes (n. 5 above) 128–129 cites as a parallel Philo, Qui rer. div. her. 152: ἀναλογία δὲ σχεδὸν τὰ πάντα ἔστιν ἴσα, and for the ἰσονομία of the elemental bodies Phil. Spec. leg. 1.208, while pointing out the difference that TL speaks of regarding the ἰσονομία of the ratios, rather than that of the elements.

85) 208.1, ῥυσμῶ Δίκας (T10).

86) Cf. Anaximander, DK B1.

87) The analysis of Harte (n. 30 above) 231–232 is also valid for TL.

88) Cf. Tim. 52E1–3 (absence of equilibrium in the precosmic state).

Water could be either flowing or compact, like snow, frost, hail and ice. Some moist things are fluid such as honey and oil, while others are compact (solid), such as pitch and wax.

The forms of the compact (earth?) are fusible, such as gold, silver, bronze, tin, lead, and copper; while others are frangible, such as brimstone, bitumen, natron, salt, alum, and rocks of a similar kind. (217.14–22)

TL lists, as Plato does, varieties⁸⁹ of the elements. The account in TL is much shorter and simplified, especially concerning the varieties of water. Contrary to Plato, TL does not connect the varieties to different sizes of the constitutive triangles, and it is not clear either what the corpuscular explanation for the varieties would be, or whether he accepts different sizes for the elemental surfaces. The easiest explanation would be to suppose that he does and uses it to explain the varieties, as Plato does. The twofold use of the term *πακτόν* is confusing: it is first used for a ‘compact’ variety of water, but then also for a fourth group of varieties, after those of fire, air, and water. One would therefore expect this ‘compact’ element to be earth, and this may be what TL indeed means – and it is also what M. Baltes thinks it means. It is possible, however, that TL intentionally avoids the word ‘earth’ because the varieties mentioned here are described in the *Timaeus* as forms of earth with an admixture of water, or such blends that have been dehumidified. It is also remarkable, as M. Baltes and R. Halleux point out,⁹⁰ that TL’s list of varieties of the fourth group closely resembles Aristotle’s list in *Meteor.* 4.389a7–9. It is therefore very likely that TL drew upon this text or a text derived from it.

R. Halleux⁹¹ offers a reading of this section that is crucially different from, and also more plausible than, Baltes’. According to Halleux, the second mention of the compact does not introduce an account of the fourth element, earth, but simply takes up the first occurrence of the word ‘compact’ (*πακτόν*), i. e. a sub-group of water. This would mean that, on his reading, the last part of the passage introduces a further subdivision of this group of watery

89) Called εἴδηα. In this context Plato uses γένη and εἴδη indiscriminately.

90) Baltes (n. 5 above) 131 n. 1; R. Halleux, *Le problème des métaux dans la science antique*, Paris 1974, 140.

91) Halleux (n. 90 above) 137–140.

varieties. The upshot is that TL discusses varieties of only three elements. The advantages of this interpretation are that Halleux does not need to assume that the reference of $\pi\alpha\kappa\tau\acute{\omicron}\nu$ changes within a span of just five words, and that the metals listed at the end of the passage indeed are classified under the element of water, which corresponds to the traditional classification.⁹²

What is more important for our purposes is that TL, like Plato,⁹³ attributes the existence of varieties to differences in size of the constitutive triangles ($\delta\iota\acute{\alpha}$ τὰν ἀνισότατα τῶν ἐν ἐκάστῳ αὐτῶν τριγώνων). Yet Plato's explanation is more complex, as it involves varieties stemming from combinations of other varieties, i. e. combinations of varieties each of which consist of differently sized triangles.⁹⁴ Like Plato, TL does not explain the relations between the different sizes – a problem that in the case of Plato has led to interesting speculations.⁹⁵ It is possible that TL was aware of the serious, perhaps insurmountable, difficulties that are involved in working out these details into a consistent and plausible theory, and preferred not to give too many details.

With this text TL ends his treatment of the elements. Next follow the account of the human soul and its sensory faculties. This section, too, contains views that are important for our purposes, namely in the passages where TL discusses elemental properties. This is, more particularly, the case in the following texts, which fall under the sense of touch.

92) For detailed analyses of TL's list of varieties of the elements and a comparison with Plato's treatment, see Baltes (n. 5 above) 130–131 and Halleux (n. 90 above) 137–140.

93) Tim. 58D4: $\delta\iota\acute{\alpha}$ τὴν τῶν τριγώνων ἀνισότητα (for air).

94) E. g. Tim. 58D5–E2.

95) Cf. Cornford (n. 9 above) 230–239; G. Vlastos, *Plato's Universe*, Seattle 1975, 72–73; B. Artmann / L. Schäfer, On Plato's "Fairest Triangles" (*Timaeus* 54a), *Historia Mathematica* 20 (1993) 255–264; A. Gregory, *Plato's Philosophy of Science*, London 2000, 198–200; Harte (n. 30 above) 240–247.

5. *Elemental properties*

- T24 What we call affections or properties (πάθηα) of the bodies are so named (A) with respect of touch, but also (B) because of their inclination toward a place. (219.9–10)
- Tim. 61C4–D5: introduction to the perceptual affections (παθήματα αἰσθητικά)

In a large section 61C4–D5 Plato discusses a series of affections (παθήματα), which he also calls ‘perceptual affections’ (παθήματα αἰσθητικά, 61D1). This section, which belongs to the third part of the physical account, i. e. the anthropological section combining the perspectives of reason and necessity, is Plato’s second treatment of the παθήματα, whereas the first treatment belongs to the second part of the physical account. In this second treatment Plato links the properties to our perception of them, whereas the first account is observer-independent. As D. O’Brien convincingly argues, the two accounts are compatible: παθήματα are neither merely objective, nor merely subjective *sensibilia*; they are, literally, the effects that one body has upon another. If the patient is sufficiently receptive, these παθήματα are perceived.⁹⁶ It is clear that these properties are not intrinsic to single bodies, but rather originate in the interaction of bodies. In our view, that does not diminish their status as objective features of the world. This was also perceived to be the case by Theophrastus, who explicitly distinguishes Plato from Democritus in this respect.⁹⁷ TL, too, relates these properties to sensation, more particularly to touch (and adds properties related to taste and smell, for which he draws on Tim. 65C–66C, cf. T26).⁹⁸ Presumably TL considers touch the most basic vital sensation, i. e. the sense most closely related to bodies and their properties.⁹⁹ Plato does not explicitly connect the properties listed here to touch, yet they are clearly tactile. Among the properties listed indiscriminately in the corresponding section of the *Timaeus*, TL distinguishes those properties that receive their name by virtue of a simple relation to touch and those – heaviness and lightness – that

96) Cf. O’Brien (n. 70 above) 124–143.

97) Theophr. De sens. 60 (trans. after G. M. Stratton): “[Plato] does not rob these objects of sense-perception of their external reality.”

98) Although TL draws on Plato’s *Timaeus* to ground the affinity between touch and taste, this affinity in itself is also observed by Aristotle, DA 2.9, 421a18–19; 2.10, 422a10; 3.12, 434b18.

99) Cf. Ar. GA 2.1, 733a11; 2.4, 739b23; 3.9, 761a27.

are so named ‘because of their inclination toward a place’. As will become clear below, the two weight-properties have a more complex relation to touch: touch has a first apprehension of them, but it is reason that discriminates between heavy and light based on a judgment about whether the motion is centripetal or centrifugal.

The fact that TL introduces these properties by referring to the name they receive (ὀνομαίνεται, echoing Plato’s λέγεται), suggests an account that is not so much about observer- and mind-independent properties, but rather about properties that have a secondary status compared to the primary properties of the external bodies themselves. This impression would seem to be corroborated by the emphasis on sensory apprehension (ἀντίλαψις, ἀνάλαψις, κρίνειν). One could even think of properties that are merely conventional: we just assign names, but we could have given other names to differently carved out groups of phenomena. However, TL’s view on the status of these properties is probably not fundamentally different from Plato’s: these properties are not intrinsic to a single body, but are an objective feature of the world. They are not intrinsic to single bodies, because they exist in the interaction between bodies, in this case, between ensouled, perceiving bodies and bodies not necessarily endowed with a soul. This also explains why there are two different accounts of smoothness (λείότης): once as a property relative to touch, once as a property relative to taste (TL 219.12 and 219.20). There is therefore no need to take the reference to naming as a sign of conventionalism: the properties can be objective, even if the names are not. It is moreover not clear whether TL would have considered name-giving a matter of convention. There is thus nothing in the text that displays or even suggests conventionalism. We therefore understand TL’s introductory phrase as follows: our names for certain πάθηα suggest that they are names for properties of the things themselves, independently of perception, but in fact they are properties of perception that only come to be in the interaction between a body and a perceiver; more precisely, a perceiver perceiving with a specific sense – here: touch.

The properties that are apprehended by touch alone are called ‘vital powers’ (see T25). We think this is because these properties are of vital importance for the living being. It should be kept in mind that in this section TL is no longer giving a strictly physical description of the elements; this passage belongs to an account of human biology. It is therefore not necessary to ascribe to TL the view that

elements and elemental bodies are themselves filled with life. The ‘vital powers’ are just Plato’s ‘perceptual affections’, though TL’s term may be narrower in scope, while restricted to the affections of touch.

Touch, a sense, performs the job of a criterion, i. e. it distinguishes (κρίνει), which amounts to apprehension. In the case of weight, this epistemic job is carried out by touch and reason (λόγος), which is, by implication, a criterion too. This theory of a twofold criterion, sensation and reason, is Peripatetic, and has left traces in other Pseudo-Pythagorica and Platonists.¹⁰⁰ Plato introduces the section on these properties by saying that it is impossible to discuss them independently of sensation. Contrary to TL, he does not explicitly say he starts with touch, but the qualities he discusses first are indeed those of touch, or maybe of sensation in general. He discusses the senses in the following order: [touch, common perceptions,] taste, smell, hearing, sight. TL begins the list of senses with sight and hearing, yet without relating them to corresponding affective properties. After that he starts discussing touch in relation to the properties, followed by the other senses in the same order, including a renewed account of sight and hearing, so that the order is: (sight₁, hearing₁) touch, taste, smell, hearing₂, sight₂. It is clear that TL combines two ordering schemes. Alcinous, whose treatment is close to TL’s, lists the senses in an order that is the exact inverse of Plato’s (Did. 174.39–175.21).

T25 (A) Touch distinguishes (κρίνει) the vital properties (ζωτικὰς δυνάμιας):

TL1. heat (θερμότητα), cold (ψυχρότητα) = Ti.1

TL2. dryness (ξηρότητα), moistness (ύγρότητα),

TL3. smoothness (λείοτητα), roughness (τραχύτητα) = Ti.5

TL4. yielding elasticity (εἴκοντα), rigidity (ἀντίτυπα) = Ti.3

TL5. softness (μαλακά), hardness (σκληρά)¹⁰¹ = Ti.2

[(B) TL6. heavy (βαρύ) and light (κούφον): cf. T27] = Ti.4

Tim. 61D5–64A1 (properties relative to sensation, παθήματα αἰσθητικά):

Ti.1 hot and cold (θερμόν, ψυχρόν) [61E1–62B5]

Ti.2 hard and soft (σκληρόν, μαλακόν) [62B6–8]

Ti.3 yielding and resistance (ύπείκει, ἀντιτυπώτατον) [62B9–C2]

Ti.4 heavy and light (βαρύ, κούφον) [62C3–E8]

Ti.5 smooth and rough (λείον, τραχύ) [63E8–64A1]

100) Ps.-Arch. De intell. 36.16–25 Th.

101) Cf. Plato, Theaet. 186B2–9.

[TL7. 219.16–18, cf. T29: hot, due to smallness of particles (λεπτομερές), and cold, due to coarseness of particles (παχυμερέστερον) = Ti.1] (219.9–12)

TL discusses the same pairs of opposites as Plato, albeit in a different order. The properties of weight are relegated to a different section (T26), justified by the idea, not explicit in Plato, that they are not distinguished by touch or sensation alone, but require reason. TL has added the pair dry/moist after the first mention of hot/cold, with the effect, probably intended, that the account starts with the four qualities whose combinations, for Aristotle, determine the four elements (though the list of the four cardinal qualities predates Aristotle and Plato, who was also familiar with it¹⁰²). TL probably wants to integrate Plato's with Aristotle's account or even to suggest that the theory as given in Aristotle predates Plato and that Plato was familiar with it. In T25, TL merely sums up the properties. In T27 he comes back to heat and cold, offering an explanation of their coming about. There they are explained by reference to fineness and coarseness, two haptic properties mentioned by Aristotle, and also by Ocellus. Alcinous' account of the haptic qualities (174.39–175.21) is in some respects close to TL's. Alcinous lists the same properties as Plato, without however mentioning the Aristotelian dryness and moistness. Like TL he has the list of the qualities followed by a separate account of the pairs heavy/light and hot/cold. There is also a terminological resemblance: whereas Plato uses the form ὑπέικει,¹⁰³ both TL and Alcinous have εἶκοντα. It is also interesting that information provided by TL, but absent from Alcinous, has close parallels in Ocellus, who in turn draws on a passage from Aristotle's *On generation and corruption*.¹⁰⁴ The account of the properties in Ocellus and Aristotle differs from Plato's and from TL and Alcinous, whose accounts are directly based on Plato's, in that in Aristotle and Ocellus the properties are regarded as simply elemental properties, not as παθήματα and πάθη of perception. This explains the presence of the properties fine and

102) Phaed. 86B9; Tim. 88D2–3; Soph. 242D3–4 (Emped. DK 31 A 29); maybe also Symp. 186D7. Cf. Anaximander DK 12 A 9; Hippocr. De prisc. med. 1.1; 13.1–3.

103) As does Theophrastus, De sens. 83; 87.

104) Ar. GC 329b17–19; Ocellus, De un. nat. 131.14–24 Th.

massive (*λεπτόν, παχύ*) in Ocellus, taken from Aristotle, and their absence in the other authors mentioned. That is to say, they are absent from the list of *πάθη*, yet used by TL in the causal explanation of the *πάθη* hot and cold (T27). The comparison between the two Pseudo-Pythagorean authors, Ocellus and TL, suggests that TL, even though thoroughly familiar with Aristotelian ideas and even when borrowing parts of Aristotle's account of these properties, chooses to stay within the Platonic framework that relates affective properties to elemental corpuscles and their interactions in sense-perception.¹⁰⁵

- T26 (B) Touch makes a first discrimination (*προκρίνει*) between heavy and light (cf. T25, TL6), but reason defines it in virtue of the inclination (*τῶ ποτὶ τὸ μέσον καὶ ἀπὸ τῶ μέσῳ νεύσει*) either toward the middle or away from the middle. 'Below' is equated with the centre of the sphere. Whatever is beyond the centre up to the circumference is 'above'. (219.13–16)
- Tim. 62C3–E8 (perception of weight); 62C3–63A6 (denies the existence of an absolute 'above' and 'below'); 63A4–6

Heaviness and lightness, the properties of weight, are introduced as being discriminated by touch and reason. The sense of touch can distinguish between what is heavy and light, but it is only reason that enables us to grasp the true nature of these properties. Heaviness is essentially a tendency to move toward the centre, lightness a tendency to move away from the centre and toward the periphery of the world. This tendency has already been called 'inclination' (*ρόπή*) when TL introduced the haptic affections (T24). As a matter of fact, this was not the first mention of 'heaviness', for in T14 earth is called the heaviest (*βαρύτεατον*) of the elements on account of the properties of the constitutive polyhedron (the cube); and in T15 TL has linked the heaviness of water to its possession of a large number of parts (*πολυμερέστερον καὶ βαρύτερον*). The fact that it is used here shows that heavy and light are not merely perceptual affections; they are also properties of bodies in the world, independently of their being perceived.

105) Atticus, when criticising Aristotle's account of the elements, lists as elemental properties hot and cold, dry and moist, soft and hard, light and heavy (corresponding to TL1, TL2, TL5, and TL6, respectively), and adds the pair rare/dense. He treats them as intrinsic properties of the elements themselves: fr. 5.19–29 Des Places.

TL's twofold mention of heaviness, once as proportionally related to the number of elemental parts, once in connection to motion in a certain direction, mirrors Plato's twofold account of weight. TL has, however, accommodated parts of Aristotle's doctrine and critique. For Plato's theory of weight, we follow the interpretation by D. O'Brien. Plato analyses weight in two different passages: 1) in 56A6–B2 and 2) in more detail in his account of human perception (62C3–63E8). In the earlier passage, weight is described as a property of the elemental bodies, which results from their mathematical constitution. It is determined by the number of triangles that make up a body. The scope of the brief remark is limited: in the case of elements made of the same constituents (primary triangles of the same type), that with the smallest number of constituents is lighter.¹⁰⁶ In the latter passage, weight is described as a *πάθημα*, the explanation of which is tied to an elaborate account of differences of places and directions in the cosmos. According to O'Brien, the two accounts are complementary: the greater the number of constituent triangles, the heavier the object. Heaviness of an element is defined in terms of the difficulty with which it can be removed from its parent body and the greater speed with which it travels back towards it. Hence for Plato a greater quantity of fire is heavier than a smaller, whereas Aristotle considers it to be lighter. Contrary to Aristotle,¹⁰⁷ Plato refuses to divide up the world between above and below: what is up or down rather depends on the nature of the element in relation to its parent body (63E4–5): fire moving away from the circumference is therefore moving down. Aristotle's criticism uses the first account as providing the Platonic definition of weight.¹⁰⁸ He also explicitly rejects the Platonic revisionary definition of the directions 'up' and 'down' (DC 4.1, 308a17–24). A comparison with Theophrastus' account of Plato's theory is equally revealing. Theophrastus correctly defines the Platonic concept of weight with the ease or the difficulty with which a body is drawn to a place opposed to its na-

106) See A. Code, Aristotle on Plato on Weight, in: Mohr / Sattler (n. 64 above) 201–211, 204.

107) Cf. DC 4.1, 308a17–29: it is absurd not to admit 'below' and 'above'; the extremity of the spherical universe is to be regarded as 'above'.

108) DC 3.1, 299b31–300a1. See also 4.2, 308b3–12 and the related argument in 308b12–29.

ture (De sens. 83). He moreover points out the difficulty of combining this idea with the notion that it is the greater mass that makes things heavier (De sens. 88).

TL's account of weight is extremely concise. What is clear is that he does not adopt the Platonic definition of 'up' and 'down', but returns to the more traditional and Aristotelian understanding of these words. He emphatically equates the centre of the spherical world with 'below', and the periphery with 'above', and claims that this is a common view ($\phi\alpha\nu\tau\acute{\iota}$).¹⁰⁹ From this division of an unqualified 'above' and 'below' one can easily derive the absolute directions 'up' and 'down'. Moreover, this distinction is related to the pair heavy and light, but TL does not really explain how exactly. If we connect the idea that heaviness can be 'felt' with the remark about the heaviness of water as proportionally related to the number of elemental triangles,¹¹⁰ we can infer that, at least for those elements that Aristotle also considers to be heavy, TL's view is not so different from Plato's. Still, we are left in the dark if we want to know how he conceived of weight in the case of Aristotle's light elements: would TL consider a greater mass of fire to be heavier or lighter than a smaller mass? Plato would say the first, Aristotle the second. We can further infer from TL's sparse remarks that the motion induced by the weight-properties is related to the cosmically defined directions 'up' and 'down'. This feature can only be grasped by reason, because presumably only reason can tell us what these expressions mean, in particular in light of the conceptual difficulties raised by Plato. The tendency to move toward specific cosmic regions can therefore be interpreted as a tendency to move upwards or downwards, in the Aristotelian sense of these words. We can feel that a lump of earth has an inclination in a specific direction and we know that this direction is 'down' thanks to reason. Similarly for one of Aristotle's light elements: we feel that fire strives in a specific direction and we know through reason that this direction is 'upwards'. It is not clear whether, according to TL, reason therefore tells us that fire is light, or rather, as Plato would have it, that a small quantity of any element is light and a large quantity

109) Aristotle explains that his definition is a more precise statement of common opinion: DC 4.1, 308a24–29.

110) In TL there is no trace of Plato's view that for each of the two types of elementary triangles there could be different sizes.

is heavy. It would make more sense for TL to say that the larger quality of whatever element is always the heavier. The remark about the heaviness of water may be thought to confirm this. More important is the general hylomorphic framework of his elemental theory: if all elemental triangles themselves contain prime matter and if in one case mass is proportionally related to heaviness, it would seem that this is generally true. It is different for Aristotle, for whom “*prima materia* [...] is itself not characterised as heavy or light”.¹¹¹ As O’Brien shows, Aristotle understands this difference with Plato’s account and argues that the amount of matter included in, or occupied by, the primary triangles determines heaviness. Hence Aristotle infers that on this view material things cannot be distinguished as heavy and light, but only as more or less heavy (whereby ‘light’ denotes the relatively less heavy), and cannot have motions in opposite directions.¹¹² The Platonic account, however, does not tie the opposition of ‘heaviness’ and ‘lightness’ to an opposition of directions. A hylomorphic interpretation of the *Timaeus* such as TL’s, according to which a chunk of prime matter is an intrinsic part of an elemental triangle, would seem to strengthen the idea that heaviness is simply a function of mass (i. e. the combined mass of the triangles making up the elements). The suggested connection of heavy and light with the Aristotelian notions of ‘up’ and ‘down’ may therefore seem to be somewhat unfortunate.

What if we compare quantities of different elements? TL does so on one occasion: where earth is called the heaviest of the elements on account of its shape (216.10, T14). This poses a problem for the quantitative interpretation, as earth consists of fewer ele-

111) O’Brien (n. 70 above) 207. It is for our purpose of no importance whether one ascribes a theory of prime matter to Aristotle or not. What is important, though, is that heavy and light occur first at the level of the different elements. This is agreed upon by scholars who have otherwise divergent views on Aristotle’s theory of the elements: cf. M. Matthen, *Why Does Earth Move to the Center? An Examination of some Explanatory Strategies in Aristotle’s Cosmology*, in: A. C. Bowen / C. Wildberg (eds), *New Perspectives on Aristotle’s De caelo*, Leiden / Boston 2009, 119–138, 125–126; M. L. Gill, *The Theory of the Elements in De caelo 3 and 4*, in: Bowen / Wildberg (above) 139–161, see 141–146; P. Needham, *An Aristotelian Theory of Chemical Substance*, in: U. Meixner / A. Newen (eds), *Logical Analysis and History of Philosophy*, Paderborn 2011, 149–164. See also V. Cordonier, *Matière, qualités, mélange. La physique élémentaire d’Aristote chez Galien et Alexandre d’Aphrodisias*, *Quaestio 7* (2007) 79–103, 87 for this issue in Alexander of Aphrodisias.

112) O’Brien (n. 70 above) 207–208.

mentary triangles than water. A possible way out of this difficulty would be to assume that the basic triangles from which earth is constituted are heavier than the other type of basic triangle, out of which the three other arguments are formed. However, another explanation is suggested by the text: the heaviness of earth is mentioned in one breath with the difficulty to be moved. The latter feature can be interpreted as the difficulty with which it can be dislodged, which is due to the stability of the cubical shape. This could mean that for TL the decisive criterion for heaviness is – as it is according to O'Brien's analysis of the *Timaeus* – the difficulty with which an element can be removed from its parent body.

There is still the question what makes each element move either up or down. TL says that the elements have an inclination to their *χώρα* (219.10, T24), a term presumably connoted as the region to which they belong, i. e. some sort of 'natural place' – even though TL does not use this expression. The reader also has grounds to believe, from earlier passages, that TL accepts the traditional cosmic distribution of the elements. Maybe it is not necessary to assume that TL, in an Aristotelian vein, supposes that fire moves upwards simply because that is its natural place or because an element has a potency to be in a certain place – a potency that is actualised in its motion toward that place. Possibly, the naturalness of the place is itself explained in a more 'mechanistic', Platonic way (see our comments for T17),¹¹³ so that relative differences in bulk and shapes favour a specific distribution of the larger masses of the elements across the universe,¹¹⁴ as was already the case in the precosmic state according to the *Timaeus*.¹¹⁵ In terms of an explanation in the framework of necessity, the primal causal factor responsible for the motion is the pressure exerted by the spherical form of the world. TL's talk of elemental inclinations could therefore be regarded as a metaphorical and somewhat imprecise description of the outcome of more complex mechanisms of the order of 'necessity'. It cannot be excluded, however, that he just ascribes a quasi-animistic tendency to the elements.

113) At the same time, the account corresponds to the intention of the demiurge: he uses these processes of 'necessity' in order to obtain the results desired.

114) This would explain why for Plato the elements move to their parent bodies, i. e. each element moves towards that with which it has an affinity: cf. Tim. 79D6 (πρὸς τὸ συγγενές).

115) Code (n.106 above) 210–211; Broadie (n.21 above) 195.

The word for inclination, ῥοπή, is the same that is used by Aristotle for the tendency of elements to move in a certain direction, and is absent from the *Timaeus*. Hence one could think that TL adopts this Aristotelian idea. But that is not necessarily so since Plato does use this word or derivatives in similar contexts. In the *Timaeus* Plato speaks of ‘having an equally strong inclination’ in the case of the powers of the elemental bodies (ἰσορροπεῖν), and in the *Phaedo* he uses the same concept to explain the stability of the earth in the centre: its inclinations in different directions balance each other out.¹¹⁶ TL was probably familiar with this passage, since he uses a similar idea as well as the word ‘inclination’ to explain the central position of the heart in the body.¹¹⁷

Interestingly, Ps.-Archytas explicitly associates the notion of inclination with weight, more precisely with the talent, a measure of weight, and discusses it as one of three kinds of quantity. This author apparently uses ‘inclination’ (ῥοπή) as a technical term for ‘weight’.¹¹⁸ M.-A. Gavray argues that Simplicius quotes Ps.-Archytas precisely in order to corroborate the view that weight is quantifiable and hence belongs to the category of quantity. By doing so, Simplicius substitutes a quantitative analysis of weight for the Aristotelian qualitative account.¹¹⁹ Aristotle never mentions inclination in the *Categories*, which made it possible for Simplicius to suggest that, for Aristotle too, inclination could be regarded as something of which there could be more or less. Not by coincidence, the quantitative concept of weight fits better Simplicius’ Platonic philosophy of nature. It is therefore tempting to think that TL too, who as we have seen is philosophically close to Ps.-Archytas, has a similar concept of inclination as quantifiable.¹²⁰ Succinct as his remarks on weight may be, they do show a tendency to harmonise Plato with Aristotle. And if TL thinks, like Ps.-Archytas,

116) Cf. Tim. 52E2–3; 88B7; Phaed. 108E4–109A7. See also Plutarch, De facie 923D2–F1.

117) Cf. 215.12–13.

118) Ps.-Arch. Cat. 25.1–3: τὰς ποσότητος διαφοραὶ τρεῖς: τὸ μὲν γὰρ αὐτὰς ἐστὶν ἐν ῥοπή ὡς τὸ τάλαντον, τὸ δὲ ἐν μεγέθει ὡς τὸ δίπαχυν, τὸ δὲ ἐν πλάθει ὡς τὸ δέκα. See also 28.4–5; De intell. 37.15–18.

119) M.-A. Gavray, Archytas lu par Simplicius. Un art de la conciliation, The International Journal of the Platonic Tradition 5 (2011) 85–158, see 133–137.

120) This offers support for the thesis that there was a Pseudo-Pythagorean school of interpretation for Aristotle’s *Categories*.

that inclination is inherently quantitative, his view of weight is closer to Plato than to Aristotle. TL's remark on the directions can be regarded as a concession to Aristotle that the terms for the directions should be defined in accordance with ordinary usage. It is clear, however, that the integration of Aristotelian ideas is accomplished by subordinating them to a Platonic theoretical context, in which weight is fundamentally dependent on mass (the aggregated mass of the basic constituents of material bodies) and/or¹²¹ the difficulty with which an element can be removed from its parent body, which depends on the constitutive elemental shapes. TL's use of the term inclination (ῥοπή) should probably not be seen as a conscious intervention in order to promote a certain view, but rather as the use of a technical term for a phenomenon that he regarded as obviously quantifiable.

T27	Heat appears to [be the effect of] small particles (λεπτομερές) and dilates bodies (διαστατικόν). Cold is [the effect of] that which is too coarse (παχυμερέστερον) for the passages (τῶν πόρων) and compresses (συμπιλωτικόν). (219.16–18)	Tim. 61D5–62A5 (heat) 62A6–B6 (cold)
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The explanation of heat and cold is highly condensed, up to the point that it no longer represents Plato's account. TL's account is binary: opposite properties have opposite causes. Hence we should use the expression *παχυμερέστερον τῶν πόρων* to explain *λεπτομερές*, and relate this too to the 'passages'. The idea is probably the following: when a body consisting of small particles encounters some macroscopic body, its particles are able to enter the passages (πόροι) in the second body as a result of which the body is dilated. This affection is called heat. When the body affected is a perceiver (has a soul), heat is a perceptual property experienced by the soul. Cold is the exact inverse case. A body consisting of larger particles encounters another body: its particles are too coarse to fit the 'channels'. As a result the body affected is compressed by the other body, as the approaching body exerts pressure upon it, for instance while surrounding it. This affection is called cold and can be perceived by the body affected in case the latter is endowed with a soul (and the affection is strong enough so as not to remain subliminal). This is confirmed by a later passage, where hot is said to relax [the

121) Depending on which interpretation one accepts for the claim that earth is the heaviest of the elements.

organ of?] touch, whereas cold contracts it (*διαχῶν / σύναγεν τὰν ἄφάν*, 220.14–15).

The passages (*πόροι*) to which the account appeals are channels inside larger bodies, for instance the channels through which sensations are conducted. Later in the text (219.19; 220.1; 220.5) TL uses the same term (*πόροι*) where Plato uses ‘veins’ (*φλέβες*). It is probable that hot and cold are explained at this same macroscopic level, yet TL may be led by the idea that smaller elemental atoms, that is, primary corpuscles that consist of fewer and possibly smaller elementary triangles, tend to produce heat, whereas larger corpuscles tend to produce cold. It is safe to assume, though, that these properties are held not just to depend on the agent, but on the relation in size between the agent and the patient. The effects depend on the relative fineness and coarseness of the agent and patient bodies, or between the first body and the channels of the second. Thus a corpuscular interpretation may be given to this account of heat and cold, as it is likely that the same phenomena also play at the microscopic level, in the sense that smaller and more sharp-angled corpuscles may penetrate more easily into the interstices between the larger ones and thus have the effect of heat. In this case, the *πόροι* could be understood as microscopic, too, and directly connected with the interstices between individual corpuscles. The reference to smallness and coarseness of particles is clearly reminiscent of the earlier account of the elements. It is, however, strange that these adjectives qualify not the elements, but ‘warm’ and ‘cold’ themselves (we have inserted the words ‘the effect of’ in our paraphrase). It is interesting that both Aristotle and Theophrastus fail to appreciate the fact that on the Platonic theory warmth is not a property of a single element, but is caused in a more complex way, and criticise¹²² Plato for the apparently unequal treatment of the opposites hot and cold: whereas heat is attached to a single element, there is no corresponding explanation for cold. Plato may indeed be blamed for not dispelling in clear enough terms the idea that fire is naturally hot. Yet TL has understood this part of the theory, whereas Aristotle and Theophrastus do not – or choose not to do so for polemical reasons.¹²³

122) Ar. DC 3.8, 307b5–10 (objection XIV); Theophr. De sens. 88–89.

123) For the rationale underlying Theophrastus’ criticism, see H. Baltussen, Theophrastus against the Presocratics and Plato. Peripatetic Dialectic in the *De sensibus*, Leiden 2000, 124–126.

TL's term διαστατικόν takes up διάκρισις from Tim. 61D7. Plato connects this effect with the sharpness of the angles and the fineness of the sides of the fire-pyramids, as well as the mobility that results from those geometric properties (61D5–62A6).¹²⁴ Plato too thinks that cold has to do with compression, but gives a more complex account that involves shaking and trembling as a result of the compression, features that are absent from TL (62A5–B6), but present, for instance, in Theophrastus (De sens. 83). TL's account is thus significantly different from Plato's. It is much shorter and simpler. There is a striking resemblance, however, with a passage from Aristotle's *De caelo* 3, in which Aristotle criticizes Plato's account of hot and cold. The resemblance is so close that we cannot but conclude that TL was directly inspired by this text. Aristotle in two brief sentences describes hot and cold as related to smallness and largeness of particles and as the result of penetrating and pressing together, respectively, and also mentions the passages (πόροι).¹²⁵ His criticism of the theory amounts to the claim that actually hot and cold are the effects only of the size of the corpuscles, not of their shape. The argument is part of his general criticism that shapes cannot account for qualitative properties. The unnamed philosophers who hold this view (307b10: ἔνιοι; 307b11: φασι) are said to contradict themselves. TL does not address the criticism, yet his account in fact confirms that size is decisive, not shape. Perhaps his use of the verb δοκεῖ betrays his awareness of a difficulty and may even suggest that the author is not himself one of those (ἔνιοι) firmly committed to this account of hot and cold.

- T28 What happens with taste is similar to what happens with touch. For things are perceived as either astringent or smooth because of contraction and dilation, as well as because of their movement through the passages and their shapes. (219.18–23) Tim. 65B6–66C7

TL declares the account of taste to be similar to that of touch, as being based on the same fundamental processes of contraction and

124) Plato's account of cold has the word μεγαλομερέστερα (62A7), to which corresponds TL's παχυμερέστερον.

125) Compare TL 219.16–18: τὸ μὲν ἄν θερμὸν λεπτομερές τε καὶ διαστατικὸν τῶν σωμάτων δοκεῖ εἶμεν, τὸ δὲ ψυχρὸν παχυμερέστερόν τε τῶν πόρων καὶ συμπλωτικόν ἐστί, with Aristotle, DC 3.8, 307b11–14: Φασι γὰρ εἶναι ψυχρὸν τὸ μεγαλομερές διὰ τὸ συνθλίβειν καὶ μὴ διέναι διὰ τῶν πόρων. Δῆλον τοίνυν ὅτι καὶ τὸ θερμὸν ἄν εἴη τὸ διόν· τοιοῦτον δ' αἰεὶ τὸ λεπτομερές.

dilation. This account likewise makes use of the ‘channels’¹²⁶ and explains the different tastes through the interaction of the bodies triggering the sensation and the sense-organs. Contrary to the preceding account of the haptic properties, TL here explicitly mentions the shapes, i. e. the geometric shapes constitutive of the elements. What is also of interest is that the same processes give rise to different qualitative properties depending on the sense to which they are related. Dilation and contraction, in relation to the tongue, cause different tastes; in relation to the eye, they cause differences in colour; and in the case of touch, they cause contrary haptic qualities. This will be pointed out explicitly by TL (220.13–16), which shows that he is aware of the fact that these qualitative properties are relative to different sense-organs and not primary qualities of the elements. Plato already uses this similarity to point out that the underlying affections are the same, and are specified by the sense-organ (67D5–E4, esp. E3: παθήματα γεγονότα ἐν ἄλλῳ γένει τὰ αὐτά).

- T29 There are many threats to life and causes of death. Tim. 82A7–B7
 One type is called disease. The basic cause of disease is lack of proportion among the primary properties (τῶν πρατῶν δυνάμιων ἀσυμμετρίαι), whenever the simple powers (ἀπλαῖ δυνάμεις), such as heat or cold, moistness or dryness, are excessive or defective. (221.14–17)

This passage mentions degrees of the powers and links illness to excess and defect, i. e. to a disturbance of the proportional equilibrium between the elements. It is possible that the proportionality weighs quantities of elements against strength of their powers (properties). The disproportionality of the powers in the case of the human body contrasts with the equilibrium between elemental powers on a cosmic scale and the resulting health of the body of the world.

The properties or powers mentioned here are called primary (πρατῶν δυνάμιων) and simple (ἀπλαῖ δυνάμεις). It is not certain whether these two qualifications pick out the same qualities. One could think that ‘primary’ powers are those that are of vital importance for the body (compare the ζωτικά δυνάμεις mentioned

126) Cf. Tim. 65C7: φλέβια, used in the account of the παθήματα περὶ τὴν γλῶτταν.

previously: T25), whereas the simple qualities are probably those that are considered as the most basic in the theory of the elements. They are indeed primitive in Aristotle's theory of the elements (which transpires also in T25), but also in the medical tradition.¹²⁷ There is an undeniable tension between the present classification of the elemental powers with the previous account of hot and cold, which hardly allows calling these qualities 'simple'. We surmise that TL here returns to a less sophisticated classification, probably because of the medical context, or because of Peripatetic influence, or both.

6. Conclusion

Because of its hylomorphism, TL's theory of the elements has drawn the attention of the late ancient commentators. TL's treatise indeed constitutes evidence of an early hylomorphic interpretation of Plato's *Timaeus*, probably the oldest of which we have knowledge. Unlike the ancient commentators, we know that, rather than being the 'Urtext' of the *Timaeus*, it postdates it, presumably by several centuries. It shows us an author who felt hylomorphism to be a natural complement to Plato's philosophy of nature. This was, or became, a common view among Platonists. Those who had access to book 1 of Aristotle's *Metaphysics* could find corroboration in the fact that there it is suggested that Plato had some notion of matter and form as ontological constituents of sense-perceptible bodies – a tenet severely impaired by the transcendence of the forms.¹²⁸ TL may very well have known this text, but – given his remark in T4 – is even more likely to have been familiar with Aristotle's claim that Plato considers matter and *χώρα* to be the same thing.¹²⁹ TL could then understand the copies of the forms entering the receptacle (205.14, T2) as the immanent forms of hylomorphism.

127) Cf. Baltes (n. 5 above) 192–193.

128) Ar. Met. 1.6, 987b33–988a1: [...] ἐξ αὐτῆς (sc. τῆς οὐσίας) ὡςπερ ἕκαστος ἐκμαγείου (cf. Tim. 50C2); 988a7–17; 1.7, 988a23–b6; 1.9, 991b2–4; b16–18; 992b1–7. Cf. C. Steel, Plato as Seen by Aristotle, in: C. Steel / O. Primavesi (eds), Aristotle's *Metaphysica* Alpha. Symposium Aristotelicum, Oxford 2012, 167–200, at 181–182, 191–192, 196; O. Primavesi, Second Thoughts on Some Presocratics, in: Steel / Primavesi (above) 225–263, at 248.

129) Phys. 4.2, 209b11–13.

morphic compounds. But also a famous passage from the *Philebus* (23C4–27C1) could be interpreted in this vein: the combination of the (formal) principle limit with the (material) principle of unlimitedness is said to yield mixtures, i. e. compounds, under the agency of a cause.¹³⁰ In the *Timaeus*, Plato formulates the requirement that there needs to be something ‘in which’ the forms or their copies appear. Platonists obviously felt that prime matter could fulfil this role. Plato’s gold analogy, which is close to Aristotle’s examples in his account of matter, will have confirmed them in this view. Bodies, starting from the most elementary ones, are then constituted out of bits of prime matter and form (i. e., enmattered forms as copies of transcendent forms).

Accordingly, TL probably thinks that Plato’s ‘third entity’ can best be understood as ‘that out of which’ elemental bodies are made, which is indeed what Plato suggests. In this vein it has been argued that Plato considers the primary geometric structures as configurations ‘of’, rather than ‘in’, space (χώρα).¹³¹ This concept of space would then be not unlike the classical concept of prime matter. Yet this may not be all that Plato’s receptacle is supposed to be. For the receptacle is also that through which the elemental corpuscles move.¹³² Some passages indeed suggest that bodies move around in the receptacle as through space.¹³³ TL accepts that the terms ‘space’ and ‘place’ can stand for matter, at least in some cas-

130) Platonists did not fail to point out the links to the *Timaeus* – whereby the term ‘cause’ denotes the demiurge (cf. Phil. 23C9; 26E6–8; 27B1–2): cf. Plut. De an. procr. 1027A, Porph. ap. Simplic. In Phys. 453.31–454.16, and see also our note 22.

131) V. Harte, ‘The Receptacle and the Primary Bodies: Something from Nothing?’, in: Mohr / Sattler (n. 64 above) 131–140, at 134–137; see also Morison (n. 32 above) 115–116. A different view is proposed by Silverman (n. 31 above) 108: Plato needs matter, yet not as a primitive; it is rather the result of the bounding of space.

132) Cf. Algra (n. 35 above) 97–98. Morison (n. 32 above), 115–116, even denies that Plato’s χώρα has the characteristic of being that in which bodies move, as some kind of independently existing, absolute space. This, however, entails serious difficulties for the concept of locomotion, as Morison does not fail to point out. According to Morison, χώρα is extension of a body, ‘taken in such a way that it is the matter of something’ (118), the substrate in which qualities inhere. The extension of a body is indissociable from it (121), and is the part of the greater χώρα (the receptacle tout court) singled out by a certain shape (115). It is difficult, however, to explain all χώρα-related passages in this way. We therefore accept Algra’s diagnosis according to which the receptacle has both functions.

133) Tim. 49D5; 52E4–53A7; 60B8–C1; 79D5–6.

es (T4). This means that he understands the receptacle primarily in accordance with the Aristotelian idea of matter, as that out of which bodies are made, at the detriment of the aspect of the receptacle as that through which bodies move. It is not clear whether he fully realises the force of Aristotle's criticism, who argued that we need place in addition to matter (and argues that Plato's treatment implies an identification of the two).¹³⁴ Whereas matter is indissociable from a particular body, place should also be that which is occupied by different bodies in turn.¹³⁵ It is therefore not a good idea to equate matter with place. If there is to be motion, hylomorphic bodies would seem to need something additional in which or through which they move. It would be wiser to keep the notions of matter, place, and arguably also space, distinct, instead of equating them. Fortunately, TL does not make the mistake of equating the three terms. As we have seen he also uses the words space and place, without defining them, in a sense that is close to Aristotle's 'place'. He appears to consider this the normal usage and to regard the other meaning they allegedly have, that of matter, as the exception (T4). Without explicating it, he keeps the notions of space and place distinct from that of matter whenever he says that elemental bodies, which have matter/χώρα as an inseparable part, travel to a different place (τόπος) or space (χώρα).¹³⁶ This clearly implies two different meanings of χώρα: travelling physical bodies take their χώρα₁ with them when they exchange one χώρα₂ for another χώρα₂.

TL moreover integrates hylomorphism with the Pythagorean theory of principles, whereby matter and form were considered as belonging to the two legs of twofold parallel series. According to this theory, an interaction of limit with a principle of unlimitedness can be observed on all levels of reality. Form and matter are what these two principles are called in their physical manifestations. The integration of hylomorphism into the account of the *Timaeus* has the advantage that it disarms some of Aristotle's most damaging

134) Cf. D.R. Miller, *The Third Kind in Plato's Timaeus*, Göttingen 2003, 197, 220.

135) For Aristotle's analysis of the problems raised by Plato's theory, understood in such a way that the extension underlying things as their matter is indeed meant to be place, see Morison (n. 32 above) 113–119.

136) Cf. n. 44.

criticisms against geometric atomism. We have been able to show that TL must have been aware of these criticisms, as he apparently uses *De caelo* 3 in rephrasing the physical account of the *Timaeus* (T27). Yet we do not know whether for TL this constitutes an important reason to rewrite the *Timaeus* within a hylomorphic framework. Possibly, he posits the hylomorphic constitution of the elemental bodies only because of his general commitment to a Neopythagorean dualism of principles. Even so, the blending of theoretical contexts has tremendous consequences.

TL's account of the qualities is much shorter and simpler than Plato's, and as a consequence several aspects remain unclear. Like Plato he presents the geometric properties of the polyhedra as basic, and the elemental qualities as derived. His list of qualities is taken from the *Timaeus*, yet partially inspired by other sources, especially insofar as concerns their order. He preserves the physicalist framework of the *παθήματα*, without adding anything theoretically significant, yet showing an awareness of the fact that some of these *παθήματα* are the result of a complex interaction of an agent and a patient, based on their material constitution and the differences of quantity and shape. He is also aware of the fact that what these properties are is in part determined by the sense by which they are perceived. TL's account of the properties heavy and light, though succinct, goes beyond Plato. It distinguishes between a first perception and a rational understanding of these properties. This understanding is based on the Aristotelian account of cosmic places (above and below) and directions (up and down) which is markedly different from Plato's.

On several occasions we have detected similarities between TL and works by Aristotle, most conspicuously *DC*, *Met.* 1, but also *Phys.* and *Meteor.* 4. Whereas some of these similarities may be coincidental or due to other sources, together they strongly suggest that TL had access to at least some of these texts. This is historically interesting, as it is evidence for an early Platonic reception of these texts. Unfortunately, we do not know exactly how early.