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Two Theories of Change in Plato's *Timaeus*

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abstract

In Plato's *Timaeus*, two different theories—the Receptacle theory and the geometrical particle theory—are presented to explain change in the natural world. In this paper, I argue that there is tension between the two theories. After examining several possible solutions for this tension, I conclude that Plato does not present it as something ready to be solved within the dialogue but, rather, as something to be *understood* in a way that maintains both theories. Finally, I also argue that the contrast between the two theories in the *Timaeus* derives from a similar contrast in the *Phaedo*.

Keywords: *Timaeus*, Receptacle, *Phaedo*, Sellars, Russell, cause

I. Introduction

In Plato's *Timaeus*, two different theories—the Receptacle theory and the geometrical particle theory—are presented to explain change in the natural world. The Receptacle is, in short, a domain where many different qualities appear, and qualitative changes of an object can be explained by different qualities entering the domain one after another. In contrast, the theory of geometrical particles explains qualitative changes of objects in terms of the gathering and scattering of particles, which seem fairly stable themselves. At first glance, these two theories appear to be competing or even conflicting explanations of changes of natural objects. However, if these prima facie impressions are on the right track, *why does Plato offer these two different explanations about the same kind of event––changes of natural objects—side by side?* In this paper, I would like to show that there is some tension between the two theories, since, to my knowledge, many interpreters of the *Timaeus* have not paid adequate attention to the relationship between the theories of the Receptacle and geometrical particles. By examining each theory, I argue that there is tension between the two theories. I then explore ways to solve this tension, proposing that Plato does not present it as something ready to be solved within the dialogue but, rather,

as something to be *understood* in a way that allows both theories to be maintained. Finally, I also argue that the contrast between the two theories in the *Timaeus* derives from the contrast in the *Phaedo* between Socrates' second voyage and the method of natural philosophers that Socrates heavily criticises.

II. Context and Conflict of the Two Theories in the *Timaeus*

The Receptacle theory is introduced in the second part (47e–69a) of Timaeus' cosmology.[1] At the beginning of the second part, Timaeus presents the difficulty of describing the natural world, as in the *Cratylus* 439d-440d and the *Theaetetus* 181c-183c. However, in this dialogue, he gives us 'the safest' answer to this problem by introducing his new theory of the Receptacle. However, the Receptacle has been the source of much

[1] Timaeus' cosmology can be divided into three parts (cf. Cornford 1937: 32–33). The first part (29d–47e) is mainly the teleological explanation, which explains how the universe was created by 'Intellect' (νοῦς); the second part (47e–69a) is the mechanical explanation, which explains how it was created by 'Necessity' (ἀνάγκη); and the third part (69a–92c) is the combination of both. While these two types of *aitiai* are contrasted as 'ἀνάγκη' and 'νοῦς' at 47e-48a, and 'τὸ μὲν ἀναγκαῖον, τὸ δὲ θεῖον' at 68e, the former is also called 'συναίτια' ('co-causes' or 'auxiliary causes') at 46c-d.

controversy since antiquity because it can be interpreted in many ways. These interpretations fall into roughly two categories: one considers the Receptacle a space or medium, and the other considers it the *substratum*. The former view leads to a phenomenalistic understanding of the natural world because, according to this view, Timaeus decomposes our ordinary concept of 'things' into space (the Receptacle) and fragmental qualities (for example, fire or water) which enter and retreat from the space. In contrast, the latter view leads to confirmation of some stability of the natural world as, according to this view, Timaeus introduces the Receptacle as the *substratum*, and 'things' keep their identities because of it even if their qualities continue to change.[2]

In connection with this ontological contrast, some of those who adopt the spatial view suggest that Timaeus is here hinting at a new way of describing the natural world. Lee argues that the spatial view leads to a new way of description based on an ontology that expels *things* (or substances). In place of the ordinary subject-predicate scheme, which attributes qualities to things, a new way of description, 'such and such Forms are imaged

[2] For the spatial view, see, for example, Cherniss 1954; Lee 1966, 1967. For the *substratum* view, see, for example, Zeyl 1975, 2000; Guthrie 1978: 264–269.

here and there', is suggested.[3] In this type of scheme, *things* (substances) are dissolved in space (the Receptacle), and the subject expressions referring to these particular things are reduced to locative adverbs such as 'here' and 'there'. Lee mentions Bertrand Russell's late view, which leads to this type of language that lacks particulars.[4] In contrast, those who take the Receptacle as the *substratum* argue that the Receptacle theory serves as ontological grounds for ordinary subject-predicate expressions.[5]

Although I adopt the spatial view of the Receptacle for several reasons, I cannot go directly into the details of the controversy in this paper as it is a highly complicated issue which demands a careful reading of the text and deserves a substantial paper on its own.[6] In the remainder of this section, instead, we will see that there is some sort of tension

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[3] Lee 1966: 363. See also Fujisawa 1974: 54.

[4] Lee 1966: 367, n.64. Russell (1940: 97) says 'I wish to suggest that "this is red" is not a subject-predicate proposition, but is of the form "redness is here"; that "red" is a name, not a predicate; and that what would commonly be called a "thing" is nothing but a bundle of coexisting qualities such as redness, hardness, etc'.

[5] Zeyl 1975: 128; Gregory 2000: 211; Kahn 2013: 188; Broadie 2011: 187.

[6] I have argued for the spatial view in detail in Nakamura (forthcoming). Cf. Cherniss 1954; Lee 1966, 1967; Zeyl 1975, 2000, 2010.

between the Receptacle theory and the geometrical particle theory, regardless of which view we adopt for the Receptacle.[7]

After he finishes his explanation of the Receptacle, Timaeus immediately introduces the geometrical particle theory (53c sqq.).[8] In his pursuit of the ultimate elements of three-dimensional bodies, he assumes that the two kinds of right-angled triangles are 'the originating principle of fire and of the other bodies (σωμάτων)' (53d). In the following, I argue that such elemental triangles and the regular solids that are composed of them are 'things' or substances[9] in the natural world, and seemingly function as the subjects of

[7] The reason I believe we should take the spatial view is somewhat indirectly shown in the context of the relationship between the *Timaeus* and the *Phaedo* in Section IV below.

[8] I consider that the particle theory starts at 53c and continues to the very end of the dialogue (92c). On the other hand, the Receptacle theory (48e-53c) is completed within the second part and does not seem to have any effect on the arguments in the third part.

[9] I have been using the word 'substance', but of course Plato does not use any Greek word corresponding to it (for example, οὐσία) in this context. Moreover, I do not intend any implications unique to Aristotelian οὐσία. By 'thing' or 'substance' in this article, I generally mean what 'πρᾶγμα' means or what is contrasted with Forms or immanent characters in the theories of change in the *Phaedo* (70c-72e, 102b-103c). In these contexts of the *Phaedo*, πρᾶγμα (or what is contrasted with Forms or characters) is the entity which

various attributes. The geometrical particle theory is a theory of bodies and starts with the reconstruction of bodies (σώματα) or 'things' from geometrical figures (53c4 ff.). Therefore, its very purpose is to introduce bodies or 'things' into the natural world, and it clearly conflicts with the spatial view of the Receptacle that Timaeus expels 'things' from the natural world. Besides this, there are some passages in the particle theory which show us more specific evidence that they serve as 'things' in the natural world.

First, it is clear that, under the geometrical particle theory, geometrical figures, whether polyhedra or elemental triangles, function as the subjects or carriers of several different attributes.

> Let us now assign to fire, earth, water, and air the structures that have just been given their formations in our speech. To earth let us give the cube, because of the four

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can endure through qualitative changes from being F to being un-F without losing its identity, whereas Forms or immanent characters cannot admit any qualitative changes. I believe that this contrast between πρᾶγμα and Forms or characters generally corresponds with the contrast between τοῦτο (this) and τοιοῦτον (such) in the Receptacle theory (*Ti.* 49c7–50a4), although τοῦτο refers to a 'thing' only in the unenlightened minds of the ordinary people, and the Receptacle theory reveals that it actually refers to this part of the Receptacle where τοιοῦτον enters and exits.

> kinds of bodies earth is the most immobile and the most pliable—which is what the solid whose faces are the most secure must of necessity turn out to be, more so than the others. Now of the [right-angled] triangles we originally postulated, the face belonging to those that have equal sides has a greater natural stability than that belonging to triangles that have unequal sides, and the surface that is composed of the two triangles, the equilateral quadrangle [the square], holds its position with greater stability than does the equilateral triangle, both in their parts and as wholes. (55d-e7)[10]

These geometrical figures are clearly the subjects of different qualities and cannot be regarded as mere random gatherings of qualities. In this passage, some other qualities are said to arise because of the geometrical figures of regular polyhedra. Therefore, the combination of geometrical figures and other qualities is not a mere collection of qualities. For example, 'being a cubic figure with a square basis' and 'being stable' are not a bundle of two qualities that have equal footing. In this case, the cube is clearly the subject, and stability is an attribute. In the same way, mobility and lightness are attributed to the

[10] All the translations of the *Timaeus* in this paper are from Zeyl 2000.

tetrahedron (fire) in the following passage (56a6-b2), and it is equally clear that the tetrahedron is the subject and mobility and lightness are attributes of it.

It is true, however, that Forms and immanent characters (or qualities in general in contrast to 'things') have internal structures among them, and therefore, certain Forms and immanent characters themselves necessarily have certain qualities or attributes. For example, the Form of Fire (or an immanent character of fire) is necessarily hot and the Form of snow (or an immanent character of snow) is necessarily cold (cf. the *Phaedo* 103c sqq.). However, of course, these facts do not imply that those Forms or immanent characters are 'things' that persist through qualitative changes. Therefore, some people might object, Timaeus' description that the cube is stable and the tetrahedron is mobile and light does not imply that they are 'things' in contrast to qualities.

Indeed. Actually, Buckels, who adopts the spatial view of the Receptacle rather than the *substratum* view and argues that ordinary 'things' are reduced to bundles of tropes (quality instances) in the Receptacle theory, continues to argue that the triangles in the geometrical particle theory are also tropes (therefore, qualities), but not 'things'.[11] I can

[11] Buckels 2018: 14-19; Buckels 2020: 98 with n.13.

agree with Buckels on many of his points on the Receptacle theory,[12] but not on the geometrical particle theory for several reasons:

While I believe that Plato deals with the three levels of flux of the natural world, Buckels seems to reduce them into two.

(1) the total flux, where we cannot refer to even qualities in the natural world; Plato rejects the flux to this degree, because it leads to the total destruction of language and knowledge (cf. *Tht.* 182d; *Cra.* 439d).

(2) the intermediate flux, where 'things' that are supposed to persist over quality changes are rejected, but sensible qualities (ta toiauta) can persist at least for some time so that we can refer to them; Timaeus deals with the flux to this degree in the Receptacle theory.

(3) the least flux, where 'things' that can persist over quality changes are admitted in the natural world; The change of the natural world is explained by gathering and scattering of the 'things' (particles) that are fairly stable themselves. Timaeus deals with the flux

[12] As Buckels does, I adopt the spatial view of the Receptacle based on Cherniss' reading of the Receptacle passage (49c-50a). However, I do not agree with him on every interpretative point of the Receptacle theory. See Nakamura (forthcoming) for my objections to his interpretation of the Receptacle passage.

to this degree in the geometrical particle theory.

While, as I am arguing in this section, I believe that we should distinguish (2) [the flux in the Receptacle theory] from (3) [the flux in the particle theory], Buckels seems to fuse them together. First, by arguing that the particles in the geometrical particle theory are tropes (therefore qualities), but not 'things', he approximates (3) to (2). Second, by emphasizing that the tropes discussed in the Receptacle theory include tropes of natural kinds (therefore 'things'; for example, fire, water, ox, and human being), he seems to argue that Plato's bundles of tropes are fairly stable, almost as stable as to function as 'things' after all.[13] Thus, he also seems to approximate (2) to (3) by this procedure.

I cannot agree with Buckels on those points. As to the first approximation, I believe that the particles in the geometrical particle theory are 'things'. The clearest evidence for it is that Timaeus describes even the elemental triangles as persisting through qualitative changes; more precisely, he describes their ageing:

So while a living thing's constitution is still young, and its elemental triangles are

[13] Buckels 2020: 106, says 'In the end, Plato does not seem to think that sensible particulars *are* changing in all ways at all times, only that they *may* change in every way at any time. To summarise, particulars … are identical to bundles of tropes' (his italics).

> "fresh from the slips," as it were, the triangles are firmly locked together, even though the frame of its entire mass is pliable, seeing that it has just lately been formed from marrow and nourished with milk. Now when the triangles that constitute the young living thing's food and drink enter its body from the outside and are enveloped within it, the body's own new triangles cut and prevail over these others, which are older and weaker than they are. The living thing is thus nourished by an abundance of like parts, and so made to grow big. But when the roots of the triangles are slackened as a result of numerous conflicts they have waged against numerous adversaries over a long period of time, they are no longer able to cut up the entering food-triangles into conformity with themselves. (81b–d)[14]

[14] Some people (for example, Gregory 2000: 203) interpret that ageing is explained in this passage *only* by the loosening of the bonds between the elemental triangles rather than the intrinsic deterioration of the elemental triangles themselves. Timaeus, however, mentions 'fresh' triangles and 'older and weaker' triangles here, and it seems plausible to consider that these old and new triangles are elemental rather than those composed of them. For, whereas the particles of fire, air, water are constructed with equilateral triangle planes larger than the elemental triangles, the particles of earth are constructed with six *square* planes composed of the elemental triangles (55bc). Therefore, it is likely that

Something that persists through qualitative changes is nothing other than a thing or a substance, in contrast to a Form, immanent character, or quality in general.[15] According to the spatial view of the Receptacle, however, it is such a particular thing, which is usually believed to persist through qualitative changes (for example, from being fire to water), that the Receptacle theory questions. Therefore, I cannot agree with Buckels that the triangles in the particle theory are qualities or tropes.[16]

Of course, I do not mean that those geometrical particles are ordinary physical things. For it seems that Plato is not merely trying to reach the ultimate physical objects (atoms) by dividing things; rather, he is reducing physical things ultimately to non-physical

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Timaeus means internal conditions of the elemental triangles when he refers to the old and new triangles. The same story seems to apply to 82d and 89c.

[15] Cf. *Phd.* 70c-72e, 102b-103c. See n.9. Actually, Buckels (2018: 18) himself acknowledges this problematic passage of the ageing triangle, and attempts to solve this problem for his interpretation by saying that 'we can allow some groups of τὰ τοιαῦτα to be more stable than others'. His evidence for it is that the heavenly bodies are more stable than others, but it is unpersuasive because the issue of whether it is a thing or quality is not a matter of degree.

[16] I will return to this criticism against Buckels from a different perspective in the next section. See n. 33 and n. 34.

(metaphysical) elements. Nevertheless, I believe that those particles are not the qualities or characters, but things (πράγματα) that can persist through qualitative changes in contrast to Forms or immanent characters that cannot undergo any change.[17]

As to the second approximation of Buckels' argument, I think that this move almost nullifies Plato's original motivation of introducing the Receptacle theory. It is true that Plato's theory of Forms accommodates not only Forms of qualities, but also those of natural kinds and 'things',[18] and that the bundles of qualities (Form images) in the Receptacle theory are not random gathering of qualities (for example, the image of Fire

[17] I believe that this contrast between πρᾶγμα and quality which is introduced by Socrates at *Phd.* 70c-71c, 103bc eventually leads to the problem of whether the soul should be regarded as a substance (thing) or a Form in the final proof of the immortality of the soul (I think that this controversial issue among interpreters was intentionally set by Plato himself). The soul is not a physical object but can be regarded as a particular thing or substance in contrast to a Form or a character (for example, D. Frede 1978 argues that it is a substance).

[18] Buckels 2020: 101: 'There is explicit mention of a Form of Fire (*Tim*. 51b8), just as Fire was mentioned in the *Phaedo* alongside Snow (*Phd*. 103c10-e5). We also find Man and Ox in the *Philebus* (15a1-7)'. Plato even mentions Forms of Couch and Table (*R*. 596b sqq.).

necessarily has the qualities of hotness and brightness). However, Buckels' argument that the bundles of qualities in the Receptacle theory are, after all, as stable as we ordinarily believe particular 'things' are[19] seems to be incompatible with the context where the Receptacle is introduced. For, the Receptacle is originally introduced to deal with the problem of referring to rapidly changing phenomena: we cannot refer to this (this 'thing' or this region of the Receptacle) as 'fire', 'water', or anything, because it can appear to be different at any minute.

Buckels says 'As long as a bundle retains an image of one natural kind Form, then it also retains all the Form images included with that natural kind Form image' and 'the same bundle may persist through time even through the loss of tropes and change of location. Since a given bundle may have several natural kind Form images, it persists until it loses the final one'.[20] Therefore, Buckels would think that, even if an ox changes its colour, the bundle of tropes retains its identity as long as it keeps the trope of ox. However, in such a situation, the assumption that a particular (say, white-coloured) image

[19] See Buckels 2020: 104-106. He says 'we should identify particulars with bundles, rather than distinguishing the two, at least if we want to follow Plato' (106).

[20] Buckels 2020: 103-104.

of Ox perishes and another particular (say, grey-coloured) image of Ox appears in the same region of the Receptacle seems to fit the context of the Receptacle theory. For, as Buckels and I agree, Timaeus introduces the Receptacle as space rather than as the *substratum* to solve the problem of referring to rapidly changing phenomena, whereas his interpretation above virtually regards images of natural kind Forms (such as an image of Ox) as *substrata*.[21] Furthermore, in any context of his dialogues, Plato does not suggest to award such a special status to the 'natural kind Forms' in contrast to quality Forms.

For these reasons, I claim that we should appropriately distinguish the two degrees of flux, (2) and (3) above, and that the geometrical particle theory conflicts with the spatial view of the Receptacle, according to which things or substances are expelled from Timaeus' ontology.

What, then, about the *substratum* view of the Receptacle? Obviously, the conflict in this case is not as tense as in the case of the spatial view, but there is still some sort of tension between the two theories. In the Receptacle theory, qualities do not stay long in

[21] To put it in different way, Buckels' interpretation would allow us to call one and the same image of Ox 'white' at one time, but 'grey' at another, although it obviously contradicts the spirit of the Receptacle theory.

the Receptacle (the *substratum* in this view), and are soon replaced by other qualities, whereas it is clear in the geometrical particle theory that the two kinds of triangles (as well as other geometrical figures composed of them) persist as *substrata* for a fairly long time even if these triangles can undergo some changes during a certain period of time (that is, ageing, *Ti*. 81b–d).[22] Namely, while in (the *substratum* view of) the Receptacle theory, the simple matter free from any qualities functions as *substratum*, in the particle theory, the geometrical figures seem to function as *substrata* and cause many kinds of changes in the natural world (for example, the sensation of hotness in us or certain mechanical changes such as decompositions of other figures).[23]

III. Two 'Images' of the World in the *Timaeus*

Assuming that there is some sort of tension between the two theories, how should we address this? I propose that we cannot solve the tension between the two theories in such

[22] Gregory (2000: 191–5), who favours the *substratum* view over the spatial view of the Receptacle, argues that there exists this sort of inconsistency between the two theories. See n.35 below.

[23] For example, *Ti*. 56d, 61d-e.

a way that either theory is reduced to the other, but that we can understand the tension while still preserving both theories by investigating their different statuses.

As we have seen so far, the two theories disagree, not only in their explanation of how things change in the natural world, but also (at least for the spatial view of the Receptacle) in their fundamental ontology of what kind of entities the natural world contains. Furthermore, we can acknowledge that the two theories are generally in contrast on the following points: (1) the Receptacle theory provides a picture of the world consisting of entities captured from the first-person, subjective, relative point of view (that is, sense experience from a specific perspective),[24] whereas the geometrical particle theory provides a picture of the world consisting of entities captured from the third-person,

[24] Remember that the whole argument of the Receptacle theory regards the sensible appearances to the perceiver which *are referred to as 'this' (in vain, though) from his perspective*. Russell (1940: 108) calls these words—'I', 'this', 'here', and 'now'—'egocentric particulars' and says 'no egocentric particulars occur in the language of physics'. They do not occur in the geometrical particle theory, either. Of course, however, I do not mean that the Receptacle theory itself is meant to be a subjective theory (since the setting of the theory demands Forms and the Receptacle), but only that it explains how a subjective worldview is provided.

objective, hypothetical reasoning (that is, scientific and mechanical theory, which is highly mathematical). In addition, (2) the Receptacle theory mainly deals with ordinary-sized entities (that is, phenomena of fire, air, and so on), which we can perceive through our sense organs, whereas the geometrical particle theory mainly deals with micro entities (that is, geometrical particles), which are not perceivable by our sense-perception, but are postulated by some theory.

In the following, I propose, *only for the sake of argument*, to compare this contrast between the two theories to the contrast between the 'manifest image' and the 'scientific image', which Wilfrid Sellars presented, because I believe that Sellars' attempt to reconcile these two images *can be our guide* for understanding the relationship between the two theories.[25]

In his 'Philosophy and Scientific Image of Man', Sellars argues regarding the tension between the two 'images' of the person and the world and his attempts to reconcile them.[26] Although they can allow a range of interpretations, it is clear that the contrast

[25] To my knowledge, the only interpreter who mentions Sellars' two 'images' in the interpretation of the two theories in the *Timaeus* is Charles Kahn 2013: 198.

[26] Sellars 1963: 1-40.

between these two images largely corresponds to that between the two Timaean theories in (1) and (2) above. Namely, typical objects in Sellars' manifest image are middle-sized objects such as tables, chairs, or ice-cubes, which have colors (or 'secondary qualities' in general), whereas typical objects in his scientific image are imperceptible particles, *postulated* in scientific theories,[27] such as electrons, atoms, or molecules, which do not have 'secondary qualities'.[28]

Since each of these two images claims to be the true and complete account of the world,[29] they inevitably clash with each other. Sellars examines three options for dealing

[27] Sellars 1963: 7.

[28] Some people might say that if the basic entities in what Sellars calls the 'manifest image' are everyday objects such as a table or a chair, then the manifest image does not seem to correspond to Timaean Receptacle theory, which expels 'things' from its ontology. Moreover, whereas the manifest image itself seems to be a subjective worldview, the Receptacle theory itself is not such a view but a theory that explains such a view (see n.24 above). I am willing to concede that there are, naturally, many significant differences between Sellars' contrast and Plato's. What I would like to propose is to use Sellars' arguments on his two 'images' *as our guide* for understanding the relation between the two theories in the *Timaeus*.

[29] Sellars 1963: 25.

with this conflict: (S1) a dualism in which scientific objects are contrasted with manifest objects, but both are preserved; (S2) a naturalism, which abandons the reality of manifest objects in favour of the exclusive reality of scientific objects; and (S3) an instrumentalism, which emphasises the merely 'calculational' status of scientific theories in contrast with the primacy of the manifest image.[30] Sellars agrees with neither naturalism nor instrumentalism and is also not satisfied with a simple dualism.[31] However, what, then, about the two Timaean theories? Timaeus also does not seem to adopt either 'naturalism' or 'instrumentalism', since, I believe, neither theory can be reduced to the other.

(T3) Indeed, some commentators of the *Timaeus* have argued that geometrical particles are, after all, images of Forms that are reflected on the Receptacle.[32] If

[30] Sellars 1963: 26, 38-9.

[31] Rather, Sellars (1963: 38-40) proposes to pursue a 'stereoscopic' vision, in which we *join* the manifest image to the scientific image by unifying 'space of reasons' and 'space of causes', although he does not give us exact details of the process. Of course, the contrast between 'reason' and 'cause' was originally developed by Plato in the *Phaedo* (95e–99d), and the unification of them (νοῦς and ἀνάγκη) can be found in the third part (69a–92c) of Timaeus' cosmology (see n.1 above).

[32] See Zeyl (2000: 127, 129), Silverman (1992: 109), and Buckels (2018: 14-19; 2020:

understood in this way, the geometrical particle theory would be reduced to the Receptacle theory, rather than vice versa. However, this alternative does not seem to work out. In the Receptacle theory, Timaeus explicitly says that the images of Forms that appear in the Receptacle are *sensible* images (49d, 50d, 51a, 52a), but in the geometrical particle theory, he clearly says that each individual particle is too small to see by itself (56c).[33]

Of course, it is not logically impossible to imagine that these tiny particles do not *appear to us* but *come into being* in the Receptacle without being perceived by anyone because of their smallness. However, if taking the analogy between Timaean and

98).

[33] Buckels (2018: 14-19; 2020: 98) most extensively argues that triangles in the particle theory are images of the Form, Triangularity, although he is well aware that Timaeus never explicitly says so (2018: 17). The only textual basis for his thesis is that Timaeus mentions a gold triangle as an example of Form image (to toiouton) at 50a5-b5, 3 Stephanus pages before he introduces the particle theory (53c sqq.). I do agree that there are Forms of geometrical shapes and their perceivable images (such as a triangle made of gold) in Timaean ontology, but it does not seem to suggest that the *unperceivable* triangles postulated in the particle theory are Form images (ta toiauta) that are discussed in the Receptacle theory, especially when Timaeus never even mentions any Forms, let alone the Form of Triangle, throughout the particle theory.

Sellarsian contrasts seriously, such a proposal turns out to be preposterous. For, it would demand that, to take Sellars' favourite example, molecules of H_2O or some dye-stuff that a pink ice cube consists of have the same *qualia* of pink color as the ice cube has.[34]

If we would like to insist on the primacy of the Receptacle theory, it might be more promising to conduct a less direct reduction of regarding the geometrical particles as some

[34] Sellars 1963: 26; Sellars 1981: 66-90. To use an example by Timaeus (61d-62a) for our purpose, this proposal would demand that each geometrical particle of fire with its sharp angles should have the *qualia* of hotness in the same way as the ordinary sensible fire that we perceive. Silverman (2002) and Buckels (2018) seem to admit that at least there is some gap of explanation between qualitative and structural properties of, say, Fire, although they both argue that triangles in the particle theory are images of the Form of Triangle. Buckels (2018: 23, n.16) notes that 'He [Silverman] thinks that there is no essential connection between a certain arrangement of geometrical form-copies … and a certain grouping of "traditional" form-copies (hot, yellow, fire, etc.). Thus it is a coincidence that quantitative and qualitative form-copies always fit together…But I think Silverman (esp. 249f) makes too much of distinguishing geometrical from traditional Forms'. While Buckels tries to nullify the gap in his way, I am sympathetic to Silverman on this, as I am arguing here. Cornford (1937:190) also says 'It [Form of Fire] cannot be identified with the pyramid, the geometrical shape of the fire corpuscle. When we look at a fire, we do not see or think of pyramids'. See also Buckels 2018: 23, n.17.

useful instruments to predict phenomena rather than regarding the geometrical particles as appearances on the Receptacle. Indeed, Timaeus repeatedly emphasises the hypothetical or provisional status of the particles (53d, 54ab) and the theory itself (that is, a 'likely story'). However, the hypothetical status of scientific theories does not necessarily indicate instrumentalism, and there is no other hint to suggest that geometrical particles have an instrumental status.

(T2) On the other hand, some commentators of the *Timaeus* have argued that the geometrical particle theory is more fundamental than the Receptacle theory. Indeed, as to the issue of the interchangeability of the elements, the geometrical particle theory seems to be more dominant than the Receptacle theory. Whereas in the Receptacle theory it is said that *we believe* (ὡς δοκοῦμεν) or *it appears* (ὡς φαίνεται) that all of the four elements transform into one another in a cycle (49bc), this appearance proves to be wrong (οὐκ ὀρθῶς φανταζόμενα, 54b8) in the geometrical particle theory because, unlike the other elements, earth consists of a different type of triangles (55e, 56d), and, therefore, earth cannot transform into the other three elements. This episode strongly suggests that the geometrical particle theory somehow revises the Receptacle theory.

However, such a minor technical revision is not strong enough as evidence that the entire Receptacle theory is *reduced* to the geometrical particle theory. The small revision of the Receptacle theory does not mean that its whole framework is *reduced to* or *replaced by* the geometrical particle theory.[35] First, the Receptacle is mentioned again in the geometrical particle theory (57c), although what is mentioned here is the function of driving the four elements to their own places by its vibration. Second, the Receptacle theory is closely related to the theory of Forms; thus, as an ontology, it seems to be more firmly grounded in Plato's thought than the geometrical particle theory, which is repeatedly said to be 'a likely story' (53d, 54a, 54b, 55d, 56a, 56b, 56d, 57d, 59cd, 68b, 68d,). In the geometrical particle theory, Forms are never mentioned, and the provisional status of particles is emphasised (53d, 54ab). Thus, we cannot adopt this option as long as it is understood in the strong sense that the Receptacle theory is reduced to the geometrical particle theory.

Therefore, the only option left for us seems to be some kind of dualism of the two

[35] Gregory (2000: 192-3) offers a proposal in this line of thought. His solution for (what he regards as) an inconsistency between the two theories is, in brief, to argue that the Receptacle theory has a serious flaw but that it is solved by the geometrical particle theory.

theories. Indeed, some interpreters of the *Timaeus* have proposed a 'dualism'. (T1) It is an attempt to preserve both theories by separating two stages of the universe, to which each theory applies. The theory of the Receptacle starts with the problem of describing the natural world. However, before and after presenting this theory (48b and 52d ff.), Timaeus mentions the chaotic condition *prior to the universe coming to be*. From this structure of the argument, some interpreters argue that the Receptacle theory is concerned exclusively with the radical chaotic condition before the universe came to be.[36] According to this interpretation, the stage of the universe *before* creation is depicted by the Receptacle theory, and the stage of the universe *during and after* the creation is depicted by the geometrical particle theory. In this view, the issue of the two theories being incompatible does not arise.

The problem with this interpretation is that it trivialises the difficulty of phenomenal flux in Plato's thought. The difficulty of describing phenomenal changes is a very important problem for Plato, which he often discusses in his other dialogues (that is, *Tht.*

[36] Lee (1966: 349–52) even argues that the whole section of the Receptacle theory, 48e–52d, stands apart from the remainder of the work. See also Cornford 1937: 181.

181c–183c and *Cra.* 439c–440d). Therefore, it would be awkward if he were to limit the problem to the stage that existed only before the universe was constructed.[37] Moreover, if we take seriously the analogy with Sellarsian contrast and believe that the Timaean argument partly deals with the tension between the subjective worldview from a certain perspective and the objective worldview constructed by a mathematical theory, then it is clear that this diachronic interpretation cannot be any help.[38]

However, there is another way to maintain dualism, and Plato actually seems to suggest it. (T1') It is suggested by a difference of meta-languages which describe the status of each theory. On the one hand, when describing the particle theory, Timaeus repeatedly says that it is a 'likely story', as we are seeing. However, when explaining the

[37] In addition, as is often pointed out, this difficulty seems to be regarded as our ongoing problem because it is explained with the present tense. Cf. Kahn 2013: 196, n.26.

[38] Other than (T1), (T2), (T3) just examined above, some proposals on the relationship between the two theories in the *Timaeus* are offered by Broadie (2011: 195, 235-6) and Silverman (1992: 87–8, 103). Their proposal is basically that the two theories complement each other, and thus they do not seem to recognise the tension at issue in the first place. Although I do not oppose their proposal that *some parts* of the one theory complement *some parts* of the other, we have to deal with the tension anyway.

Receptacle, he never uses expressions such as 'likely story' or 'likely myth' but, rather, emphasises that it is 'the safest' (ἀσφαλέστατα μακρῷ, 49d; μακρῷ πρὸς ἀλήθειαν ἀσφαλέστατον, 50b) and 'the most correct' (ὀρθότατα, 51b) way of describing the natural world.[39]

Indeed, immediately before introducing the Receptacle into his argument, Timaeus mentions the status of a 'likely story':

> Let us therefore at the outset of this discourse call upon the god to be our savior this time, too, to give us safe passage through a strange and unusual exposition (ἄτοπος καὶ ἀήθης διήγησις), and lead us to a view of what is likely. (48d4-e1)

However, this seems to suggest that Plato intentionally excludes the Receptacle theory from the likely story, since his argument of the Receptacle is a preliminary passage *before* arriving at a likely story but not a likely story in itself.

Having said that, I must also admit that, indeed, Timaean cosmology is characterised as a 'likely story' or 'likely myth' from the beginning (29c-d), and it thus seems

[39] Cf. Lee 1966: 350-1.

implausible to see some specific part of it alone being excluded from the likely story.[40] In addition, Timaeus explains that the reason his cosmology is only a likely (εἰκώς) story is that it deals with the unstable image (εἰκών) of the everlasting reality (29b-d), and the Receptacle theory is the theory of how to describe this unstable image. Therefore, perhaps we should not regard the 'likely story' and the 'safety' in the Receptacle theory as mutually exclusive concepts. Rather, we should regard the safe descriptions based on the Receptacle theory (that is, calling only the phenomenon or character of F 'F')[41] as the safest part of the likely story.

Nevertheless, it is true that when Timaeus presents the particle theory, its likeliness or provisional status is emphasised, and that when he introduces the Receptacle, its main purpose is to secure the safest way of describing the becoming. I believe that this shows the contrasting characteristics of these two theories, even if the likeliness and the safety

[40] This point was raised by anonymous referees for *Dialogoi*.

[41] In addition to this type of 'tautological' statements, statements of the 'such and such Forms are imaged here and there' type might also be regarded as 'the safest' description. See n.3 above.

are not mutually exclusive concepts.[42]

As we saw above, the hypothetical or provisional status of the geometrical particle theory does not imply that it is only an instrument to predict phenomena or that it can be reduced to the Receptacle theory. However, this difference in the tones of the meta-languages suggests, at least, that the two theories are presented with different degrees of

[42] In his famous article on εἰκὼς μῦθος, Burnyeat (2005) presents a detailed analysis of the 'prelude' to Timaeus' discourse (29b1-d3), where the phrase εἰκὼς μῦθος is first introduced: 'On the one hand, (i) accounts exegetic of that which is permanent and stable and manifest to reason are themselves permanent and unchangeable…On the other hand, (ii) accounts exegetic of that which is made to be like that other and so is itself a likeness will themselves be εἰκότες and will stand to those other [type (i)] accounts in the following proportion: as being is to becoming, so truth [ἀλήθεια] is to conviction [πίστις]' (his translation with modification; 147–148). And he argues that the contrast between ἀλήθεια and πίστις here refers to Parmenides' distinction between them (fr.1, 29–30). Thus, he further argues that εἰκὼς λόγος is a reasoning which lacks the rigour of mathematical proof or Parmenidean logic (153–154). Aside from this, I believe that Timaeus' response to the difficulty of describing the phenomenal flux in terms of the Receptacle is clearly a response to Parmenides' challenge. Then, if these assumptions are on the right track, it seems to follow that the 'safest' route, which attempts to preserve the rigour of Parmenidean logic (by calling only the phenomenon of F 'F'), is contrasted with the εἰκὼς λόγος.

safety. On the one hand, if we take 'the safest' course, we have to adopt the description methods ('the phenomenon or character of *F* is *F*' or 'the Form *F* is imaged here') that we saw suggested by the Receptacle theory. On the other hand, if we focus on the reservation that it is a likely story, we can accept the two kinds of triangles that function as *substrata* in this world, *as a hypothesis*, if not the safest route.[43]

This strategy also suggests a hint of how to understand the general contrasts of (1) and (2) above (pp.18-9) between the two theories. The worldview based on the Receptacle theory is a first-hand, and therefore, in a sense, more secure view, and the worldview based on the geometrical particle theory is a provisional, and therefore, less secure but more informative view. In my interpretation, Plato does not present either type of worldview as reducible to or replaceable by the other, but puts them at different degrees of safety in such a way that we can maintain both.

[43] Of course, by the word 'hypothesis' (or 'hypothetical' which I have used so far) I do not mean to suggest that the particle theory as a likely story has anything to do with Plato's method of hypothesis in his earlier dialogues (cf. *Men.* 86e ff.; *Phd.* 100a ff.; *R.* 510b ff.). There is no hint that the methodological procedure of hypothesis is used concerning Socrates' likely account or anything else in the *Timaeus*.

Of course, Plato and Sellars are not the only philosophers who have argued about the problem of bridging the two types of worldviews discussed in this section.[44] However, this tentative analogy between Plato and Sellars seems to show that an awareness of the issue had already existed in Plato, in a rather different form, though long before modern science aggravated the situation.[45]

IV. Socrates' Second Voyage and Timaeus' Receptacle Theory

In the previous section, we have seen that Plato himself suggests the contrast between the two theories by indicating that the particle theory should be viewed as a 'likely' account, while the Receptacle theory enables the 'safest' account.

In this section, I will argue that this contrast between the two theories in the *Timaeus*

[44] For example, Husserl (1970 [1936]) also famously contrasts 'the geometrised sciences' and 'the life-world' and argues that, since Galileo, the sciences have been geometrised or mathematised and that subjectivity and normativity have been lost from the knowledge. Cf. Kalkavage 2001: 33.

[45] Sellars (1963: 26) also says that Greek atomism already adumbrated the contrast between the scientific image and the manifest image.

developed from the contrast in the *Phaedo* between the method of natural philosophers that Socrates severely criticises (*Phd*. 95e-99c) and Socrates' 'second voyage' (99d-107b). There are several grounds for this thesis.

First, generally speaking, we can see that the geometrical particle theory in the *Timaeus* is some sort of mechanical account which explains phenomenal changes by the gathering and scattering of the elements,[46] just as the method of natural philosophers criticised in the *Phaedo* is the mechanical account which makes prominent use of the addition and division of physical objects.[47] On the other hand, Socrates' second voyage and Timaeus' Receptacle theory have a lot in common as a theory of change, which is deeply involved in the theory of Forms. Indeed, there are some important differences of

[46] Although the particle theory clearly contains some teleological elements in the second part as well as in the third part, it is introduced mainly as the core factor of the mechanical explanation (i.e., the second part: 47e–69a) of his cosmology (see n.1 above).

[47] Cf. *Phd*. 96c8-d5, e7-b3. I believe that the example in the latter passage is not purely mathematical. The process of dividing something into two clearly suggests that Socrates has some physical objects in mind even in this kind of 'mathematical' example. Cf. Menn 2010: 41.

emphasis between Socrates' second voyage and the Receptacle theory,[48] but their basic structure *as theories of change* seems to be the same. Namely, the change in nature is explained by characters or phenomena coming in and out of a place, but these characters or phenomena themselves cannot accept their opposite characters and instead retreat or perish when others approach (*Phd.* 102d-107b; *Ti.* 49e-50a, 52a).

Second, both in Socrates' second voyage and in Timaeus' Receptacle theory, the statements based on each theory are claimed to be 'the safest' (ἀσφαλέστατον) (*Phd.* 100d–e; *Ti.* 49d, 50b). In my view, the reason that the statements based on the second voyage are referred to as 'the safest' is somehow related to that of the Receptacle theory. According to my interpretation, Timaeus says that it is the safest to call not this part of the Receptacle, but such and such phenomenon (a phenomenon of fire, in this case) 'fire'

[48] The most general difference between them is that the second voyage is an aetiology, while the Receptacle theory is an ontology. Another, but a related, important difference is that in (at least the spatial interpretation of) the Receptacle theory, the enduring 'things' are expelled from the basic construction of the universe, but in the context of the *Phaedo*, they are not (*Phd*. 70c-72e, 102b-103c. See also n. 9 above). 'Things' are only expelled from Socrates' aetiology but not completely from his ontology in the final argument of the immortality of the soul.

(*Ti.* 49d3–6).[49] This means that, while it is not safe to call a certain part of the Receptacle 'fire' because it may change to appear as water or air at any minute, it is safe to call a phenomenon of fire 'fire' since it cannot change into any other thing (but only escape or perish). It might not seem particularly informative to call a phenomenon (or character) of fire 'fire', but it is certainly safer than to call a part of the Receptacle 'fire'.

This almost 'tautological' safety naturally reminds us of the safety mentioned in Socrates' second voyage in the *Phaedo*. After confirming the existence of Forms, Socrates claims that it is the safest to say that in terms of the beautiful all beautiful things are beautiful (*Phd.* 100c–e). As Vlastos argues, I believe that this does not mean to suggest any specific *efficient cause* of something becoming beautiful but, rather, means that it is

[49] There is a controversy over the reading of a short sentence (*Ti.* 49d4–6) in the Receptacle passage. According to the normal 'alternative reading', this sentence says that it is the safest to call not this phenomenon but such and such character (the character of fire, in this case) 'fire' (Cherniss 1954; Lee 1967). In contrast, according to the 'traditional reading', it says that it is the safest to call a phenomenal fire not 'this', but 'such' (Zeyl 1975). I basically adopt the alternative construction but understand the sentence as shown above (cf. Nakamura, forthcoming). For the controversy between the traditional and alternative reading, see Zeyl 2000: lvi-lxiii.

analytically safe to say that all F things are F in terms of the F.[50] Of course, this does not look exactly the same as the case of the Receptacle theory, but it seems clear that some kind of logical certainty is suggested by 'the safest' (ἀσφαλέστατον) in both cases.[51]

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[50] Vlastos 1969: 308–9; Burge 1971: 7; Sedley 1998: 117-118. Shorey (1933: 179) calls this type of reasoning 'only a tautological logic'. However, it seems even more tautological to call a phenomenon (or character) of F 'F', as Timaeus demands in the Receptacle theory.

[51] Some interpreters of the *Phaedo* seem to think that this safety is founded on the method of hypothesis. Kanayama (2000: 58) says 'When Socrates describes the *Aitia* Proposition [that it is because of the *F* that *F* things are *F*] as 'the safest' (100D8) or 'safe' (E1), he must be thinking that its safety has something essential to do with the procedures of the method of hypothesis; this is supported by the expression "that safety [*or* that safe thing] of the hypothesis" [101d2] ... too'. I do agree with Kanayama that this safe thesis is one of Socrates' 'hypotheses' (ὑποθέσεις), but I believe that the safety comes from the 'tautological' obviousness of the thesis itself rather than from the procedures of the method of hypothesis or from the other preceding hypothesis that there is something Beautiful, etc., itself by itself (100b5-7). First of all, this preceding metaphysical thesis which hypothesizes the existence of Forms in general does not seem particularly safe (or safer than the 'tautological' thesis), and in fact, Socrates does not call it 'safe'. Second, after presenting this existence thesis, Socrates states the 'tautological' thesis three times: the first version (100c4-6) is highly metaphysical, using the technical term 'μετέχειν', but

Third, both in the second voyage and in the Receptacle theory, this 'safest' method of inquiry is contrasted with the method of inquiring into material *things* that can undergo qualitative changes without losing their identities. As to the Receptacle theory, we have seen in Section II that this is exactly the contrast between the spatial understanding of the Receptacle (which I adopt) and the geometrical particle theory. In the case of the second voyage as well, this point is explicitly stated by Socrates, since at its very introduction it is contrasted with the inquiry into sensible *things* (τὰ πράγματα) via senses and described as the inquiry into *logoi*.[52]

As shown above, it is said in the final argument for the immortality of souls that both

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the second and the third versions (100d7-8, 100e2-3) seem to be focusing on the tautological content of the thesis itself, disregarding its metaphysical aspect (whether the relation between the Form and particulars is παρουσία or κοινωνία, 100d4-6) and even without using 'μετέχειν' this time. Socrates calls only these second and third versions 'the safest' or 'safe'.

[52] 'I was afraid I might be completely blinded in my mind if I looked at things (τὰ πράγματα) with my eyes and attempted to apprehend them with one or other senses; so I decided I must take refuge in propositions (εἰς τοὺς λόγους), and study the truth of things (τῶν ὄντων τὴν ἀλήθειαν) in them'(99e2-6) (translation by Hackforth).

largeness itself and largeness in us can never admit smallness but, instead, retreats or perishes when its opposite, smallness, approaches (*Phd*. 102d–103a). The same is said about heat, coldness, fire, snow, and so on. This is essentially the same as the explanation of change in the Receptacle theory in the *Timaeus*: phenomena such as fire, water, and so on, may come about in the same place in turn, but they retreat or perish when others approach (*Ti*. 49e-50a, 52a).

Therefore, in Socrates' second voyage, which is supposed to inquire into the causes of change in the nature, entities that can have contrary properties (being F and being un-F) are not admitted, *at least as causes*. For example, entities that can be fire at one time but become water at another time are not admitted as causes in this theory. By contrast, sensible *things* that natural philosophers deal with can blind our souls because they appear F at one time but un-F at another time. I believe that those entities that *cannot* have contrary properties *even at different times* are Forms and immanent characters that lack *substrata*, while the entities that can appear F and un-F through time are sensible *things* (πρᾶγμα) with *substrata* (cf. *Phd*. 70c-71c, 103bc).

If we consider in this way the kinds of entities that are admitted in one theory but not

in another, we can make more intelligible the laws that commentators of the *Phaedo* have interpreted as assumed by Socrates in his second voyage. Scholars have interpreted that Socrates assumes the following three laws of *aitiai* (causes) and that he rejects the aetiology of natural philosophers because it is incompatible with them.[53]

If x is an *aitia* for anything being F (whose opposite is un-F),[54]

L1: x must not be un-F (101a8-b2);

L2: x's opposite must not be an *aitia* for anything being F (97a7-b3, cf. 101a8-b2);

L3: x must never be an *aitia* for anything being un-F (101a6-8).

Even though many interpreters have admitted that these laws are assumed in the second voyage, I think that they have not necessarily been so successful at providing any clear explanation of why such peculiar laws of *aitiai* are assumed by Socrates. I propose that these laws are deduced from the following two principles that look more familiar to

[53] The following is a formulation by Kanayama 2000: 54. Cf. Sedley 1998: 121; Annas 1982: 316; Burge 1971: 4–5; Bostock 1986: 137.

[54] I cannot go into the controversy over how to understand the 'opposites' (ἐναντία) here. Whatever it means, it must imply incompatibility at a minimum. See Sedley 2012; Justin 2020.

readers of Plato:[55]

P1: Any *aitia* for anything to be F must be F.

P2: Any *aitia* being F cannot be un-F *even at different times*.

P1 definitely reminds us of the self-predication of Forms[56] (and also somehow reminds

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[55] Kanayama (2000: 65) argues that these three laws of *aitia* are Socrates' 'hypotheses' in addition to Existence Proposition that there is something Beautiful, etc., itself by itself (100b5-7) and *Aitia* Proposition that it is because of the *F* that *F* things are *F* (100c-101c). If this is the case, we might be able to regard P1 and P2 as instances of the higher hypothesis from which the original hypothesis can be deduced (101d).

[56] Whether Platonic Forms are really self-predicative or not is a very controversial topic. However, some interpreters (for example, Teloh 1981: 42-46; Malcolm 1991: 142-158; cf. Burge 1971: 5), having affirmed that (at least some) Platonic Forms are self-predicative, argue that it is partly because Plato implicitly assumes P1 (or the 'Causal Principle' in their words). That is, generally, the causes must have the properties that they cause in other things (the Causal Principle or P1), and Forms are the causes for the other things to have their corresponding properties (*Phd*. 100c); therefore, Forms themselves must have the properties that they cause in other things (the self-predication of Forms). Bostock (1986: 152) somehow argues that L1 may be restated as 'The cause of a thing's being *P* must itself be *P*, and cannot be the opposite to being *P*' (he calls it 'Plato's principle of causation'), which is virtually the conjunction of my P1 and P2 above, although, as I will show below, all of L1-3 can be deduced from the conjunction.

me of a fragment of Anaxagoras[57]), and indeed, some interpreters have pointed out that Socrates might assume P1 as a more general principle, from which L1 is deduced.[58] Indeed, he clearly suggests that the Form of F-ness itself is F (100c, 102de). Additionally, as we just saw above, P2 also seems to be suggested by Socrates as an assumption of his second voyage,[59] but not of the natural philosophers' inquiry into sensible *things*.

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[57] Fr.10: 'For how,' he [Anaxagoras] says, 'can hair come from what is not hair, and flesh from what is not flesh?' (translation by Curd 2007: 23). Curd (2007: 54) says 'The question applies the Eleatic denial of what-is-not to specific entities. Just as what-is cannot come from what-is-not, so what is something cannot come from what is not that thing.' P1 seems to be true of this kind reasoning, too (the *aitia* for anything to be hair or flesh must be hair or flesh itself).

[58] Cf. Burge 1971: 5; Bostock 1986: 152-155; Sedley 1998: 119; Hankinson 1998: 92.

[59] Both largeness itself and largeness in us can never admit smallness but, instead, retreat or perish when its opposite, smallness, approaches (*Phd*. 102d–103a). On the other hand, as Socrates argues here, 'πρᾶγμα' (or whatever is contrasted with Forms or immanent characters here) can be F and un-F: Simmias happens to be larger than Socrates but smaller than Phaedo (102b3-d2), and Socrates himself can accept smallness without losing his identity (102c2-4, e3-5). Therefore, unlike in the Receptacle theory in the *Timaeus*, 'things' are not expelled from Socrates' ontology in his second voyage (see n. 48 above). As P2 says, 'things' are only rejected as *aitiai* but not expelled from Socrates' ontology in the second voyage.

I argue that L1 and L3 can be deduced from the conjunction of P1 and P2 (see below)[60] and that Socrates' second voyage assumes P1 and P2.[61] In contrast, he rejects the method of natural philosophers because it is incompatible with the conjunction of them.[62] For instance, natural philosophers claim that one man is bigger than another because of his head and that the latter is smaller than the former because of that same thing (100e2-101a1). However, [from P1] if a head is a cause for something to be big

[60] Cf. Hankinson 1998: 92.

[61] See *Phd*. 102d: 'not only will largeness itself never consent to be simultaneously large and small, but the largeness in us can never admit smallness, and never consent to be overtopped' (translation by Hackforth 1955:148 with some modifications). This short sentence seems to suggest that Socrates' second voyage assumes P1 and P2. See also *Phd*. 96e-97a.

[62] In fact, it seems that the natural philosophers cannot accept either of them. Contrary to P1, they make something small (that is, a head) a cause for another thing's being big (101a8-b2). As regards P2, Socrates does not explicitly mention it when rejecting their aetiology, but it is quite obvious that their physical and mechanical aetiology is incompatible with it. Furthermore, the way he describes the contrast between the 'thing' (πρᾶγμα) and the Form or immanent character (102d-103c) seems to suggest that their aetiology mainly deals with the 'thing' which can be F and un-F, while Socrates' second voyage only deals with the latter kind of *aitiai.*

(bigger), the head itself must be big. In addition, [from P2] if the head as a cause is big, it cannot become small. Therefore, if a head is a cause for something to be big, it cannot be small (L1; 101a8-b2). However, [from P1] if it cannot be small, it cannot be a cause for something to be small. Therefore, if a head is a cause for something to be big, it cannot be a cause for something to be small (L3; 101a6-8).

As for L2, whether it is deducible from the conjunction of P1 and P2 depends on how we understand opposites (ἐναντία), setting aside whether they are polar contraries, contradictories, converse contraries, or anything else.[63] If we understand 'opposites' as entities with opposite characters that cause opposite results, then, of course, L2 is deducible from the conjunction: [From P1] the cause for another thing being un-F must be un-F, but [from P2] the cause being un-F cannot be F, and [from P1] the cause which cannot be F cannot be the cause for another thing being F (L2).

Likewise, the Receptacle theory in the *Timaeus* seems to abide by assumptions that are somehow similar to P1 and P2, while the geometrical particle theory does not. The main reason we cannot formulate them exactly in the same way as P1 and P2 is that, in

[63] Cf. Sedley 2012; Justin 2020.

the *Timaeus*, Forms and their appearances are not called '*aitiai*'.[64] However, the Receptacle theory seems consistent with something like the following principles:

P1': Any *entities responsible* for anything being F must be F.

P2': Any *fundamental entities* being F cannot be un-F *even at different times*.[65]

Timaeus introduces the Receptacle into his arguments because of the difficulty that the same thing appears to be fire at one time but water at another time (*Ti*. 49b-d). To solve this difficulty, he introduces the Receptacle with the ontology of P2'. Namely, if we do not admit entities that are F at one time but are un-F at another, we can safely avoid calling the same entity 'F' and 'un-F'. Furthermore, it seems plausible to assume that the Receptacle theory is also consistent with P1'. The Form of Fire, for instance, has all the properties that appearances of fire have in an imperfect manner.

In contrast, part of the reason Timaeus calls the geometrical particle theory 'a likely

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[64] Cf. *Ti*. 29a, 46c-e, 47e-48a.

[65] I am not sure if Plato explicitly had P1' and P2' in mind in these specific forms when writing the *Timaeus*, whereas I interpret that Plato had P1 and P2 in mind as higher hypotheses when writing the *Phaedo*. I am just suggesting that, when writing the *Timaeus*, Plato had some general ideas similar to P1 and P2 of the *Phaedo*.

story' but not 'the safest' seems to be that it rejects P2' and admits entities that has a *substratum* and can change from being F to being un-F. From a Parmenidean, and probably Platonic, point of view, admitting entities with *substratum* that can appear interchangeably F and un-F *even at different times* contains some kind of inconsistency.[66] Furthermore, the geometrical particle theory also does not accept P1'. Although the Form of Fire itself must be hot in the perfect manner, the geometrical particles of fire, which are supposed to be responsible for the hotness of phenomenal fire (*Ti*. 61d-62a), are not hot (do not have the *qualia* of hotness) themselves.[67]

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[66] If we interpret, as we have seen so far in this section, that the contrasts between two kinds of theories in the *Timaeus* as well as in the *Phaedo* turn on those principles (P1'&P2'/P1&P2), which somehow deal with the problem of identity of things over time, then we might be able to adjust the difference of interpretations on the *Phaedo* between Sedley (1998), who argues that Socrates assumes the three laws of causation (L1-L3), and Menn (2010: especially 50–53), who argues that Socrates rejects the aetiology of the natural philosophers because it cannot account for identity of things over time, but not because it violates the three laws (cf. Ebrey 2014: 257–258). Contemporary philosophers are also still arguing on the problem of identity of changing objects. Cf. Lewis 1986; Merricks 1995; Sider 2001.

[67] Annas (1982: 318): 'The hotness of fire is explained, in the *Timaeus*, by the properties

Thus, finally, we can return to the question 'Why, in the *Timaeus*, does Plato put the two conflicting theories regarding the same issue (that is, explaining change in nature) side by side?' This is because, I believe, he intended to develop the two kinds of aetiologies that he presented in the *Phaedo*. That is, aside from the difference of contexts in the two dialogues, the Receptacle theory develops from Socrates' second voyage, and the geometrical particle theory develops from the mechanical account of natural philosophers that Socrates himself criticises. In my view, the point in which the Receptacle theory is most improved from the second voyage is that the former is never presented in such a way that readers are misled to take Forms as efficient causes.[68] Indeed, Forms are not called '*aitiai*' in the *Timaeus* to begin with.

On the other hand, the geometrical particle theory is also much improved from its counterparts in the *Phaedo*. In addition to the clearest merit that the particle theory in the

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of triangles, which are not themselves hot. (*Timaeus* 53c-56b, 61 d-e.)'

[68] Many interpreters, including Aristotle, have taken Forms in the *Phaedo* as meant to be efficient causes (*Metaph*. A 9, 99lb3-9; *De Gen. et Corr*. 335b7-16, 18-24). Cf. Annas 1982.

Timaeus contains and cooperates with teleological elements,[69] the fundamental entities in this theory are not *sensible* things that blind our souls but *geometrical* things that are only comprehensible through reason. However, as long as the particle theory explains efficient causes in its mechanical explanation, it has to introduce not only qualities or characters but also entities with *substrata* (that is, things) and, therefore, cannot accept P2'. Geometrical particles, although not sensible, can be F at one time but un-F at another (that is, ageing of particles, *Ti*. 81b–d). As a result, the particle theory remains a likely account. However, it is the price that it has to pay to discuss efficient causes.

V. Conclusion

From the beginning of this paper, I have attempted to make the point that there is some tension over the concept of a 'thing' or substance between the two theories in the *Timaeus*.

[69] For example, at the very beginning of the particle theory the geometrical figures of the four elements seem to be decided from their 'excellence' (53e-54a). Although the third part of Timaean cosmology rarely mentions the geometrical particles (cf. 81b-d, 82d, 89c), it generally depicts the cooperation between the teleological and the mechanical causes (for example, see the explanation of why the mouth is organised at it is at 75d5-e5).

However, from the investigation on the aetiologies in the *Phaedo*, the tension in the *Timaeus* was shown to derive from the tension in the *Phaedo* between Socrates' second voyage and the method of natural philosophers. Just as Socrates' second voyage assumes P1 and P2, the Timaean Receptacle theory assumes P1' (Any *entities responsible* for anything being F must be F) and P2' (Any *fundamental entities* being F cannot be un-F *even at different times*). On the other hand, just as the geometrical particle theory in the *Timaeus* rejects both P1' and P2', the mechanical aetiology of natural philosophers in the *Phaedo* rejects, at least, the conjunction of P1 and P2 (probably both).

Many of interpreters of the *Timaeus* have not recognised or have even explicitly denied the tension between the Receptacle theory and the geometrical particle theory. In contrast, it has been universally recognised that there is serious tension between the two kinds of aetiologies in the *Phaedo* as Socrates himself explicitly emphasises the contrast between them. In the previous section, I showed that the contrast in the *Phaedo* between Socrates' second voyage and the method of natural philosophers overlaps with the contrast in the *Timaeus* between the two theories. Therefore, I believe it is now clear that, between the Receptacle theory and the geometrical particle theory in the *Timaeus*, there

is significant tension worth taking seriously.

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