

## **Aristotle and Some of His Commentators on the *Timaeus*' Receptacle.**

The nature of the receptacle, presented at *Timaeus* 48e-53b, is controversial. It is unclear whether the receptacle is supposed to be matter, or whether it is supposed to be space, or whether it is in some way both matter and space. Plato seems to intend some reform of the way in which we refer to the phenomena, but the nature of that reform is far from clear.<sup>1</sup> Can the evidence of Aristotle help us here? Aristotle and some of his commentators have some interesting and significant things to say about the receptacle and its contents, more perhaps than is generally recognised.

Some commentators believe that the receptacle passage, *Timaeus* 48e-53b, is self-contained and can be taken in isolation from the rest of the *Timaeus*. In my view that is quite wrong. Geometrical atomism (GA) is introduced at 53c. By geometrical atomism I mean the theory that the elements (earth, water, air, fire) can be analysed into three-dimensional particles of definite shape (cubes, octahedra, eikosaedra, tetrahedra, which I shall call 'atoms', in the modern sense), and that these particles can be further subdivided into planes, and that these planes can be further subdivided into one of two types of triangle. GA does not sit entirely easily with the receptacle passage. It may develop or modify the receptacle theory, and certainly it has a considerable bearing on the nature of the receptacle. At the very least we need to think carefully about how the entities proposed by GA relate to the receptacle. What is undeniable is that the rest of the *Timaeus* (53c *ad fin*) discusses the phenomena in terms of GA and not the receptacle. We get an analysis of objects, human beings, human perception, and of qualities as a result of the interaction of objects and human beings, entirely in terms of GA without any mention of the receptacle. In my view we often underrate the importance of GA in relation to the receptacle. It may well be the case that Plato was primarily interested in philosophy rather than science, and that, to us, the receptacle is interesting 'live' philosophy, while GA is merely redundant 'dead' science. However, Plato in the *Timaeus* was interested in at least the broad outlines of a teleological account of the cosmos and humans, and GA is certainly an important and integral part of that. What we find philosophically interesting in the *Timaeus* is no sure guide to what

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<sup>1</sup> There is a large literature on the receptacle. The most interesting recent contributions, which have references to the earlier literature, are K. A. Algra, *Concepts of Space in Greek Thought* (Leiden 1994), D. P. Hunt, 'The 'Problem of Fire': Referring to the Phenomena in Plato's *Timaeus*', *Ancient Philosophy* 18 (1998) 69-79, A. Silverman, 'Timaeian Particulars', *Classical Quarterly* 42 (1992) 87-113, M. L. Gill, 'Matter and Flux in Plato's *Timaeus*', *Phronesis* 32 (1987) 34-53, J. Kung, 'Why the Receptacle is Not a Mirror', *Archiv fur Geschichte der Philosophie* 70 (1988) 167-178.

Plato or the ancients following Plato found important, and hopefully this is something that an examination of Aristotle and some of his commentators may illuminate.

There is an important consideration about Aristotle's evidence in relation to these issues. Undoubtedly the best known passage on the receptacle in Aristotle is *Physics* IV/2 on the supposed identification of space and matter in Plato. There are though passages in *De Caelo* and *De Generatione et Corruptione* and the commentaries on those works which deal with the nature of the entities supposed by GA and their relation to the receptacle, and to how Plato explains changing phenomena. We need to look at and evaluate this less well known evidence as well. Firstly I will give a brief overview of the receptacle passage and some of the main problems of interpretation relating to it. I will then look briefly at the relation between the receptacle passage and GA. We will then be in a position to look at the evidence of Aristotle and some of his commentators on these matters.

## I

The passage which introduces the receptacle comes after one of the great turning points in the *Timaeus*. At 47e Timaeus announces that so far we have looked at the works of reason, and now we must examine the works of necessity as well, and we must take a new starting point. We must attempt to discover the real nature of earth, water air and fire, which some call elements. These ought not to be likened, by a man with any sense, even to syllables. Timaeus is also emphatic that the forthcoming description of the receptacle should be considered only a likely account.

The receptacle itself is introduced as a third thing, where two, forms and that which becomes and is visible, had been supposed before.<sup>2</sup> In order to understand the receptacle, Timaeus tells us, we must examine the problem of the elements.<sup>3</sup> Earth, water, air and fire all appear to be in a cycle of change, perpetually changing into each other.<sup>4</sup> The receptacle is the nurse of all becoming, but its nature is 'difficult and obscure' (*χαλεπὸν καὶ ἀμυδρόν*, 49a3). So:

"Speaking of each of these, to say which ought really to be termed water rather than fire, and which by any name rather than each and all, so as to employ language which is sound and secure, is hard."<sup>5</sup>

This brings us to the first great interpretative crux at 49d:

"Since, then each of these never appear the same, which of them can we assert with confidence and without shame to be this - whatever it is - and not something else? It is not possible, but much the safest way to speak of them is as follows. Whatever we perceive as always changing into something else, like fire, in each case we should not call fire 'this' but 'the suchlike' (*ὡς πῦρ, μὴ τοῦτο ἀλλὰ τὸ τοιοῦτον ἐκάστοτε προσαγεύρειν πῦρ*). Nor should we call water 'this' but always 'suchlike', nor any-

<sup>2</sup> See *Timaeus* 48e.

<sup>3</sup> While this series is on the commentary tradition on the *Timaeus*, it is also important to note that the *Timaeus* is often itself a commentary, if a slightly strange and allusive one, on presocratic philosophy. Here it would seem Milesian ideas are under discussion, perhaps Heraclitus too, and in other places the ideas of the atomists are in the background, Hesiod's theogony looms large and there are allusions to Empedocles (eg. *Timaeus* 44c) as well.

<sup>4</sup> *Timaeus* 49cd.

<sup>5</sup> *Timaeus* 49de.

thing else as this if it had some stability, among the things we indicate by the expressions 'this' or 'that', and think we indicate something; for they slip away and do not wait to be described as 'this' or 'that' or any term which attributes permanence to them."<sup>6</sup>

The critical phrase is *ὡς πῦρ, μὴ τοῦτο ἀλλὰ τὸ τοιοῦτον ἐκάστοτε προσαγεύρειν πῦρ*. The traditional reading is that *τοῦτο*, 'this' and *τὸ τοιοῦτον*, 'suchlike' are competing predicates for the subject *πῦρ*, fire. The phrase then concerns ways in which we may talk of fire, one proper and one improper. So we ought not to call fire 'this', but we can call it 'suchlike'. The alternative reading takes *τοῦτο* and *τὸ τοιοῦτον* to be competing subjects for the predicate *πῦρ*, the sense now being that words such as fire which we now apply to transient phenomena are better applied to more stable entities. So if we are to use 'fire' properly, we should only use it to refer to entities which are 'this', and not those which are 'suchlike'. Both of these interpretations are acceptable renderings of the Greek, and is it not clear from the rest of the receptacle passage which Plato intends.

Having proposed this reform of our language, the gold example is introduced to explain the matter more clearly:

"If someone were to mould all the shapes out of gold and without stopping remodel each of these into the rest, then should he point one of them out and ask what it is, by far the safest answer in truth would be that it is gold, but as for the triangle and the other figures that occur, it would be wrong to describe them as having being, as they change even as we state them, and we should rest content if they willingly receive the description of the suchlike with some safety."<sup>7</sup>

One interpretative problem raised by the gold example is the degree of flux envisaged. Is an outright Heraclitean flux supposed here, where everything is changing in every way at every instant? Or is some milder version of this supposed? How does this relate to conceptions of flux in other later works, most notably the *Cratylus* and the first part of the *Theaetetus*? Is the claim that we can use the term 'suchlike' a viable reform of our language or merely a 'lame plea' as Owen has argued?<sup>8</sup>

A further interpretative problem raised by gold example is whether the receptacle is supposed to be space, or matter. There appear to be a mixture of strongly material and strongly spatial descriptions of the receptacle. The receptacle is referred to as that 'out of which' things are formed.<sup>9</sup> It is like a moulding-stuff or wax, or soft material, and is referred to as mother, nurse, and as an odourless base for perfumes.<sup>10</sup> It is that which is ignified and liquefied to produce phenomenal fire and water.<sup>11</sup> The receptacle is also that 'in which' things occur, is space, is a seat or place, and is also a winnowing-basket, the motion of which sorts

<sup>6</sup> *Timaeus* 49b2-5.

<sup>7</sup> *Timaeus* 50a5-50b5.

<sup>8</sup> See G. E. L. Owen, 'The Place of the *Timaeus* in Plato's Dialogues', *Classical Quarterly* NS 3 (1953) 75-95.

<sup>9</sup> *ἐκ χρυσοῦ*, 'out of gold', *Timaeus* 50a6.

<sup>10</sup> Moulding-stuff or wax (*ἐκμαγεῖον*, *Timaeus* 50c2), soft material (*μαλακῶν*, 50e8), mother (*μητρόι*, 50d3, cf. 51a4) nurse (*τιθήνην*, 49a6, cf. 52d6), odourless base for perfumes (50e).

<sup>11</sup> See *Timaeus* 51b4, cf. 52d5.

the particles it contains.<sup>12</sup> This is a particularly strong spatial metaphor (cf. the vortex of the atomists), as it suggests that the particles are independent of but contained by the winnowing-basket. Clearly there are questions here concerning whether the receptacle can be, or be like all of these things, and how the receptacle relates to what we suppose to be in it.

The receptacle, if it is to be referred to as a 'this', must remain unchanged. The contents of the receptacle though are always changing. If the receptacle is in some way material, and is constitutive of the things in it, can those things change without the receptacle changing? This difficulty is best exemplified by the struggle Timaeus has at 50bc to produce a coherent account of the receptacle and its relation to the things in it. This passage follows on from the gold example where we have been told that the shapes are moulded out of gold. Timaeus tells us that:

"The same account applies concerning the nature of that which receives all bodies. It must always be called the same, for it never departs at all from its own character (*δυνάμεως*). For since it always receives all things, in no way whatsoever does it assume a shape (*μορφήν*) similar to any of the things which enter it."<sup>13</sup>

That must be so, if the receptacle is to be a 'this'. However, immediately following, Timaeus says:

"For in nature it is a moulding-stuff (*ἐκμαγεῖτον*) for everything, changed and shaped (*κινούμενον τε καὶ διασχηματιζόμενον*) by the things which enter it, and because of this appears different at different times."<sup>14</sup>

If the receptacle is constitutive of the phenomena, the conflicting demands look difficult to reconcile, and in other contexts I would argue that the problems here are intractable.<sup>15</sup> One alternative line of interpretation of the receptacle suggests it is like a mirror or a medium.<sup>16</sup> The receptacle is then not constitutive of the phenomena, and is (supposed to be) unchanged by the changing images it provides a medium for. In my view there are good arguments against that sort of view as well, though all I want to do here is point out that there is an issue about the nature of the receptacle. Later on, we will look at an ancient argument against the medium view.<sup>17</sup> The *Timaeus* too seems to recognise that there is a problem here, as it goes on to say that:

<sup>12</sup> 'In which' things occur (*ἐν ᾧ*, *Timaeus* 49e7, 50d1, *ἐν αὐτῷ* 50e5, *ἐν τινι τόπῳ* 52a6, 52b4), space (*χώραν*, 52b4, cf. 52d3, 53a6, cf. 58a7), seat or place (*ἐδραν*, 52b1, 53a2), winnowing-basket (*πλοκάνων*, 52e6, cf. 57c. 88de).

<sup>13</sup> *Timaeus* 50b5-c2. It is interesting to note here that the Greek piles up four negatives in the last part of the sentence and so is highly emphatic.

<sup>14</sup> *Timaeus* 50c2-c4.

<sup>15</sup> See A. D. Gregory, *Plato's Philosophy of Science* (London, 2000) Ch. 8. In relation to the gold example, it is one thing for something to take on an external shape, as with the gold, and retain its character, it is quite another for something to take on many shapes internally and remain one thing with the same character as seems to be required for the receptacle.

<sup>16</sup> See F. M. Cornford *Plato's Cosmology* (London 1937), D. Keyt, 'Aristotle on Plato's Receptacle', *American Journal of Philology* 82 (1961) 291-300.

<sup>17</sup> Gregory (n.15) Ch. 8 especially 223-227.

"The things entering and leaving the receptacle are copies of those ever existent, and are stamped from them in some hard to explain and marvellous manner (δύσφραστον καὶ θαυμαστόν), which we will follow up later."<sup>18</sup>

This he fails to do in *Timaeus* 48e-53b. All we are told is that the receptacle partakes in the intelligible in a most difficult and hard to grasp manner (ἀπορώτατά... καὶ δύσαλωτότατον) at 51b1, and at 51b and 52d that the receptacle is liquefied and ignified.

There is also a problem of what we can say about the receptacle. If it is entirely lacking in character and quality, and is imperceptible, it is difficult to see what we could say about it or how we could come to say anything about it. The way it partakes in the intelligible is 'most difficult and hard to grasp' and 'hard to explain and marvellous'. At *Timaeus* 49a3 it was something difficult and obscure, at 52b it is grasped without sensation by some bastard reasoning and is the subject of a dream. Something that cannot be explained in terms of anything more basic and has no character seems in itself inexplicable.

The receptacle passage then is hardly free from difficulties, and in places it is difficult to discern which of the various possibilities Plato has in mind. In a moment we will see what Aristotle has to say on some of these issues, but first let us look at the introduction of GA at 53c ff. and the difficulties and possibilities that raises.

## II

I want emphasise some of the differences between the receptacle passage and the theory of GA introduced at 53c ff. The receptacle passage stresses a tripartite ontology of form, receptacle, and that which is perceptible.<sup>19</sup> What is created by form and receptacle is specifically visible, sensible and the mother and receptacle of the visible and sensible must not be called by any of the names of the elements.<sup>20</sup> Indeed, the entire discussion of the elements is conducted at the perceptual level. This is emphasised very strongly at 49b-d. We see, so we believe the transmutation of earth, water, air and fire. They form a cycle 'so it appears' and we see things such as fire constantly changing.<sup>21</sup> There is no hint, prior to 53c, of any substructure of the elements. We might also have the impression that the phenomena are the sole inhabitants of the receptacle.<sup>22</sup>

However, the entities of GA are all below the threshold of human perception. *Timaeus* 56bc is quite clear. The atoms of the elements cannot be seen because of their smallness.<sup>23</sup> Only when they form a mass can they be seen.<sup>24</sup> If that is so of the atoms, then *a fortiori* it is true of the planar complexes and the basic triangles. So 53c ff. appears to take a new approach and to postulate some new entities.

<sup>18</sup> *Timaeus* 50c4-6.

<sup>19</sup> See *Timaeus* 48e3 ff., 50c7 ff. and 51a4 ff., and 51e6 ff.

<sup>20</sup> Visible (ὄρατόν 49a1), sensible (αἰσθητόν 52a5, cf. 52a7) and what comes to be in the mother is ὄρατοῦ καὶ πάντως αἰσθητοῦ, 51a4.

<sup>21</sup> 'So it appears' (ὡς φαίνεται 49c9, cf. φανταζομένων 49d1), seeing (καθορῶμεν 49d4).

<sup>22</sup> This is one of the perils of isolating the receptacle passage from GA and the rest of the *Timaeus*.

<sup>23</sup> οὐδὲν ὀρώμενον 56c1-2.

<sup>24</sup> ὀρᾶσθαι, 56c3.

All the phenomena in the receptacle appeared to be subject to change, and the status of earth, water air and fire as elements was undermined. Clearly the atoms, and the complex planes of GA are subject to change, but what of the two basic types of triangle ? Are these truly elemental and are they subject to change ? They are often referred to as the 'stoicheic triangles' which would suggest they are treated as elemental.<sup>25</sup> For GA to work, no change in these basic triangles is required and none is mentioned.<sup>26</sup> Clearly they enter into bonding relations with each other, and have locomotion, but they undergo no change relative to themselves.<sup>27</sup> They undergo *φορά* but not *ἀλλοίωσις*.<sup>28</sup> *Timaeus* 48b rejects the idea of earth, water air and fire being elements, as they are not letters and not even syllables, and indeed if these triangles are the basic elements, earth, water air and fire would not even be syllables. In the gold example, someone is doing the moulding and so bringing about change. What, on a cosmological scale brings about change in the GA theory ? The action of the atoms of the elements on each other work to cut them up and keep them in a flux of changing into each other. Two causes bring about the motion required to keep the elements mobile and in constant contact. There is a like to like principle, which brings like elements together, and there is a compression created by the revolution of the same which forces all the material particles towards the centre of the cosmos.<sup>29</sup>

A further question which arises in relation to GA is the matter of empty space. It is evident that if the elements are tetrahedra, cubes, octahedra and icosahedra they will not pack so as to fill completely fill space. If, when the elements transmute, they break up into their planar surfaces, again there will be empty space created in the time taken from break up to reformation. It is hard to believe that Plato did not recognise these elementary implications of GA. Indeed, in places he does seem to recognise them, as *Timaeus* 81b tells us that: "The blood particles are chopped up within us... so when each of these divided entities moves towards its kin, it fills again the emptied space (*κενωθέν*)."  
We might also look at the use of *κενός* at *Timaeus* 58b3, and *διάκενος* at *Timaeus* 58b5, 60e5, 61a1, 61b1 and 61b4, especially as all these uses are in the context of the vertices of the atoms and how the atoms pack. We have to balance that against *Timaeus* 58a, where we are told that the revolution of the all compresses the elements, and 'allows no void space to be left', and 80c, 'there is no void'. Perhaps best here is O'Brien's solution, that Plato wishes

<sup>25</sup> See *Timaeus* 54d6, 55a8, 55b4, 57c9 and 61a7, cf. *Timaeus* 53c8-9 *δυσὶν ἄρχεται τριγώνων*, 55b and 57c *τῶν στοιχείων*, 55e3-4 *τῶν κατ' ἀρχὰς τριγώνων ὑποτεθέντων*.

<sup>26</sup> When the *Timaeus* explains old in terms of the 'roots of the triangles slackening' (81c) this could mean (i) the complex planar triangles forming atoms disassociate (ii) the stoicheic triangles forming planar complexes disassociate (iii) the stoicheic triangles themselves undergo some change. Only (iii) would entail change in the stoicheics themselves, and (i) or (ii) are the most likely readings here.

<sup>27</sup> We might use here a distinction that the *Sophist* uses between change relative to itself and change relative to other things. This is close to the distinction made by T. H. Irwin, 'Plato's Heracliteanism', *Philosophical Quarterly* 27 (1977) 1-13, between (a-) change and (s-) change. Irwin gives the following definition of aspect (a-) and self (s-) change "x s-changes iff at Time  $t_1$  x is F and at Time  $t_2$  x is not F, and x is not in the same condition at  $t_2$  as it was at  $t_1$ ... x a-changes iff x is F in one aspect, not F in another, and x is in the same condition when it is F and when it is not F." In my view, the stoicheic triangles undergo no s- change.

<sup>28</sup> *Theaetetus* 181c ff. makes a clear distinction between *ἀλλοίωσις* and *φορά*.

<sup>29</sup> See *Timaeus* 58a.

to deny any large scale void, but does not wish to deny small scale voids caused by the failure of the atoms to pack or their transmutations.<sup>30</sup>

If GA does require empty space, and moreover Plato recognised that, then this would appear to go very much against the idea of the receptacle as a material substrate. What then do we do with all the apparently material analogies of the receptacle passage? The receptacle was likened to gold, wax, moulding stuff, mother, nurse, it was that which was ignifed and liquefied, and that out of which shapes were made. There were also the spatial analogies of that 'in which', space, place and winnowing basket. One approach is to try to defuse the material analogies. One can argue that the point of the passages in which they occur is not to draw a material analogy, but to emphasise some other aspect of the receptacle. So it is likened to wax or a moulding stuff because of its characterlessness, while the gold example makes points about flux and reference. Other analogies, such as that of mother, can be re-interpreted. This analogy is supposed to explicate the in which relation.<sup>31</sup> At *Timaeus* 91a ff., we find that the male supplies the seed while the woman supplies the place in which the child grows, but does not supply any matter.<sup>32</sup>

However, it is hard to avoid the impression that the receptacle is in some way material when there are so many analogues which would seem to point us in that direction. My own view is that the receptacle as presented between 48e-53b is indeed both material and spatial, and that there are intractable problems with that, which Plato was aware of. GA is either a new theory or a radical modification of the receptacle theory. It is noticeable that the material analogies peter out in the receptacle passage, and that there are none after introduction of GA at 53c, only strongly spatial analogies. GA requires the idea of empty space, and seems to work best with the stoicheic triangles moving independently of the space they are in. That raises the question of the nature of the entities supposed by GA. I would suggest two options. If we suppose the stoicheic triangles to be impenetrable, then they would be very like the particles envisaged by Descartes. They would be virtually geometrical entities (though extended in two dimensions against Descartes' three) in being immaterial, but would have the property of being impenetrable. Alternatively, they might simply be material in the same way that the particles of the atomists were material. In a moment we will see whether the evidence of Aristotle and some of his commentators recognise that there might be tensions between the receptacle passage and GA, what they think about the nature of the stoicheic triangles, and who they group Plato with.

If there are some significant differences between the receptacle passage and the theory of GA, what might Plato's intentions be? One might be to introduce some entities below the level of human perception which are stable. The phenomena would still be in some form of flux, and we might still need to reform how we refer to them, but the ultimate elements of the world, the stoicheic triangles would be stable. They might even qualify as 'thises'. They are

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<sup>30</sup> Aristotle, Alexander and Simplicius were all well aware of the implications of GA for the existence of a void.

<sup>31</sup> See *Timaeus* 50d1.

<sup>32</sup> Cf. Cornford (n.16) 187 note 1, p. 94 note 49, Gregory (n.15) 219-20 for debate on this matter. Aristotle, *De Generatione Animalium* 763b ff. seems to hold the same view as Plato.

qualitatively stable, and the receptacle qualifies as a 'this' even though it moves.<sup>33</sup> This solves the problem of the arche of the traditional elements of earth, water, air and fire. If the triangles are qualitatively stable but move and bond with each other, the phenomena can change (and so need to be called 'suchlike') while the triangles and the receptacle do not, and so can remain 'thises'. This solves the paradox of how the phenomena might change while the receptacle remains unchanged. While we are still left with little to say about the receptacle (other than that it is space), there is now quite a lot that can be said about matter.

If the stoicheic triangles are stable, then there is the possibility of an interesting comparison. Socrates' dream in the *Theaetetus* employs a letters and syllables analogy, but at the end of analysis by decomposition has the elements unknowable. In the *Timaeus* though, at the end of analysis by decomposition, at least for the physical elements there is a switch to a teleological account of the nature of the elements. Language, and the structure of the world would then both be complex, involving weaving together the elements (cf. *Philebus*). More orthodox views of the receptacle might suggest a subject/ predicate and quality/ substrate view of language and the world.

The bonds between the entities are of variable strengths, with the ability to last a certain amount of time/ wear. This means that Plato can have an account of why some macroscopic entities are more transient than others, up to and possibly including the permanent stability of the heavenly bodies, which are put together with indissoluble bonds.<sup>34</sup> So in my view Plato does not have a perpetual rapid flux of the objects of sensation, but actually has a quite sophisticated account of the degrees of longevity complex entities might have.

I have emphasised the differences between the receptacle passage and GA. One could, of course, try to minimise those differences. It may be though that there are some intractable differences between the two passages. If so, do we try to interpret GA in such a way that it fits with the receptacle passage? Or ought we to try to interpret the receptacle passage in such a way that it fits with GA? Or ought we even to let those differences stand and recognise the receptacle and GA to be somewhat different theories? This is a point which requires further consideration, but I point out the latter two possibilities, as there has been a tendency, where potential differences have been recognised, to assume the first option. I would emphasise that GA is important for Plato in the *Timaeus*, and that there appear to be some significant differences with the receptacle passage. It is not clear what the nature of the stoicheic triangles is, nor is it clear quite what their relation to the receptacle is. So can the evidence of Aristotle and some of his commentators help to clarify these matters? It will be interesting to see which they consider to be the dominant theory.

### III

There are some specific questions I would like to focus on. According to Aristotle:

- 1) Are Plato's 'stoicheic triangles' the basic entities, and are they indivisible?
- 2) How does Plato relate to Leucippus and Democritus?
- 3) What use does Plato make of a material receptacle?

<sup>33</sup> The receptacle shakes its contents; see *Timaeus* 52de, 57c and 88de.

<sup>34</sup> ἀλύττοις... δεσμοῖς, *Timaeus* 43a2,



- 4) What is the relation between the stoicheic triangles and the receptacle ?
- 5) Does Plato envisage a material receptacle ?
- 6) Is Plato's analysis of change in terms of the receptacle or GA ?
- 7) Does GA require empty space ?
- 8) What is the nature of the entities supposed by GA?
- 9) Is the receptacle or GA the dominant theory ?

Let us begin with *De Generatione et Corruptione* I/2. Aristotle is here conducting a survey of views on generation and destruction, and tells us that:

"The starting point for all of these things is the question of whether things come to be, change, grow and undergo the contraries of these because the primary, basic entities are indivisible magnitudes (τῶν πρώτων ὑπαρχόντων μεγεθῶν ἀδιαιρέτων). Or is no magnitude indivisible ? It is important which view we take. If there are these magnitudes, are they bodies, as with Democritus and Leucippus, or planes, as in the *Timaeus* ? To resolve into planes but no further is illogical, as we have said elsewhere."<sup>35</sup>

It is important, in Aristotle's delightfully emphatic phrase τῶν πρώτων ὑπαρχόντων μεγεθῶν ἀδιαιρέτων, that for Plato there are primary, basic entities which are indivisible magnitudes, and that these are the planes. The general context here is significant too. Aristotle, just before this passage, tells us that:

"Those who construct everything out of one element must of necessity say that genesis and destruction are alteration. For the substrate (τὸ ὑποκείμενον) always remains the same and one, and it is this we say undergoes alteration."<sup>36</sup>

That seems reasonable enough, but given that Aristotle has recognised that, and that in other places he refers to the receptacle as a ὑποκείμενον, it is highly significant that instead of placing Plato in this group he places him with the atomists. This is not an isolated instance. At the beginning of *De Generatione et Corruptione* I/2, where Aristotle is critical of Plato but places him with those, such as Democritus, who deal with unqualified generation and destruction. He also says that:

"For concerning the existence of atomic magnitudes, they say otherwise the triangle itself would be many, while Democritus appears to have been persuaded by more germane arguments."<sup>37</sup>

<sup>35</sup> Aristotle, *De Generatione et Corruptione* I/2, 315b24-32.

<sup>36</sup> Aristotle, *De Generatione et Corruptione* I/1, 314b1-4. Aristotle's definition of an element is (*De Caelo* III/3 302a15-19) 'Let an element of a body be that into which other bodies can be divided, and is present potentially or actually (we can decide which later), and which itself cannot be divided into other kinds. Something like this is what all men in all cases wish to say is an element.'

<sup>37</sup> Aristotle, *De Generatione et Corruptione* I/2, 316a11-14.

I have no intention of trying to unravel what Aristotle might have meant by 'the triangle itself', but I would emphasise that throughout *De Generatione et Corruptione* I/1 and I/2 Aristotle groups Plato with the atomists in a significant manner.<sup>38</sup>

Aristotle is fond of saying that to analyse as far as these planes but no further is illogical.<sup>39</sup> He has various arguments here, concerning weight and whether the solids envisaged by GA can be packed together without empty space occurring. He also has the general argument that there is no reason, if one is going to conduct this sort of geometrical analysis, for stopping at planes. Planes are composed of lines and lines of points, according to Aristotle, in exactly the same manner that solids are composed of planes. There seems to be no reason why solids are divisible but planes are not. So too Aristotle it seems entirely arbitrary to halt this analysis at planes.<sup>40</sup>

In *De Generatione et Corruptione* I/8, Aristotle discusses how acting and being acted upon occur. He discusses the views of Leucippus at length, and then says:

"Plato differs from Leucippus in this manner. For Leucippus the indivisibles are solids, while for Plato they are planes. For Leucippus they are determined by an indefinite number of shapes, for Plato by a definite number, though both say that the indivisibles are determined by shapes. Indeed it is out of these things that coming to be and dissolution occur, and according to Leucippus there are two ways in which this may happen, on account of the void and contact, for in this way each breaks up, and according to Plato on account of contact alone, for he says that the void does not exist. We have dealt with indivisible planes (τῶν ἀδιαίρέτων ἐπιπέδων) in a prior discussion."<sup>41</sup>

Again, Aristotle groups Plato with the atomists, but here we get some interesting contrasts. Both have indivisibles which are shapes, but Leucippus has an indefinite number of solid shapes, Plato a definite number of planes. Behind that difference is an important dispute about principles. According to Simplicius:

"Leucippus supposed there to be an infinite number of atoms that are always in motion and have an infinite number of shapes on the grounds that nothing is such rather than such."<sup>42</sup>

Such a view was rather an anathema to Plato, who held that there could be a teleological account of a limited number of basic particles:

"We must be eager then to bring together the best four types of body, and to state that we have adequately grasped the nature of these bodies. Of the two triangles the isosceles has one nature, the scalene an unlimited number. Of this unlimited number we must select the best, if we intend to begin in the proper manner. If someone has singled out anything

<sup>38</sup> Philoponus, *On Aristotle On Coming-to be and Persishing* 27, 1 ff.

<sup>39</sup> The reference to a previous discussion is probably to *De Caelo* III/1 299a ff.

<sup>40</sup> Philoponus, *On Aristotle On Coming-to be and Persishing* 164, 5 ff.

<sup>41</sup> Aristotle, *De Generatione et Corruptione* I/8, 325b25-34.

<sup>42</sup> Simplicius *in Physics* 28.8.

better for the construction of these bodies, his victory will be that of a friend rather than an enemy. We shall pass over the many and postulate the best triangles."<sup>43</sup>

That is one aspect of a broader dispute between Plato and some of the presocratics about whether we ought to explain our current cosmos in terms of a multiplicity of accidents, or as the result of teleological ordering. Other aspects of this are the dispute between Plato and the atomists as to whether there are many cosmosi or one teleologically ordered cosmos,<sup>44</sup> and the dispute between Plato and Empedocles over whether there were many accidental by products before viable species occurred, or whether life began with single, teleologically ordered species.<sup>45</sup> One objection one might raise against the idea of material stoicheic triangles is that this would bring Plato too close to the atomists who he clearly objects to in a fundamental manner. The key point at issue though between Plato and the atomists is whether the order of our world is accidental or the result teleological design.

#### IV

Aristotle changes his approach slightly in *De Generatione et Corruptione* II/1. Aristotle is reviewing opinions on the arche of bodies, and says that:

"It may be agreed that it is correctly said that the primary arche, ie. the stoicheia are those which from whose changes (whether by association or dissociation or some other process) generation and destruction occurs. But those who think that there is one matter (*μίαν ὕλην*) beyond those we have spoken of, which is corporeal and separable, are in error. For it is impossible that such a body could exist without perceptible contraries. This indefinite, which some say is the arche, must of necessity be light or heavy, or cold or hot."<sup>46</sup>

One's first impression is that Anaximander is the target here, but Plato is in Aristotle's sights as well. He then goes on to say:

"What is written in the *Timaeus* is not well defined. It is not at all clear if the allreceiving (*πανδεχέης*) is separate from the stoicheia (*χωρίζεται τῶν στοιχείων*) and he makes no use of this after saying it is a substratum (*ὑποκείμενον*) prior to the so-called elements, just as gold things are made out of gold. This though is not well expressed if it is put in this manner, for of the things which change, or are generated and destroyed, it is not possible to name these things out of that which they are generated, though at any rate he says that by far the truest way is to say that each of them is gold. He

<sup>43</sup> Plato, *Timaeus* 53d4-54a6.

<sup>44</sup> On this see Gregory (n.15) Chapter 1.

<sup>45</sup> I would agree with Mueller (I. Mueller, *Plato's Geometrical Chemistry and Its Exegesis in Antiquity*, in Suppes, Moravcsik and Mendell (eds.) *Ancient and Medieval Traditions in the Exact Sciences: Essays in Memory of Wilbur Knorr* Stanford (2000), pp. 159-176) pp. 159-160, 163 that Plato's primary aim in the geometrisation of the primary bodies was not to create a mathematical physics. However, I would disagree that the *Timaeus* presents an 'Ableitungssystem' ('the natural world is in some sense derived from the intelligible', p. 161). Rather, in my view Plato's first aim is a proto-realist philosophy of science and a teleological physics (on this see Gregory (n.15) pp. 5-10, 13-16 *et passim*), which then has implications for geometrisation/ mathematisation and the comprehensibility of the natural world.

produces an analysis of the elements which are solid as far as planes, though it is not possible for the nurse (τὴν τιθίνην), the primary matter (τὴν ἕλην τὴν πρώτην), to be the planes."<sup>47</sup>

The first sentence and a half I take to be fair comment. What is written in the *Timaeus* is not well defined, as many scholars have found. It is not clear if the stoicheia, by which I presume Aristotle means the stoicheic triangles, are separate from the all-receiving. Aristotle is somewhat careless with the terms he attributes to the *Timaeus*. Plato does use πανδεχές but does not use ὑποκείμενον.

What is highly significant here is that according to Aristotle, Plato makes no use of the all-receiving after saying it is a substratum. That too is fair comment, as Plato's explanations of the natural world, humans and perception are all in terms of GA with no mention of the receptacle.

Aristotle's phraseology here is also interesting, and perhaps significant. Aristotle says that Plato 'makes no use of', which is reminiscent of what Plato has Socrates say about Anaxagoras in the *Phaedo*, both in terms of phraseology and nature of the criticism:

"I saw a man not making any use of intelligence (νῦν οὐδὲν χρώμενον), nor assigning to it any responsibility for the arrangement of things, but using as causes air and water many other absurd things."<sup>48</sup>

I take the criticism here to be that Anaxagoras proposes an entity that he makes no use of. Aristotle makes a similar criticism of Anaxagoras in the *Metaphysics*:

"Anaxagoras makes use of mind as a contrivance for the original ordering of the world, and when he is in aporia from attempting to say from what cause something necessarily is, then he brings this in, but otherwise he makes anything other than mind the cause of events."<sup>49</sup>

So perhaps this comment on not making use of the receptacle is quite barbed. It is worth noting, in relation to some passages we will look at in a moment, that Aristotle was well aware of the gold example of *Timaeus* 50a ff.<sup>50</sup> It is also significant that Aristotle is adamant that 'the nurse, the primary matter' cannot be the planes. Plato does use nurse,<sup>51</sup> but does not use ἕλη. Aristotle gives no argument why this should be so, but it is clear that as far as he is concerned there is a considerable problem concerning the relation of the entities of GA to the receptacle. Finally, it is interesting that Aristotle associates 'nurse' and 'primary matter'. One might argue that nurse is not supposed to be a material metaphor, but the receptacle is a nurse because it rocks the cosmos like a nurse would rock a child, as at *Timaeus* 88d. However, Aristotle does not interpret nurse in that way, and simply associates nurse with matter, and so too he takes the gold example as a material metaphor.

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<sup>46</sup> Aristotle, *De Generatione et Corruptione* II/1, 329a5-13.

<sup>47</sup> Aristotle, *De Generatione et Corruptione* II/1, 329a13-24.

<sup>48</sup> Plato, *Phaedo* 98b8-9.

<sup>49</sup> Aristotle, *Metaphysics* A4, 985a18-21.

<sup>50</sup> Aristotle paraphrases rather than quotes here though.

## V

Philoponus' commentary on *De Generatione et Corruptione* is interesting in that it displays no surprise or comment on Plato being grouped with Leucippus and Democritus.<sup>52</sup> Philoponus is also quite explicit in telling us that:

"The triangles, ie. the primary elements, he [Plato] said were indivisible, since these things were not divided into other, more primitive things."<sup>53</sup>

In relation to Aristotle's claim at Aristotle, *De Generatione et Corruptione* 329a15 ff. that the nurse/primary matter could not be the surfaces, he says:

"Plato was not so weak at geometry as to think that body could be dissolved into surfaces, rather he was talking of physical surfaces, i.e. corporeal ones, which had depth as well. And clearly things like this also have matter in them; so in Plato's view the things that come to be are not without matter."<sup>54</sup>

Clearly that it is interesting in relation to one of the possibilities I outlined above, that the stoicheic triangles may be matter. What Philoponus sheds less light on is how a material conception of the receptacle relates to these material stoicheic triangles.

Alexander of Aphrodisias deals the question of the nature of the stoicheic triangles in *Quaestiones* 2.13: "Against the Platonists who say that it is the shapes and forms of bodies that are put together from the triangles, not the bodies themselves."<sup>55</sup> He says that:

"If what underlies the simple bodies is the triangles (for it is from these first [of all] that [the simple bodies] have their coming to be, according to [the Platonists], and it is into these ultimately that [they have their] resolving), the triangles are the matter of the bodies, and a certain kind of putting together of a certain number of these is their form."<sup>56</sup>

Alexander gives the following argument against the idea that the triangles play the role of form rather than matter. If there is matter underlying the triangles, which they supply form to, then all the elements would be able to transmute into each other, including earth into the rest contrary to what Plato says. Matter which now has an isosceles form imposed on it (i.e. that of the stoicheic triangles which make up earth and only earth) could at some other time have a half-equilateral form imposed on it (i.e. that of the stoicheic triangles which make up the other elements). If so, that very same matter could at one time be earth, and at another the other elements. So Alexander concludes:

<sup>51</sup> See *Timaeus* 49a6, 52d6 and 88d6.

<sup>52</sup> See eg. Philoponus, *On Aristotle On Coming-to be and Persishing*, 6, 5 ff. 21, 30 ff., 25, 5 ff. 27, 1 ff.

<sup>53</sup> Philoponus, *On Aristotle On Coming-to be and Persishing* 162, 11-13, Williams' translation. (C. Williams, *Philoponus On Aristotle On Coming-to-be and Perishing* (London 1999, 2 vols.), *ad loc.*).

<sup>54</sup> Philoponus, *On Aristotle On Coming-to be and Persishing*, Williams' translation (n.52).

<sup>55</sup> Alexander *Quaestiones* 2.13, 58,1 ff. Sharples' translation (R. W. Sharples, *Alexander of Aphrodisias Quaestiones 1.1-2.15* (London 1992) *ad loc.*).

<sup>56</sup> Alexander *Quaestiones* 2.13, 58,14 ff. Sharples' translation and brackets.

"Since [Plato] denies that they change into one another in a similar way, he clearly makes the triangles their underlying matter."<sup>57</sup>

This is a strong argument, and I would add that if the triangles are in motion but their matter is not, then the matter must be changing its form all the time. One reply might be that Plato only meant that the triangles which constitute earth cannot be arranged to form the other elements, but it would be undeniable that the same matter could be (part of) different elements.

We should though treat the evidence of the commentators after Aristotle with considerable caution. Some seek to make Plato immune from Aristotle's criticisms, while Simplicius, in a passage discussing GA and the receptacle adopts views 'in order that Plato agrees with himself, and Aristotle with Plato'.<sup>58</sup> According to him, Plato's view is that 'The shapes are made from planes, the planes from matter and forms.'<sup>59</sup> Simplicius quotes extended passages from *Timaeus* 53c ff. and seems well versed in the main ideas of GA. He is aware of Alexander's argument about transmutation, and quotes him.<sup>60</sup> He also quotes the *Timaeus Locrus* as saying that the *archai* of what comes to be are the underlying matter and the forms.<sup>61</sup> Simplicius in the *Physics* commentary has no doubts that the receptacle is supposed to be material as well as space and place.<sup>62</sup> He also expresses the view that the triangles have depth several times,<sup>63</sup> citing this as Proclus' view as well. However, he also takes the view that the triangles come apart in order that earth can transmute into the other elements and vice versa, as is Aristotle's view, and a point on which Aristotle criticised Plato.<sup>64</sup>

Philoponus, in some passages, took the view that triangles were indivisible in the sense that if one divides a triangle (from a vertex with a straight line) all that is produced is more triangles (they cannot be divided into other shapes), but divisible in the ordinary sense.<sup>65</sup> The agenda here is to save Plato from Aristotle's criticism concerning indivisible lines. However, this view is untenable as an interpretation of the *Timaeus*. Firstly, it would allow transmutation from earth to air, water or fire and vice-versa, as it would be possible to divide an isosceles into a half-equilateral and remainder or a half-equilateral into an isosceles and remainder. The *Timaeus* though is quite specific that there is no transmutation between earth and the other elements, and nor is there any indication that there are any non isosceles, non half-equilateral remainders. Secondly, if all triangles are divisible into further triangles, the *Timaeus* ought not postulate two basic types of triangle nor should it assign any particular triangular shape to them. Yet the *Timaeus* makes a great show of hypothesising two

<sup>57</sup> Alexander *Quaestiones* 2.13, 58, 26 ff. Sharples' translation and brackets.

<sup>58</sup> Simplicius *in De Caelo*, Heiberg 644.7-8.

<sup>59</sup> Simplicius *in De Caelo*, Heiberg 638.24-5.

<sup>60</sup> Simplicius *in De Caelo*, Heiberg 640.9-12.

<sup>61</sup> Simplicius *in De Caelo*, Heiberg 641.11-14, cf. *Timaeus Locrus* 97e ff.

<sup>62</sup> Simplicius *in Physics* Heiberg 539.11, cf. 545, 24-25.

<sup>63</sup> See e.g. Simplicius *in De Caelo*, Heiberg 646.22-23, 648.19-20, 656.22-25.

<sup>64</sup> See Simplicius *in De Caelo*, Heiberg 644.10 ff.

<sup>65</sup> See Philoponus, *On Aristotle On Coming-to be and Perishing* 27,8 ff., cf. Simplicius *in De Caelo*, Heiberg 684.19 ff. Mueller (n.45) p. 169 calls this kind indivisibility.

specifically shaped types of triangles as the basic constituents,<sup>66</sup> and frequently refers to them as *stoicheia*, an entirely inappropriate term if they are indefinitely divisible.<sup>67</sup> The *Timaeus* also hypothesizes the two basic shapes as the best shapes, yet if they are divisible into an indefinite number of different triangular shapes that teleological thrust will be lost, as will the essence of Plato's objection to the Leucippus and Democritus approach to the shapes of particles.

The later commentators have a good deal of interest to say about the nature of GA, but in each case we need to ask what their agenda is in relation to the criticisms that Aristotle made of GA.

## VI

Now let us look at *Physics* IV/2, where Aristotle asserts that Plato identifies space and matter. The context here is an investigation into the nature of place and space. Aristotle states that:

“Plato identifies matter (*ύλην*) and space (*χώραν*) in the *Timaeus*. For that which participates and space are one and the same. His account of that which participates differs in the unwritten opinions, but he is consistent in identifying place (*τόπον*) and space (*χώραν*). For while everyone says that place (*τόπον*) is something, he alone attempts to say what it is.”<sup>68</sup>

Plato does not use *ύλη* or *μεταληπτικόν*. So this is Aristotle's interpretation of what happens in the *Timaeus* rather than anything that Plato says directly. Having said that, Plato does refer to the receptacle (either directly or implicitly) as space, as that in which phenomena occur, and as a seat or place.<sup>69</sup> If we take the material metaphors seriously, as Aristotle does, then it is easy to reach the conclusion that the receptacle is matter, space and place.<sup>70</sup> As Aristotle is only concerned with the nature of space and place here, one can see why he deals only with the receptacle and not with GA or the relation of the receptacle to GA.<sup>71</sup> What may be significant though is that while Aristotle considers Plato to be consistent in identifying space and place, he does not say that he is consistent in identifying matter, space and place. One frustrating aspect of this passage is the reference to the unwritten opinions. Aristotle says a little later in *Physics* IV/2 that:

<sup>66</sup> The *Timaeus* does refer to higher principles than the two basic triangles at 53d, but the language here suggests that these are teleological principles rather than further, more fundamental physical ones; see Gregory (n.15) 40-41.

<sup>67</sup> See Gregory (n.15) 208-210 on letters and syllables in the *Timaeus* and their relation to letters and syllables in other late works.

<sup>68</sup> Aristotle, *Physics* IV/2, 209b11-16.

<sup>69</sup> See n.10 and n.12 for instances of material and spatial metaphors.

<sup>70</sup> Simplicius in *Physics* Heiberg 545.24-25 'In the *Timaeus* he called it matter, which he also called place and space.' According to Simplicius, Alexander agreed that Plato 'called matter space in the *Timaeus*', Simplicius in *Physics* Heiberg 540.20.

<sup>71</sup> Another possibility is that Aristotle's views on the relation of the receptacle to GA developed, and that those expressed in *De Caelo* and *De Generatione et Corruptione* are later and more sophisticated views.

“Plato ought to give an account, if I may make a necessary digression, of why ideas and numbers are not in place, if place is what participates, and whether the receptive is the great and the small, or is matter, as he writes in the *Timaeus*.”<sup>72</sup>

There are several references in Aristotle to the ‘great and the small’, and clearly he considered them significant in Plato’s later philosophy.<sup>73</sup> I have no new light to shed on that vexed subject here, but I would emphasise that Aristotle does not take the receptacle passage to be Plato’s last word on these matters.

## VII

In *De Caelo* III/7, Aristotle conducts a survey of possible ways in which the elements may transmute into each other. Having rejected separation, he considers two more:

“Change of shape, just as a sphere or a cube might be generated out of the same piece of wax (*ἐκ τοῦ αὐτοῦ κηροῦ*), or the analysis into surfaces, as some have said... If this is dissolution into planes, then firstly there is the absurdity of not having all the elements generated from each other, which it is necessary for them to say, and they do say... The reason for this is that they have not well grasped the primary principles, but wish to lead everything towards some predetermined views. For necessarily the principles are equally sensible of sensible things, eternal of eternal things and perishable of perishable things, or more generally, something of the same kind underlies.”<sup>74</sup>

Clearly those who analyse into surfaces are Plato and his followers, especially as their idiosyncratic view that earth cannot transmute into the other elements is mentioned. What is significant here is that Aristotle, who is well aware of the gold example and the rest of the receptacle passage, does not associate Plato with generating shapes as one might out of wax, even though the receptacle passage likens the receptacle to moulding-stuff or wax, or soft material at *Timaeus* 50c-e. GA is treated here as the dominant theory for explaining changing phenomena. It is also interesting that here Aristotle appears to put forward a principle about arche, that they should be like what they are arche of, and criticises Plato for deviating from that principle. Presumably he recognises that for Plato the arche of sensible and perishable things are neither sensible nor perishable.

Aristotle quite clearly recognises that GA entails a belief in empty space, as the following two passages from *De Caelo* III/7 and *De Caelo* III/8 show:

“But even in the dissolution theory, there is the absurdity of the suspension of triangles in space. This happens in the process of changing into one another, because they are composed from an unequal number of triangles. Further, it is necessary for them to say

<sup>72</sup> Aristotle, *Physics* IV/2, 209b33-a2.

<sup>73</sup> References to the ‘great and small’ also occur at *Physics* 187a,18, 189a7, 192a7, 192a12, 203a15, 206b7 and *Metaphysics* 987b20, 988a26, 992a12, 998b10 1083b23, 1085a10, 1087b14 sometimes (as at 987b20) being associated with matter.

<sup>74</sup> Aristotle, *De Caelo* III/7, 305b29-306a11.



that these things are not made out of body. For whatever is generated from planes cannot be said to have been generated from body."<sup>75</sup>

"It is entirely irrational to attempt to assign shapes to the simple bodies, primarily because when placed together they will not fill the whole. It is supposed that there are three plane figures which can fill space, the triangle, the square and the hexagon, and among solids only two, the pyramid and the cube."<sup>76</sup>

It is hard to believe that Aristotle saw these relatively elementary considerations about how the GA atoms pack together and what happens when elements transmute but Plato did not especially as the passages at *Timaeus* 58b ff. and 60e ff. appear to assert the existence of small scale voids for precisely these reasons. Aristotle's criticism of this aspect of GA is hardly surprising, given his own strongly held view that there is no empty space. The next stage of Aristotle's argument in *De Caelo* III/8 is that if the primary bodies cannot have shapes, then:

"It is necessary for that which underlies (τὸ ὑποκείμενον) to be devoid of forms and shapes, so that it will be more capable of modification, just like the all receiving (πανδέχης), as is written in the *Timaeus*."<sup>77</sup>

That again highlights what Aristotle sees as a tension between what is demanded by the receptacle and what is demanded by GA.

### VIII

In *De Caelo* III/1, Aristotle says that he has now treated the first element, and it is time to deal with the others. He reviews what the presocratics had to say about generation and destruction, and then tells us that:

"There are also those who believe all bodies to be generated, being constructed from planes and being dissolved back into planes again."<sup>78</sup>

Once more it is interesting that Aristotle takes this to be Plato's position on the elements rather than anything more specifically to do with the receptacle. Aristotle then singles out this theory for some special criticism. Aristotle creates a dilemma. Either the point has weight, which is absurd,<sup>79</sup> or it does not. If the point does not have weight, as that which has weight cannot be composed of that which has no weight, nothing which is composed of points can have weight.<sup>80</sup> According to Aristotle, planes are as much composed of lines as solids are of planes, and lines are similarly composed of points.<sup>81</sup> He then says that:

<sup>75</sup> Aristotle, *De Caelo* III/7, 306a20-26.

<sup>76</sup> Aristotle, *De Caelo* III/8, 306b2-9.

<sup>77</sup> Aristotle, *De Caelo* III/8, 306b16-19.

<sup>78</sup> See Aristotle, *De Caelo* III/1 298b33-299a1.

<sup>79</sup> See Aristotle, *De Caelo* III/1 299a30-b7.

<sup>80</sup> See Aristotle, *De Caelo* III/1 299b14-23.

<sup>81</sup> See Aristotle, *De Caelo* III/1 299a6-11, cf. 300a2-3.

“Further, if the weight of bodies is due to the number of their surfaces, as the *Timaeus* has it, then it is clear that lines and points will have weight, since these are all analogously related, as we said earlier.”<sup>82</sup> This is related to Aristotle’s standard criticism that it is illogical to analyse as far as planes but no further. The alternative to this is that if points do not have weight, nothing bodily can be constructed out of them, as at least some bodily things have weight.<sup>83</sup> Aristotle has another related criticism here as well, which is that it is absurd to believe that the planes can only be put together along their edges. The planes might in fact combine in many possible ways, and then they will not create the elements. Whether Plato has a defence to that criticism or not, it is significant that Aristotle does not bring up another similar criticism here, that the planes might pass through one another or combine with one plane protruding through another. This at least suggests that Aristotle considered these bodies to be impenetrable to each other.

## IX

One thing I hope to have shown in this paper is that if we hope to reach a fuller understanding of the *Timaeus*’ receptacle, we cannot restrict discussion to *Timaeus* 48e-53b, nor can we deal only with the evidence of Aristotle and his commentators which relates directly to *Timaeus* 48e-53b. There is important material in Aristotle and his commentators which deals with GA and how GA relates to the receptacle. Aristotle is far from being a perfect witness on these matters, of course. He has his own agenda behind each of the passages we have looked at, and as ever, he interprets his predecessors in terms of his own philosophical position. So too his commentators, having their own influences and agendas, have to be taken with due care. Having said that though, they do have some interesting and significant information to impart about the receptacle, GA and their relation.

They agree that for Plato, the stoicheic triangles are indeed the basic entities, and that they are indivisible. Aristotle frequently groups Plato with Leucippus and Democritus, and none of his commentators express any surprise at this. It is highly significant that Aristotle believes that Plato postulates, but then makes no use of the receptacle, and it is quite possible that he does so in a similar manner to that in which Plato criticises Anaxagoras for postulating then making no use of nous. Clearly he believes that GA is the dominant theory which Plato uses for explaining natural phenomena. He also sees that there are problems of the relation between the receptacle and the entities of GA. Quiet simply, he says it is impossible for the receptacle to be the stoicheic triangles.

Aristotle for one takes the metaphors that Plato uses to imply that the receptacle is in some way material. Tempting though it may be to try to explain away Plato’s use of material metaphors, clearly to at least one contemporary Greek philosopher believed these metaphors did imply a material nature of the receptacle. Aristotle is quite clear that GA requires empty space, on grounds of packing the solids and what happens when the elements transmute. Aristotle himself has little to say on the nature of the stoicheic triangles, perhaps because he believes he has given sufficient grounds already for not believing in them. Alexander,

<sup>82</sup> Aristotle, *De Caelo* III/1, 299b32-300a2. See *Timaeus* 56b.

<sup>83</sup> See Aristotle, *De Caelo* III/1 299a26-30.

Philoponus and Simplicius seem quite clear though. The stoicheic triangles are indeed material.

Aristotle treats GA as at least as significant as the receptacle. His commentators also take GA to be an important theory. That is something we need to take on board when we consider the relation of the receptacle and GA from a distance of over two millennia.

