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A Likely Account of Necessity: Plato's Receptacle as a Physical and Metaphysical Foundation for Space

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I. INTRODUCTION

THE CONCEPTUALIZATION OF SPACE in ancient times is often seen as one of the less successful enterprises in the history of philosophy. There are the cosmologies of the Ionian thinkers, but they contain hardly any conceptual work on the notion of space. And the most elaborate account of the dimension of space, at least before Euclid,¹ Aristotle's well-known notion of *topos*, is often regarded as one of the weakest points of his *Physics*.² Aristotle himself—normally eager to provide an overview of the work of his predecessors on a given topic—remarks that there is only one person who had in fact tried to give an account of space before him, namely Plato with his notion of the receptacle in the *Timaeus*.³ However, Plato equated space and

¹Though we are used to talking about Euclidean space as a two- or three-dimensional space in which all the axioms and postulates of Euclidean geometry hold, there is no explicit analysis of space in Euclid. Thus, Aristotle's account can probably be seen as the most elaborate conceptualization of space at least up to Philoponus's and Simplicius's corollaries on place in the sixth-century CE.

²See Morison, *Location*, 1; Sorabji, *Matter*; chs. 11 and 12; and Jammer, *Concepts of Space*, 25, 75, 86–87 (I am referring to the second German edition in order to include all extensions). Aristotle is quite often understood as developing only a theory of place, not of space; see Morison, *Location*, 171. While I do not think this is correct, I cannot go into that dispute here. That Aristotle uses *topos* most prominently and Plato *chôra* does not necessarily mean that they are dealing with different phenomena, as Aristotle himself makes clear in his *Physics* 209b13–17; cf. also Mendell, "Topos," and the discussion of the relation of *topos* and *chôra* below.

³"While all hold place to be something, he [Plato] alone tried to say what it is [*ti esti*]" (209b16–17). The void of the ancient atomists might also seem like a notion of space—as something *in* which the atoms move, see e.g. DK 68 A37, line 29; Aristotle, however, does not consider them as predecessors for his investigation.

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matter according to Aristotle. From the point of view of Aristotelian metaphysics, this means really missing the point of space: matter is not separable from the thing whose matter it is and does not contain it, while, in contrast, space or place can be separated from the thing that it contains (*Physics*, 212a1–2). Accordingly, one of the main points of the debate in the secondary literature on Plato's receptacle is the question whether what we might call Plato's account of space is rather an account of matter, or whether he mixes both notions, matter and space, either consciously or inadvertently.⁴

What I ultimately want to show in this paper is that in the *Timaeus*, Plato gives us a straightforward notion neither of space nor of matter. Rather, he provides what we might call the *metaphysical foundation for space*. Note that this claim is quite distinct from the one that the receptacle is a metaphysical base for the physical world as such, i.e. for the realm of Becoming, whose objects are perceptible by our senses. This latter claim seems to follow directly from Plato's introduction of the receptacle as a third *genos*, besides Being and Becoming, in 52a. What this paper aims to establish, by contrast, is that this third metaphysical *genos* or principle is itself not space,⁵ but a set of potentialities that allows for the development of geometrical and physical space. In this sense I call it a metaphysical foundation for space, which, however, will show some physical features.

In order to carry out this investigation of Plato's receptacle in a methodologically controlled way—determining whether it is really confused, or whether he had a notion that we would comfortably regard as a notion of space, or as a metaphysical underpinning for space—we first have to get clear about what we mean by space. For a possible metaphysical foundation for space will have to be compatible with these criteria, too. The secondary literature on Plato's notion of space interestingly attempts to do without this for the most part. People take firm views on the question whether Plato's notion of the receptacle is a notion of space,⁶ a notion of matter,⁷ or some kind of a mixed notion.⁸ But most people seem to make such claims without ever defining what they mean by space (or, for that matter, what they mean by matter).⁹

⁴So as not to get entangled in the dispute whether Plato's notion has to be thought of as space or matter in a terminologically uncontrolled way, for the time being I will just stick to the term Plato uses when introducing it, namely 'receptacle.' This has become the term used most frequently in the secondary literature (even though it might indeed already evoke a notion of space, in contrast, for instance, to the term 'receiver').

⁵As we might think following the conception of the atomists, who, at least on one reading of their notion of the void, employ a kind of space together with atoms as the two metaphysical principles for what there is.

⁶So, for instance, Cherniss, *The Riddle of the Early Academy*; Cornford, *Cosmology*; and Gregory, *Plato's Philosophy of Science*.

⁷This is a view especially common in antiquity; see Sorabji, *Matter*, 33. In the twentieth century it was taken up e.g. by Sachs, *Die fünf platonischen Körper*.

⁸So, for instance, Algra, *Space*, and Zeyl in the introduction to his translation of the *Timaeus*; see also Zeyl's article on Plato's *Timaeus* in the *Stanford Encyclopedia of Philosophy* where he describes the receptacle as filled space, and his account of the receptacle as matter-filled space in "Visualizing Platonic Space." An extensive overview of the debate can be found in Miller, *Third Kind*. For my purposes, Miller's account can also be seen as a version of a mixed notion.

⁹No doubt, there is a lot of discussion about container and mirror spaces in the secondary literature. Usually, however, no criteria are given for what counts as space, nor is it made sufficiently clear

Granted, giving such a definition is not an easy thing to do. Too many different notions of space seem to be on offer. Do we want to talk about space as the relation of things or as a substance; if the latter, about space as a body like other physical bodies in the world (presumably just somewhat bigger), or as an entity genuinely different from ordinary bodies? Is space to be thought of as a container or as a framework? This list seems to be easily extendable. But this should not allow us to retreat simply to the assumption that our everyday understanding of space without any clarification will do. Accordingly, I start out with a brief account of some very basic criteria for a notion of space. In order to avoid a specialized account and thus presuppose too much, I begin with employing a highly general notion of space tied to topology and the theory of metric spaces. That is, I start out with a modern mathematical notion of space and inquire whether such a notion can provide us with criteria useful for a discussion of Plato.

Hence, I am framing my enterprise in a way distinctively different from the normal debate on Plato's receptacle in the literature: in order to answer the question whether Plato had a genuine notion of space, I think we first have to spend some time working out what exactly is involved in this question. This includes discussing what we might mean when we ask for a notion of space and what kind of problem a notion of space can be thought of as responding to. Some readers might think the preparatory work provided in this paper to be too extensive. However, even if some of the features discussed will turn out not to be prominent in the *Timaeus*, I think this or a similar procedure is the only way to determine systematically whether we have a notion of space on the table or not. Otherwise, we—and other participants in these debates—will be simply resting on whatever our implicit background assumptions may be. We will be assuming that we are talking about the same thing, while we may be talking either past each other or in an unsatisfactorily vague way, as we can see when we look at the often indeterminate talk of mirror and container space in much of the literature (see n. 9 above). Accordingly, this way of framing the problem should help to put the whole debate on a more secure ground, and to provide a basis for further discussion.

In order to establish an even firmer ground for the debate, the investigation of the receptacle focusing on space given in this paper would have to be accompanied by a similar kind of investigation focusing on matter. Especially given twentieth-century notions of matter and space, where the geometrical structure of space can be understood as being dependent on the distribution of matter,¹⁰ we might be

what is to be understood by “container” and “mirror” spaces, which are simply taken up as metaphors. Both metaphors seem to imply bounded spaces and an exterior—a presupposition that leads into problems with Plato's account of the receptacle, as we will see. Jammer (*Concepts of Space*, 2 and 163) seems to think that the notion of a metaphysically independent space conceived as a container was first introduced in the Renaissance. And the thought of space functioning like a mirror raises additional problems for the motions and changes of the phenomena. For a mirror does not allow for any independent motions of the appearances themselves, and what is reflected in the mirror would have to be the unchanging and unmoving Forms. Even if we assumed the mirror to be like water, moving in itself, this could not explain the possibility of elemental change, in which Plato is particularly interested after the introduction of the receptacle. Furthermore, we would get an unhappy mixture of intelligible and physical realms, since what is outside the mirror would have to be the realm of the Forms themselves.

¹⁰And space and matter can be conceived of as being not necessarily distinct ontological entities. Other incentives for thinking of the receptacle along these lines might come from “geometrical” notions of

highly inclined to think that conceiving of something as space might not exclude understanding it also as matter.¹¹ Accordingly, an investigation similar to the one attempted in this paper for space would need to be done for matter. First, we would need to determine central criteria for matter or basic stuff. So we might, for instance, work with a model of matter along the lines of Aristotle's *hylê* as something underlying changes such that out of it (*ex hou*) something else comes into being,¹² or with a more Newtonian picture that takes inertia and weight as crucial features of matter. And then we would have to consider whether at least one aspect of the function of the receptacle could be captured with such a notion of matter.

Unfortunately, this would be a project for a separate paper and cannot be undertaken here. All that I will be able to show methodologically in this paper is that Plato prepares the ground for a notion of space. While I will indicate *en passant* in a few passages below why I think that the receptacle does not give us a notion of matter, I will not be able to give a full-fledged argument here showing that Plato's account of the receptacle necessarily excludes understanding it simultaneously as matter. And in order to keep the main argument as clear as possible, discussion of several debates in the secondary literature will have to be restricted to the footnotes.

2. BASIC CRITERIA FOR SPACE

On the most basic level we can think of the core idea of a space as a collection of elements all connected by paths which themselves comprise elements. Each of these elements within such a space has to have other elements around it in its immediate surroundings, i.e. it has to have a neighborhood.¹³

The structure such a set of elements possesses in a topological space is quite reduced. This is a clear advantage for our investigation, because we thus only have to bring a minimum of assumptions to the Platonic text. Loosely speaking, a topological space is a space from which we have abstracted all kinds of structure we are used to from Euclidean space (or other spaces as, for instance, affine spaces), such as the fact that the fifth postulate holds or that space can be coordinatized.¹⁴

matter that define matter essentially through extension or shape, size, and position, as we find it in Galileo and Descartes.

¹¹See also Harte, *Parts*, 251; and Johansen, *Timaeus-Critias*, 117–18.

¹²See e.g. *Physics* 190b3–4 and 192a31–32. For further characteristics of Aristotle's notion of matter, see e.g. Miller, *Third Kind*, 21. For Aristotle, weight and density do not seem to be features of *hylê*.

¹³Alexandroff (*Elementary Concepts of Topology*, 22) determines a topological space as "a set of arbitrary elements (called 'points' of the space) in which a concept of continuity is defined" that is based on the existence of neighborhood relations. What we called elements connected by paths he captures by the notion of continuity, which is explained with the help of neighborhood relations; cf. also Seifert and Threlfall, *Topology*, 20–21. A neighborhood for a point *p* in a topological space *X* is a set *V* that contains an open set *U* containing *p*. And *U* is an open set if, intuitively speaking, the distance between any point *x* in *U* and the boundary of *U* is always greater than zero. If we think of applying these notions to a physical space, we have to take into account that while points are reasonable in a Cartesian coordinate system, within an ancient context we should more cautiously talk simply about elements, not points. And in order not to presuppose any kind of atomism (according to the ancient picture) we should assume that space need not consist of elements already given as minimal parts of it, but that the parts could exist simply potentially.

¹⁴See Sklar, *Spacetime*, 13–54.

The structure left in a topological space includes dimensionality—a topological plane, for instance, is also two-dimensional—and the possession or lack of connectedness, i.e. loosely speaking, it does or does not consist of disjoint patches.¹⁵ It is compact, if it is closed and bounded, or not compact. And a topological space is either orientable or non-orientable,¹⁶ i.e. figures either do have a certain orientation, for instance, they are right-handed within a certain region, so that they cannot be moved around the region in such a way that they look like their own mirror image (orientable), or they do not have such an orientation (non-orientable).¹⁷

The topological properties of objects are not the same as we are used to from considering the more specific properties of objects in Euclidean space.¹⁸ Rather, the topologically relevant properties are those which objects retain under deformation, i.e. deforming transformations such as bending, stretching, and squeezing.¹⁹ To be more precise, topological properties are those properties which are preserved under homeomorphisms, i.e. one-to-one mappings between the points of two spaces or two geometrical objects such that each point p of a space or geometrical object corresponds to only one point p' in the other space or object, and points close to p become close to p' . Dimensionality, for instance, is preserved under homeomorphic mapping.²⁰

Finally, a metric will allow us to determine the distance between any two elements. Normally a topological space is metrizable if a suitable distance D can be assigned to each pair of its points (x, y) . However, for a metric in a less formal sense we do not necessarily need to have distance *units*. For example, Euclidean space originally lacked distance units. It is enough if we can distinguish different degrees of nearness and are able to add distances.

What I want to do in the following is to see whether Plato's notion of the receptacle fits these basic criteria, and thus whether Plato and we are dealing with

¹⁵To be more precise, it is connected if it cannot be represented as the disjoint union of two or more nonempty open subsets.

¹⁶Strictly speaking, this feature applies only to manifolds, i.e. to topological spaces in which every point has a neighborhood homeomorphic to Euclidean space.

¹⁷Speaking more strictly, a topological space is a pair (X, ω) consisting of a set X and a topology ω on X . A collection ω of subsets of a given set X is called a topology on X if it satisfies the following three requirements:

T1: The intersection of any two sets belonging to ω again belongs to ω .

T2: The union of any nonempty sub-collection of ω belongs to ω .

T3: The empty set and X belong to ω . Elements of ω are open sets of X .

See e.g. Buskes and van Rooij, *Topological Spaces*, 188.

¹⁸We will have to see at the end how specific we have to get.

¹⁹But not under breaking and tearing, so Plato's elements might in the end turn out not to have the same topology.

²⁰More formally speaking, a homeomorphism is a function f from x to y if it is one-one and onto, and the image of any open set is an open set and the inverse image of an open set is also open. Two sets are topologically equivalent if homeomorphism holds. The deformation concept mentioned in the main text has limits with respect to dimensionality, as additional dimensions might be required for the transformations; see Seifert and Threlfall, *Topology*, 2 and 3. Thus the homeomorphism definition is the more exact one. Seifert and Threlfall compare the role of the concept of homeomorphism in topology to that of the concept of congruence in elementary geometry.

a similar phenomenon of “space.” However, the following two objections (A) and (B) might be raised immediately:

(A) Given that topology and the theory of metric spaces provide us primarily with mathematical notions of space, using these as criteria might prejudice us against a genuinely physical notion of space. Looking back from Aristotle’s *Physics*, we might rather think that it is essential for a good notion of space, which can explain our physical world, that it should enable us to locate physical things and their motions. Essentially, the notion of space should help us to answer what we may distinguish as two different kinds of basic questions: where a (stationary) thing is located (Where is my copy of Plato? It is on the shelf), and where a thing is moving or changing (Where is Plato doing his sailing? On the Nile). While the former indicates a certain position, the second gives us a certain region within which motion can take place. In order to avoid neglecting the possibility of a physical space, we will expand our criteria so as not to overlook such features essential for physical space. For something to count as space we might want to say that it has to fulfill at least one of two sets of conditions:

(I) It has to fulfill the criteria for a geometrical space just listed, i.e. dimensionality, possession or lack of connectedness, compactness, orientability, and metrizable; thus it is at least a *basis* for topological and metrical determinations, and compatible with the geometry of its time. Since the *Timaeus* does not deal with pure mathematics but rather with natural philosophy, such a geometrical space also has to be connected with Plato’s explanation of the physical world in some way—a condition that might restrict the mathematical possibilities.

(II) Focusing on nature, Plato might rather attempt to establish a concept of physical space that provides at least some conditions for explaining nature as *moved*. In this case his concept of space should fulfill the following requirements:

- (a) It has to be that in which every sensible thing can be situated (leaving it open, however, whether that wherein the sensible stuff is situated is an entity of its own or simply the relation of the sensible objects).
- (b) It should contribute to explaining the locomotions, transformations, and comings into being of sensible things.
- (c) In some sense this space will have to be a, or the, condition for explaining the shapes of the sensible phenomena.
- (d) It should account to a certain degree for how sensible things can be perceived, in case this differs from (c).

Finally, we should also leave it open as a possibility that our distinction between physical and geometrical space might not be a distinction Plato himself would draw. And thus he might not keep these two sets of criteria strictly apart. At least within the Pythagorean tradition this distinction does not seem to be relevant, because one and the same spatial notion, the void, is used to separate numbers, and hence mathematical entities, as well as to separate sensible things.²¹

²¹See DK 58 B 30. *Timaeus* is often seen as being characterized as a Pythagorean; see Taylor, *Commentary*, 17. In any case, he employs some Pythagorean doctrines.

(B) It could be objected that because topology was developed only in the nineteenth and twentieth centuries, by using features from topology and the theory of metric spaces we are bound to misunderstand Plato's project and to be grossly anachronistic. Furthermore, it might seem odd to employ the modern idea of topology for mathematical space, while referring to Aristotle's parameters for physical space.

The reason for the latter oddity is simply that while Aristotle explicitly discusses physical space in his *Physics*, an explicit discussion of mathematical space seems to be lacking in classical Greece. As for the former worry, why employ a modern notion of space at all, I am using topology because it is probably the most general notion of space available, making much less specific assumptions than, for instance, the notion of Euclidean space does. So using topology is the attempt to work with the bare minimum of presuppositions concerning space²²—that is, as few as possible, but as many as necessary to be certain that we are still dealing with what could possibly count as space. In order to make sure that this consideration of paucity does not amount to walking straightforwardly into the anachronistic trap, let us first look at the problem to which Plato's receptacle is a response.

3. PLATO'S ACCOUNT OF THE RECEPTACLE

What Plato says explicitly about the receptacle is rather meager. Accordingly, we not only have to inquire into the function of the receptacle (3.1) and look at the features that allow the receptacle to fulfil this function (3.2), but we also have to investigate the relation between the receptacle and its content (3.3) before we can determine which spatial aspects Plato thus introduces in the *Timaeus* (3.4). Only such a detailed inquiry will finally enable us to determine whether the *Timaeus* does indeed develop a concept of space and where the spatial structures derive from (4). Before we give a systematic account of the passage introducing the receptacle, which will allow us to analyze the function of the receptacle, let us start here with a quick overview of this passage.

After providing a sketch of the universe insofar as it is a work of reason, Timaeus starts anew with what comes about of necessity. It is here, with this new start, that the receptacle is introduced. First we are given a metaphysical account of the receptacle: we are told why, if we look at the most basic foundation of everything there is, we need a third *genos* besides Being and Becoming, and what its most basic features are. The metaphysical account is complemented by what we could call a physical account: Plato describes the role of the receptacle and of the traces of the elements²³ as the basic players of the physical world before creation and their development during creation. But what is the problem that the receptacle is meant to solve in the *Timaeus*?

²²For topological spaces as the minimum space we can assume, see also Sklar, *Spacetime*, 49–54.

²³I use the term 'elements' to refer to fire, air, water, and earth, which were seen as the basic elements in the *physiologoi* tradition before Plato. Plato does not think they are really elements (see 48b–c), but for the sake of terminological simplicity I will refer to them in the traditional way; cf. also Harte, *Parts*, 213n94.

3.1 *The Systematic Function of the Receptacle*

In his only book that is almost entirely dedicated to the explanation of the physical realm, Plato wants to show that to a certain degree our sensible world, which is changeable, material and bodily, can actually be understood as rationally structured and thus intelligible. While in Plato's earlier works the sensible realm was seen as rationally structured only insofar as it participated in the Forms, and this meant exactly not *qua* changeable and bodily, the *Timaeus* shows that some regularity and thus rational structure can also be found in changes and physical bodies.²⁴ The general task of the *Timaeus* is to spell out this rational structure of the physical world, which is done with the help of a creation story.

Parts of this task are already taken care of in what, following roughly Cornford, can be called the "Reason Part" of the dialogue (29d–47e).²⁵ There it is shown that the World Body is fitted together according to mathematical proportions. The introduction of time as grounding the numerical order of the motions of the heavens enables Plato to demonstrate that locomotion is compatible with rational structures and is thus intelligible. However, this is not enough to show that individual sensible bodies²⁶ are rationally designed, neither insofar as they are sensible bodies, nor insofar as they are undergoing elementary changes, like coming into being and passing away. The rational structure of these processes is only shown once the receptacle is introduced in what can be called the "Necessity Part" of the *Timaeus* (47e–69a).

It will become obvious in the following that when Plato introduces necessity in 48a he does not mean logical necessity. Rather, as Cornford and others have pointed out, necessity is understood as the limitations imposed by what is given to the demiurge as basic "material" from which to form the cosmos.²⁷ These limita-

²⁴I think this account holds true whether we think the reason for it is, as a developmental interpretation assumes, that the late Plato conceived of the sensible world as more rational than the middle Plato did, or whether we presuppose, as Unitarians do, that it is due to the fact that the *Timaeus* is the only work of Plato where we get a full-fledged account of the sensible world. For the relation of regularity and rationality in the *Timaeus*, see Sattler, "Time," 249–65.

²⁵See Cornford, *Cosmology*, 32–33; and *Timaeus* 47e3–48a5. For a discussion of possible divisions of Timaeus's speech see Harte, *Parts*, 222–26. I agree with Harte that talking about the Reason Part does not entail that with respect to the created cosmos reason can ever work independently of any necessity; so, for instance, employing the four elements for the creation of the World Body close to the beginning of the Reason part shows that necessity is in the background here. However, I do think, contrary to Silverman (*Dialectic*, 267–69) and Lennox ("Plato's Unnatural Teleology," 209–12) that with his account of the pre-cosmos Plato at least aims to show us an account of the effects of necessity independent of reason; cf. also Cornford, *Cosmology*, 162–77. This account of necessity independent of the influence of reason is restricted to only one small part of what Cornford calls the "Necessity Part," since for the construction of the four elements proper the reasoning of the demiurge is heavily involved in providing *logos* and *metros*; the main chunk of the Necessity Part focuses on how what is given by necessity can be persuaded by reason.

²⁶I am using the terms 'body' and 'bodily' in this paper in a broad sense to mean three-dimensional objects (for the three-dimensionality, see 53c5–6). If the bodies are qualified as sensible, they refer to physical objects. But without this qualification, the term 'body' can also refer to a geometrical one. Hence this usage is broader than the one entertained by Plato, who in the *Timaeus* normally uses *sōma* for physical bodies (e.g. 28b8, 56a4, 56d8, 60b7), and *schēma* (54c8 and 55c2–3) as well as *eidos* (56b5) for geometrical ones.

²⁷This is the sense of necessity relevant for our discussion. However, this does not mean that Plato at times does not also use necessity in a logical sense, as for instance in 28a and c, 29b, 32a, 49b, or 53c.

tions cannot be simply changed by the demiurge; all he can do is “persuade” (48a and 56c) the material to be used for his aim,²⁸ i.e. the creation and preservation of the best world possible given this material.²⁹ What is of necessity includes the constraints imposed by the traces of the elements and the receptacle.

But why does Plato assume he has to introduce the receptacle, as something belonging to this realm of necessity, in order to account for the rational structure of the individual sensible bodies and their processes? What does this new *genos* explain that cannot be explained without it? We will see that with respect to the processes of the sensible bodies, the receptacle is involved in the initiation of their motion as well as in ensuring some stability. And it allows the elements as images of the Forms to become sensible bodies.

The basic elements out of which the World Body is formed, i.e. fire, air, water, and earth, are just taken as given in the Reason Part (as they are in the tradition preceding Plato). But, the *Timaeus* tells us, they cannot be understood as unanalyzable primitives; rather they are coming into being and are not even as basic as syllables, let alone as “elemental letters of the universe” (48c).³⁰ What is characteristic of these elements³¹ is their incessant transformations—this is what Plato understands by their coming into being and passing away.³² By continuously changing into each other, however, they seem to leave us with a world without any stable points of reference and thus without any orientation (49c7–50b5). Accordingly, Plato tells us not to call what we perceive as fire a “this,” in the sense of a stable point of reference, but only a “such like.”³³

²⁸With the creation of the cosmos, the traces are transformed into the geometrical forms of the elements and the receptacle is bounded; this is the persuasion of necessity the demiurge arranges for, as we will see below.

²⁹Johansen (*Timaeus-Critias*, 98) claims that “necessity is a product of the creation, not a precondition of it”; it “arises out of the geometrical nature of the simple bodies,” for nothing possesses sufficient reality to have causal power in the pre-cosmos. However, it is not only the case that the pre-cosmos, and thus the preconditions of creation, are only introduced once *Timaeus* changes from his account of the works of reason to what comes about of necessity. In the discussion below, we will also see that contrary to Johansen’s claim there is indeed genuine causal power to be found in the pre-cosmos. Furthermore, it is not clear why god would bring about the constraints of necessity, as he would have to in Johansen’s account. And finally, how could necessity on the one hand be brought about by creation and thus by the rational activity of the demiurge, and on the other hand be independent of it at least to the degree that it has to be persuaded by reason? Consequently, it seems more plausible to me to understand the realm of necessity as the limitations the demiurge is faced with by having to deal with the pre-cosmic entities. This also fits 68e well, where we are told that the demiurge “took over” (*paralambanō*) what is of necessity when he created the cosmos.

³⁰Plato is playing with the fact that in Greek the same word ‘*stoicheion*’ is used for letters as well as for elements.

³¹We will distinguish between the elements and their traces later on; this characteristic, however, seems to hold for both.

³²On the most basic level, these changes are the *locomotions* of basic triangles, as we will see below. While originally it seems that all four elements can be transformed into each other, we learn later on in the *Timaeus* that earth can actually not turn into any of the other three. But also earth can be dissolved into its basic triangles and fitted together from them again (see 56d). This account of the coming into being of the elements holds once the cosmos is created. Before that, the elements are first formed out of the traces thanks to the action of the demiurge so as to make the World Body out of them; see below.

³³This is how I read the passage 49c7–50b5, which has been called the “much misread passage in the *Timaeus*” since Harold Cherniss’s famous paper, “A Much Misread Passage of the *Timaeus*.” The main dispute that Cherniss’s article started is whether this passage should be read, following the tradition,

However, Plato shows that there is nevertheless some kind of permanence that guarantees us a point of reference, i.e. some “this”: “That in which they [the elements] each come to appear and from which they subsequently perish, that’s the only thing to refer to by means of the expression ‘that’ and ‘this’” (49e7–50a2). Plato assumes that this possible orientation is guaranteed by a self-subsisting entity that he calls the “receptacle.” The permanence secured by the receptacle remains also when, say, fire “perishes” by turning into air. Thus it cannot be the permanence an element possesses as long as it stays this same element. But it is also not a simple substrate of which changing properties are predicated, like “this is fire now but used to be air.”³⁴ Nor is it a point of reference with respect to which something moves, like, for instance, the origin in a coordinate system. Rather the receptacle allows employing a stable “this” by being that *in which* something moves and in which the elements change into each other. It is the permanent ground vis-à-vis the changing elements, and thus the only thing that can properly be called a “this.” Plato illustrates this with the help of the gold example (50a–c), where, as an analogue for the receptacle, a piece of gold is said to stay constant while the shapes in it change.³⁵ In this sense the gold, like the receptacle, “has to be called always the same” (50b6–7).

The receptacle is thus responsible for some kind of stability in the sensible world—it ensures the continuous possibility that motions, changes, and comings into being can take place, while, as we will see below, the (limited) stability particulars enjoy is ensured by their mathematical structure.³⁶ Being the stable entity in which all elemental transformations and motions are possible is one respect in which the receptacle is a necessary condition for the sensible world. Thus it seems to have a function similar to the void of the atomists. They assume that the

as attempting to correct a misguided belief about the status of particulars (they are “such like” rather than “this”), or with Cherniss as trying to supply us with a new referent for the terms ‘fire,’ ‘water,’ etc. (we should not call “this” fire, but rather what is always such like). For a comparison between the traditional and the alternative readings, see Zeyl, *Timaeus*, lvi–lix; Gill, “Flux”; and Silverman, *Dialectic*, 259–60. The alternative reading normally faces the disadvantage of having to introduce some additional entity that is the new stable referent for fire. So Cherniss himself introduces “distinct and self-identical characteristics” as referents, over and above the Forms, the receptacle, and the transient phenomena; see also Gill, “Flux,” 41; and Zeyl, *Timaeus*, lix. Silverman, who follows the outline of Cherniss’s reading, tries to avoid introducing additional entities by understanding the phenomena as the apparent affections of regions of the receptacle, 264–65. While I think Silverman’s reading can indeed avoid the introduction of additional entities, the main text below will show why I cannot endorse the understanding of particulars required for his reading. Rather, I agree with the traditional reading that this passage first introduces a difference in status of the elemental particulars before referring to the receptacle as that which has some permanence (cf. also 49d7 where being a “this” is connected with possessing *bebaiotêta*, stability or permanence). And I think that also the traditional reading can give us a new understanding of how Forms and particulars hang together; see below.

³⁴I agree with Silverman that what counts as “this”—on my reading: the receptacle as that which stays permanent during a change—is not a subject of which fire, etc., is predicated. The *mimêmata* of the Forms are not attributes of which the receptacle is the subject, for otherwise the receptacle would be altered by the *mimêmata*. I will argue in the main text that the receptacle is rather a constant background necessary for our normal deictic uses of “this.”

³⁵Similarly Johansen (*Timaeus-Critias*, 122n8) thinks the point of the gold analogy is that shapes in the receptacle keep changing, not the way in which the shapes are composed out of the receptacle.

³⁶See also Silverman (*Dialectic*, 244), who understands the mathematical structure as what equips them to “remain members of some kind.”

basic building blocks, their atoms, can move only if there is a void, since in order for an atom to move there has to be something in which it can move. And this cannot be the same kind of thing as the atoms, because then the two things would have to coincide (see for instance Aristotle, *GC* 324b35–325b5). However, Plato does not think that a void will do the trick, for if the void is mere emptiness or nothingness, it cannot be something in which a body can move (for Plato's treatment of the void, see also below). But he seems to follow the atomistic assumption that that in which a body moves cannot itself be a body, which explains why the receptacle has to be clearly distinguished from the elements and their traces. Ensuring stability by being that in which something moves or changes provides good reasons for associating the receptacle with space; for as we saw above, being that in which something moves or changes is one of the most important criteria a physical space should fulfill.

However, with the realm of necessity Plato also introduces the idea of the "wandering cause" (*planômenê aitia*, 48a7), and, as I understand the text, the most important wandering cause of the cosmos is the receptacle. In order to figure out how this function fits its task of ensuring stability, we first have to understand in what sense this cause is wandering. Following Broadie, Johansen, and others, we can understand the wandering of causes as their lack of teleological structure. They do not have a clear aim—as the demiurge has, who is also a cause of the cosmos and has the aim to make everything as good as possible—and are wandering in this sense.³⁷ As a wandering *cause*, however, the receptacle is *causing motion*, and, as we will see below, is itself in motion. This seems to be in conflict with its function of ensuring stability.

But in order to find out whether there is indeed a conflict, we first have to look closer at the receptacle's involvement in motion. Causing motion as well as being itself in motion are both crucial features of the receptacle if it is to serve in an explanation of the world as moving and changing. This becomes obvious if we look at how motion is introduced into the universe. To account for the first occurrence of motion, Plato assumes two stages of the world: one before and one after an act of creation by a divine demiurge (for ease of expression, I will use language that takes creation literally; however, this should not be understood as taking sides in the dispute about whether or not the act of creation is meant as a

³⁷See Broadie, *Divinity*, 182; and Johansen, *Timaeus-Critias*. For Broadie they are wandering in the sense that they are "random in relation to the cosmic desideratum," while for Johansen they do not seem to have any teleological structure. I disagree with Johansen in two important points (which Broadie does not seem to share with him): according to him the motions of the receptacle, which are compared to those of a winnowing basket, are indeterminate and thus cannot belong to the wandering cause. While it is true that the motions of a winnowing basket are not determinate in the sense that every single aspect of it is determined in advance, the whole motion is; and similarly, the motion of the receptacle does not have to be conceived as indeterminate. Secondly, Johansen thinks that because the wandering cause is not teleological, the effects have to be disordered (94). But while it is true that the wandering cause is not aiming at order, as the demiurge does, this does not necessarily preclude it from producing a certain order as a side effect, as we will see below. The difference between a wandering cause and what Plato calls a contributory or supporting cause—and here I do follow again the broad line of Johansen—is that the former is "a description of necessity in so far as it has no regard for the outcome," while the latter describes necessity "in so far as it has been persuaded by intelligence," by the demiurge (95).

metaphor; if it is a metaphor, the “pre-cosmos” would just be the cosmos considered independently or in the absence of god and reason [see 53b3–4]).³⁸ As long as the demiurge has not yet started working, we only find traces of the elements (53b) in the world,³⁹ not the elements themselves. The task of the demiurge is not to create something out of nothing—Parmenides has insistently warned us against this assumption—but rather to order what is given to him in a disordered state (30a and 69b). So there has to be something there before creation. And an essential part of this disordered condition is the existence of traces.

Some scholars, however, do not think the demiurge creates from these traces, normally because they assume that the elements are some configuration of space. And while space is given, the configuration is brought in by the demiurge.⁴⁰ In this picture, however, it is unclear what we are to do with the disorderly things that can be found in the pre-cosmos, if they are not the seeds of orderly things. If they were simply fleeting configurations that disappear again, as Harte (*Traces*, 137) suggests as one reading, how could the demiurge be said to “lead them from disorder to order” (30a)? There would be nothing to lead. And the sorting of the traces in 53a also requires some stability. The demiurge’s explicit task, the imposition of order (30a5, 69b3–5) by introducing *metron* and *logos*, seems to me to require something that is taken over as being originally *ametros* and *alogos*, and that is exactly how the traces are described (see also below). This way it is ensured that the demiurge is not bringing into being new stuff. He is only ordering what is lying around and behaving disorderly, i.e. moving chaotically. And this he does by applying rational structures to what is in a disorderly state, i.e. he brings arithmetical and geometrical structures to the realm of necessity, as, for instance, when he introduces arithmetic periodicity and geometrical shapes.⁴¹

In order to understand the receptacle’s involvement in motion, let us first consider the world before creation. In this initial state there is no order installed by the demiurge, but there are traces of the elements in the receptacle, which are distributed in a dissimilar and unbalanced way due to their different powers (*dynamêôn*, 52e):

[B]ecause it [the receptacle] was filled with powers that were neither alike nor evenly balanced, there was no equipoise in any region of it; but it was everywhere swayed unevenly and shaken by these things, and by its motion shook them in turn. (52e1–5, Cornford’s translation)

³⁸In addition, Broadie (*Divinity*, 199 and section 6.4, n52; and “Contents,” 189n30) distinguishes two stages of the pre-cosmos, one without any divine activity, and one when the material is divinely prepared for its formation for the World Body. I consider this second stage as part of the creation process. And I read 69b–c as showing clearly that the demiurge not only forms the World Body, but also transforms the traces into the actual elements; thus we do not have to assume another deity for this initial ordering, as Broadie (*Divinity*, sect. 6.4) suggests as one alternative.

³⁹For a discussion of Plato’s notion of traces in the *Timaeus*, see Harte, “Traces.”

⁴⁰See e.g. Harte, *Parts*, 251: “If we then abstract from this account of the construction of earth, air, fire, and water that structure which the demiurge imposes, what we are left with is simply: space.” And also Silverman, *Dialectic*, 263–65. For a discussion of the elements and traces, see sub-sect. 3.3, where their relations to the Forms will also be discussed.

⁴¹See below and Silverman, *Dialectic*, 244.

According to this passage, the initial motion in the physical world is caused by the uneven powers of the traces⁴² in the receptacle: because of their unevenness they move the receptacle and are moved by it in turn; thus the receptacle is itself moved and causing motion. However, since antiquity there has been a dispute about the cause of motion prior to the creation of soul.⁴³ The objection to understanding the different traces and the receptacle as the cause of the initial motion in the physical world is that allegedly in a Platonic picture nothing physical can be the original source of motion, but only rational souls (this seems to be supported mainly by passages from the middle period, but also by *Laws* 892a–896e). It is unclear, however, why a rational soul should ever produce something quite irrational, namely chaotic motion as we find it in the passage above. There have been attempts to explain this chaotic motion with the help of an irrational soul.⁴⁴ But no such irrational soul is introduced in the text as a possible cause of the initial motion. Accordingly, it seems much more plausible to me to take the above passage literally and understand differences in powers as the origin of physical motion (from earlier texts we know that Plato claims differences as the origins of changes and motion, see for instance *Phaedo* 78b–c).⁴⁵ So while soul is the original source of all intelligent and teleological motion, mere chaotic motion in the physical realm seems to have its origin in differences of powers. This we can also see from *Timaeus* 57e–58c, which claims that heterogeneity provides perpetual motion of the elements.⁴⁶ And Aristotle explicitly states in his *Metaphysics* 1071b37–1072a3 that soul is what Plato “sometimes [*eniotē*] supposes to be the source of movement” —there is no talk about soul being always or the only source of motion.⁴⁷ Since the pre-cosmos is defined as the absence of god (and the World Soul was not yet created), there does not seem to be any soul left to cause the pre-cosmic motion.

The initial motion of the traces and the receptacle is chaotic but leads, nevertheless, to some sorting. This is why Plato compares it to the motions of a winnowing basket—shaking the traces, we get the heavy and dense parts on one side and the light and rare ones on another side. The immediate effect of the motion of the receptacle is a vanishing of the initial dissimilarity, as it leads to a sorting

⁴²53b makes it clear that the powers are features of the traces. But we are not told whether the powers can be ultimately derived from the differences in the shapes of the traces (see below) or have to be assumed as irreducible features themselves.

⁴³See Cherniss, *Criticism*, 426n360; and Johansen, *Timaeus-Critias*, 96–97. Johansen himself tries to avoid this problem by claiming that there is no proper motion before the creation of the cosmos and hence of soul, so that there is also no proper cause of motion in the pre-cosmos. While this description might be true for Plato, if we understand this to mean that there cannot be *orderly* motion, since this motion would need to be in time, etc., it is not necessarily true for us.

⁴⁴See Cornford, *Cosmology*, 203–10; and also Vlastos's criticism of it in “Disorderly.”

⁴⁵See also Simplicius, *Physics*, 431.4–5: “That Plato spoke of inequality as a cause [of motion] will be clear shortly, when I quote the text of Plato.”

⁴⁶This might be compatible with the passage in the *Laws* if we take into account that there Plato is arguing for the priority of soul over body, not over the pre-cosmos, its entities and motions. Plato would not bring in any pre-cosmic references in the *Laws*, since the audience is not meant to be the experts of the *Timaeus* but laymen, and his aim of argumentation is not the basic set up of the universe but to refute the atheists; see also Vlastos, *Disorderly*.

⁴⁷For the thought that the soul is not the principle of *all* motion, see also Vlastos, *Disorderly*; Cornford, *Cosmology*, 240–41; and Miller, *Third Kind*, 154.

of equal traces such that similar traces gather together with their like.⁴⁸ This very basic sorting is already done when the demiurge takes over (52e–53b). Thus, the wandering cause can also produce some kind of order as an inadvertent side effect, and it is an order that seems to be spatial: fire traces come to be here, water traces there (an order clearly different from the numerical one granted by reason in the first part of the *Timaeus*). We see that the receptacle as a moved wandering cause is involved in the distribution of the elemental traces, and that this aspect is not in conflict with its function of ensuring stability.

But if all the initial differences are balanced out with the help of the moving receptacle, should we not end up with an orderly distribution of all the elements, i.e. with a totally stable world, without any further motion and elemental change? Such an unmoving world, however, would not correspond at all to the world as Plato and we experience it and as he seems to explain it. In the world before creation we probably will not get any complete order that would lead to a totally stable world, because the traces lack, as we will see below, *logos* and *metron*, which are necessary for such a stable order. But what guarantees the permanence of change and motion in the created world? According to Plato, the fact that in the created world all the elements are pressed together in a spherical universe, not leaving any gaps and with nothing outside, ensures that we will never be stuck with a completely orderly distribution of all the elements. For such a voidless universe is only possible if smaller elements, like fire, are pressed into the interstices between the larger elements, as Plato explains in a passage worth quoting at length:

The revolution of the universe, when once it has comprehended the (four) kinds, being round and naturally tending to come together upon itself, constricts them all and allows no room to be left empty.⁴⁹ Hence fire has more than all the rest penetrated in among all the others; and in the second degree air, as being second in the fineness of its particles; and so on with the rest. For the kinds that are composed of the largest particles leave the largest gaps, while the smallest bodies leave the least. So the coming together involved in the condensing process thrusts the small bodies together into the interstices between the large ones. Accordingly, when the small are set alongside the large, and the lesser break up the larger, while the larger cause the lesser to combine,

⁴⁸The fact that similar traces gather together with what is similar, Plato seems to take up simply from tradition, where often vortices lead to this result. The sorting motion in the *Timaeus*, which is illustrated with the help of the image of a winnowing basket, seems to correspond closely to the one expressed in Democritus DK 68 B 164. Cornford (*Cosmology*, 200–201) objects that winnowing baskets only separate different qualities (heavy and dense), not, as in the Democritean picture, different sizes. However, while the sorting is indeed due to differences in density and weight in 53a–b, these are connected to different shapes as we will see below. And for Democritus as well as for Plato two different kinds of forces are involved in this kind of sorting: one coming from the like things gathering together (the “attractive force” in Democritus, the uneven powers in the case of the *Timaeus*), the other one being external (the wave in Democritus, the motions of the receptacle in the *Timaeus*).

⁴⁹The four kinds are originally comprehended into a spherical shape by the demiurge, as we are told in 33b. The question is whether, once set up in the creation process, this compression stays stable or whether, in addition, the revolution of the universe has a constraining force keeping the universe in this shape. Plato does not explicitly introduce an additional force, and rotational forces as such are centrifugal, as already Anaxagoras observed; see also Cornford, *Cosmology*, 244. So if the compression of the universe were to require permanent re-enforcement, this could either work with the help of the like-to-like force Plato has already introduced in 53a, or by understanding the rotation of the universe functioning like a boundary.

all are changing the direction of their movement, this way and that, towards their own regions; for each, in changing its size, changes also its local region. In this way, then, and by these means there is a perpetual safeguard for the occurrence of that heterogeneity which provides that the perpetual motion of these bodies is and shall be without cessation. (58a–c, Cornford's translation with alterations)

It is a simple mechanism that guarantees the permanence of change and motion: the bounding of the receptacle and its content causes the elements from different regions to mix again. Given the restricted universe, their imbalance and dissimilarity can no longer be balanced out immediately by redistribution, but rather lead to new changes: the elements affect each other so that the smaller elements dissolve the larger ones, while the larger ones squeeze the smaller ones. In this way, the compression of the universe leads to the transformations of one kind of element into another one with a new size. This transformation also brings about a change of direction of the original locomotion, since the new element has the tendency to move toward its new kind. Constant changes of the elements into each other as well as changes in the direction of the basic locomotions are thus guaranteed by the compression of the receptacle. So while the receptacle is involved in ensuring a basic order of the traces due to the sorting motion in the pre-cosmos, it is also a condition for the disorder required for the *permanence* of motion in the created cosmos.

Insofar as the receptacle is a necessary condition for the physical world to be rational—it is grounding some order and permanence and, as we will see below, it is a condition for the existence of sensible particulars—we might think it to have the very same task the Forms have. And indeed, Plato takes up the possible objection that according to the picture of the world painted with the help of the new *genos*, the Forms might be altogether superfluous (51b7–c5). Answering this objection, Plato ensures that the receptacle and the Forms are indeed two different *genê* that are not reducible to each other, and that both have an essential and non-substitutable role to play.

The receptacle itself obviously cannot be a Form, because it is moved and also involved in providing the disorder that guarantees permanent change. In addition, the kind of order and permanence secured by the Forms and the one secured by the receptacle are not the same: the Forms ensure the permanence that some particular is fire rather than air, while the receptacle guarantees the permanence of that *in which* a fire particle appears and turns into an air particle. So the receptacle does not provide for the existence of the elements as a particle of fire, water, etc. Rather it is the condition that allows the elements to exist as *sensible* things by being that in which they can appear and change.

Let us explain this a little bit further: the *Timaeus* characterizes the sensible things as images (*eikôn*, 52c2), appearances (*phantasma*, 52c3), or copies (*mimêmata*, 50c5) of the Forms, as that which has been made similar to them (*aphomoiômata*, 51a) and as “impressions [*typhôthenta*] taken from them [the Forms] in a strange manner that is hard to express” (50c5).⁵⁰ But as image and appearance, each thing

⁵⁰It is this talk of *eikôn* and *phantasma* that seems to support interpreters understanding the receptacle as a mirror (see e.g. Mohr, *The Platonic Cosmology*, 93; Cornford, *Cosmology*, 181 and 194;

needs something else *in which* it can appear, as Plato makes clear at 52c4.⁵¹ That in which the things as images of the Forms appear, however, cannot be the Forms themselves (see 52c–d1); it must be a third *genos*, over and above the Forms and the things that have come into being. This “third kind is *chôra*⁵² [space]” (52a). Once the images of the Forms appear in the receptacle, they are the sensible things we perceive.⁵³ It is in this sense that the receptacle lends the phenomena “what Being they have” (52c), namely sensible Being. So the sensible particulars, as images of the Forms, depend on the Forms to be the *specific* images they are, e.g. fire, etc.; but as images they also depend on the receptacle in which they can appear and thus be a *sensible* thing that we can perceive.⁵⁴

That Plato asserts the receptacle as the condition allowing for the things to become sensible in the sense just described is supported by a couple of images Plato introduces for the description of the receptacle. Right at the very beginning it is introduced as the nurse of becoming. Like a nurse, the receptacle enables and initiates becoming without itself being in the process of becoming. The sense in which it enables the becoming of the sensible world is explicated with the help of

Gill, “Flux,” 48–49; and Algra, *Space*, 92). Even though the idea of the Forms reflecting themselves in the receptacle as in a mirror is a dominant image in a lot of the secondary literature on Plato’s receptacle, it is not an image that can be found in the *Timaeus*, as is pointed out for instance by Sayre, “The Multilayered Incoherence of Timaeus’ Receptacle,” 62.

⁵¹For an overview of the different translations suggested for 52c2–5 in the earlier secondary literature, see Cherniss, “*Timaeus* 52c2–5,” 364–75.

⁵²For the relation between *chôra* and *topos*—both termini are used in the *Timaeus* (see e.g. 52b4)—see especially Algra, *Space*, and also Morison, *Location*, 23 and 121–32. ‘*Chôra*’ is the Greek word that we tend to translate as space, while ‘*topos*’ is often translated as place. There is, however, no one-to-one match between these pairs. The adequate translation depends in each case on the context (so, for instance, in *Timaeus* 19a Plato talks about the *chôra* of a person in a class society dependent on his ability; we would probably translate it as the “place” [rather than “space”] that the less deserving should change with the more deserving). And different translators assess the context differently, as can be seen, for instance, when comparing different translations of 57c. Schleiermacher translates ‘*chôra*’ as “place” and ‘*topos*’ as “space” when he writes, [I]nfolge dieser Vorgänge verändern denn auch alle die Gattungen stets ihren Ort [*chôra*], denn die Massen einer jeden empfangen ihren eigenen Raum [*topon idion*]. Cornford (*Cosmology*) by contrast translates ‘*chôra*’ as “region” and ‘*topos*’ as “place”; Zeyl understands them as territories and regions, respectively. When both are used together, *topos* may denote a part of *chôra*. This fits Cherniss’s claim that “for Plato *chôra* is extension and *topos* any dimensional section of this extension within it” (*Criticism*, 114). In contrast to *chôra*, *topos* can also be used to denote relative location or position in relation to a surrounding. I am assuming that this last feature might be one of the reasons why Plato talks about *chôra* rather than *topos* here; see below. Johansen (*Timaeus-Critias*, 128–29) argues that because *topos* is often understood as fully occupied place, *chôra* as only partly occupied, *chôra* is the term that better communicates the independence of the receptacle as a third kind.

⁵³I understand the *mimēmata* of the Forms themselves as non-sensible; only once they appear in the receptacle do they become sensible things. For insofar as they are only images of the solely intelligible Forms, they seem to possess some (albeit rather diminished) form of intelligibility but no sensibility yet. Otherwise they would not need, as Plato claims in 52c, the receptacle for their appearance, see also 50d. Accordingly, the *mimēmata* are not “anywhere” independent of their appearance in the receptacle, like the Forms are not anywhere in the proper locative sense. And they are not created by the demiurge, since they are already there as traces in the receptacle before creation. If Plato talks about the sensible things, or elemental particles, as images of the Forms, I understand this to be short for “images of the Forms that appear in the receptacle.” In this sense the introduction of the receptacle does indeed change our understanding of particulars fundamentally.

⁵⁴There will be more discussion of the relation of the receptacle and what appears in it in subsect. 3.3.

the image of a mother, a *hedra* (literally a bench or basis, 52b1), and a receptacle.⁵⁵ For all three images stress that Plato's new principle is something *in* or *on* which other things can be (as on a *hedra* or in a receptacle) or can come into being (as in a mother).⁵⁶ Thus this group of images emphasizes that the receptacle is that which helps the sensible things come into existence by being a stable entity in which they can appear.

With the help of these images, Plato explains how the receptacle is responsible for the appearance of the sensible things as images of the Forms, and he ensures that the receptacle has indeed to be taken as a third *genos*, besides Being and Becoming. For a certain sensible particular to exist, it needs both the receptacle and the Forms. It requires the receptacle, a member of the domain of necessity, in order to exist in the sensible realm, and it requires a member of the realm of reason, a Form whose copy it is, in order to be a certain something, for instance, fire. The realms of necessity and reason are both required to explain the existence of the sensible and rational universe. Both realms have to cooperate,⁵⁷ but both are also clearly distinct.

Introduced as a third *genos* over and above the two basic principles Plato had used previously in his metaphysics, the receptacle is a metaphysical innovation in the Platonic world. This innovation undermines what up to the *Timaeus* seemed like an exhaustive division: sensible things that we can perceive on the one hand, and intelligible things accessed by reason on the other.⁵⁸ However, it is only the exhaustiveness of the distinction that is put in question by the receptacle, not the fundamental distinction between Forms and sensible things, as Plato makes clear in the context of this passage.⁵⁹

⁵⁵I understand the receptacle itself, which is the first description Plato introduces for the third kind, also as an image, because any normal vessel possesses at least some boundaries, has some internal structure, and so on—all features that Plato's third kind, being amorphous, does not display. Hence the notion of a receptacle is only an image illustrating that the third kind is something *in which* the sensible things can be or come to be.

⁵⁶According to a widespread belief in ancient times, it is the male who provides the seed for the offspring while the female is only the place for it to grow; see also Cornford, *Cosmology*, 187. The *Timaeus* explicitly endorses this belief in 91a–d.

⁵⁷Because the receptacle is a necessary condition for the instantiation of the Forms in the sensible world, it is also a necessary condition for the sensible world to be rational.

⁵⁸We can neither relate to it by perception nor by mere reasoning; rather we seem to “look at it as in a dream” (52b2)—that is how *Timaeus* appropriately continues this portrayal of the receptacle. The beginning of the *Timaeus* refers to the *Republic* or a *Republic*-like account. Even though it does not mention the metaphysics of the central books, the reader familiar with and reminded of Plato's metaphysics in the *Republic* might thus indeed at first feel somewhat disoriented, as in a dream. And being as in a dream, she might now claim, as Zeno did in his paradox, that everything that exists must be in a place and occupy some space—this is how the dream sentence continues. This assumption is dreamlike in so far as the person claiming it forgets that it only holds true for everything sensible, not for Forms, which do not require something in which to exist.

⁵⁹In 51b–52a the dichotomy between the independent Forms and the sensible things is re-enforced on the basis of the distinction between true belief and intelligence. The receptacle, Being, and Becoming are claimed by Plato to be three independent *genê*. But one might wonder whether there are not some things in Plato's ontology that cannot simply be attributed to one of the *genê*, as for instance souls, which, like the Forms, are not sensible, but unlike the Forms in normal cases seem to need something else in order to exist.

3.2. *The Features of the Receptacle*

So far we have determined the function of the receptacle as that *in which* sensible things come into being and can appear as imitations of the Forms, as being involved in motions and changes that lead to a basic order of the traces, and as helping to guarantee the permanence of elemental changes. In the following we will investigate possible features that the receptacle needs in order to fulfill these functions.

We have seen that the receptacle is itself moved (*kineitai*). Apart from souls, which for Plato are self-movers, the only things moved in Plato's ontology are physical and sensible things. Hence, the receptacle itself seems in some degree to be treated as something *physical* and sensible.⁶⁰ At the same time, however, it is a *condition* for the physical and sensible things to come into existence and thus Plato's third *metaphysical genos*. As the condition for the Form-copies to become something physical, it supposedly needs to be physical itself in certain respects; it guarantees sensible existence by being itself sensible.

Being a metaphysical *genos*, the receptacle is eternal (52a8) as the basis for the never-ceasing process of becoming. However, this feature, eternity, is not uniquely possessed by the receptacle.⁶¹ We get more specific features if we focus on the central function of the receptacle to receive the traces and elements (*qua* images of the Forms) in such a way that they can appear. This function, according to Plato, is best fulfilled if the receptacle itself is free of all those shapes that it is receiving. Accordingly, Plato claims that it is *amorphos* (50d–e and 51a7),⁶² and that this allows the receptacle to be all-receiving (*pandeches*, 51a8).⁶³ As the basis in which the sensible things come into being, it is itself not visible (*anoraton*, 51a7) and indeed in no way perceptible (52b2), for otherwise it would itself be a sensible

⁶⁰I am treating 'sensible' and 'physical' more or less as equivalent in this paper, the former emphasizing the contrast to the intelligible (realm), the latter to the metaphysical (foundation), but both referring to what moves and changes and rests in time and is in principle perceptible by the senses. Obviously, the receptacle is never itself perceptible by the senses, but only insofar as it appears as the things that enter it. But it moves, and, after the demiurge's creation, it also does this in time. Does the World Soul then also have to be something physical, as Aristotle seems to complain about in his *De anima* 407a2–22 when criticizing it as something spatially extended that is moved? The motion of the World Soul, however, is self-caused and intelligibly structured, while the motions of the receptacle and the sensible things are caused by differences and, at least before creation, chaotic. Thus Plato seems to keep the idea from the *Phaedo* (79b–80b) that souls are rather on the side of the intelligible than of necessity.

⁶¹Also in this respect it seems to be *prima facie* similar to the Forms: it is uncreated and not admitting destruction (52a8–b1). However, once the world is created and the receptacle is integrated into the order of the sensible world, we can also say that the receptacle always exists through time, as the world as something created does, in contrast to the Forms.

⁶²The receptacle obviously has certain features, for instance being uncreated. But it is devoid of any determined character (*eidos*, 50e6) and shape (*amorphon*, 51a) that would interfere with the phenomena it gives rise to.

⁶³It might be helpful to take up a terminological distinction made by Miller (*Third Kind*, 13) between "receiving" and "taking on." According to him, a wax block, for example, might receive a shape impressed upon it, but does not take on this shape, i.e. "it does not come to be this sort of shaped thing"; it is, as expressed above, not altered by the *mimēmata*. This distinction can be based on the difference in Plato's usage of *dechomai* (receiving) and *lambanō* (taking on) in 50b–51b, 52d, and 57c. Obviously, this distinction runs counter to an understanding of the receptacle as a certain kind of matter, namely as the building stuff that just becomes part of the thing built, like for instance the dough out of which we form our cookies.

thing, and hence possess a certain form. Thus it would not be able indifferently to let everything come into being in it.

How we can conceive of the receptacle as some underlying basis that does not possess characteristics of its own but receives them from something else, Plato illustrates with the help of three images: the image of the *ekmageion* (50c2)—a medium informed by the impressions it receives—the perfume base example (50e5–8), and the image of a soft substance in which *schêmata* can be impressed (50e8–9). With the help of the last two images Plato spells out explicitly that being free of all forms itself is the necessary condition for receiving these forms. The perfume base has to be made as odorless as possible in order to be able to receive all kinds of scents. And the soft substance⁶⁴ is made as smooth as possible to receive all shapes.

Plato's account of the receptacle—as being itself a constant, characterless basis that receives something else—seems akin to what, in Aristotelian terminology, we can call *hylê*, i.e. matter. Thus we could agree with Aristotle's observation in the *Physics*⁶⁵ that Plato equates space and matter, *chôra* and *hylê*, *insofar* as the receptacle fulfills a function that within the Aristotelian system is performed by matter: to be some indeterminate receiver, which is characterized by form and underlies change.⁶⁶ But this does not mean that Plato mistakes space for matter. It shows only that Plato and Aristotle do indeed share a problem—something is needed that is underlying processes, something which is itself indeterminate but can be extended and determined by forms and shapes. In Aristotle's theory this problem is solved by *hylê*,⁶⁷ in Plato's account by the receptacle. Aristotle's *hylê* and Plato's receptacle, however, cannot be identified with each other.⁶⁸ For the receptacle is not something out of which the elements are made up,⁶⁹ which is an

⁶⁴For images of the receptacle as something that can receive imprints, see also 50d6, which talks about that in which the impressions come to be.

⁶⁵*Physics*, book IV, ch. 2.

⁶⁶See *Timaeus* 49–50, where the receptacle is described as what underlies the changes of one element into another. Johansen (*Timaeus-Critias*, 133–35) thinks that Aristotle offers two distinct reasons why Plato equated space and matter: first, because he thought of place as extension, as what is bounded by the form (see 209b7–9), so that place as well as matter is what is left if you abstract the formal characteristics of a body; second, and implicitly, because matter is what underlies change.

⁶⁷Plato uses the term '*hylê*' only once in the *Timaeus*, in 69a: "We have now sorted out the different kinds of cause, which lie ready for us like lumber [*hylê*] for carpenters." According to this passage, '*hylê*' seems to be determined to a higher degree than the receptacle. Originally, '*hylê*' in Greek means something like forest, copse, as well as raw material like wood, stone, and metal out of which something is made. In this sense '*hylê*' is used by Plato in the dialogue that employs this term most frequently, the *Critias*. In the context of the *Timaeus*, the term '*hylê*' might have sounded already too much like stuff specific for the element earth, which thus would not be able to receive neutrally all the different elements.

⁶⁸See also Taylor, *Commentary*, on *Timaeus* 52b4.

⁶⁹The receptacle is never described as that out of which, *ex hou*, something is made. While in the gold analogy in 50a we are told that *schêmata* were produced *ek chrusou*, it is nowhere indicated that this is a feature we should assume the receptacle also possesses, *pace* Algra, *Space*, 79. Rather, we are told that the point of comparison in the gold analogy is that there is something persistent through change that can receive all kinds of shapes and display them without itself taking them on; cf. Plato's explanation of the image in 50b6–c2.

essential function of Aristotelian matter. Rather, it is something in which things come into being.⁷⁰

Besides not being matter in the Aristotelian sense, the receptacle also does not imply weight or density—two other features which we, in contrast to Aristotle, might think characteristic of matter. For Plato, weight⁷¹ and density only come into play once we deal with elementary traces and geometrical bodies, not with the receptacle as such (53a). Underlying all processes of coming into being without being material building stuff, the receptacle is only that in which coming into being happens.

The ontological features of the receptacle named so far have some important epistemological consequences. As the receptacle is not perceptible, it is “hardly an object of belief” in Plato’s epistemology (52b2). And it can also not be intelligible in the way a Form is: as a *noema* that can be determined in itself and is thus a proper object of reasoning. However, in some sense we have to presuppose the receptacle as a necessary condition required in order to give a full account of our sensible world. This seems to be the reason that Plato talks about it as “partaking in the intelligible in a most puzzling way” (51a8–51b1) and being very hard to comprehend (51b1).⁷²

Being neither perceptible nor purely intelligible, the receptacle itself cannot be understood by us the way normal members of the intelligible and the sensible realm can, i.e. by reason and opinion, respectively (51d). The only way we can access it is by a “bastard reasoning” (52b), i.e. we have to presuppose it for the explanation of the world but cannot fully determine it in itself. Accordingly, the metaphysical innovation requires an epistemological innovation (quite what we should expect given Plato’s intimate linkage of metaphysics and epistemology). This epistemological quirkiness shows that the receptacle cannot be space in the sense of another (big) physical body. For bodies do not need a bastard reasoning according to the account in the *Timaeus* so far.

We have seen that the receptacle is necessary for the existence of sensible bodies, which come into being in it; but it is itself no body. And we saw that Plato furnished it with hardly any other features. But since the receptacle is a condition for the existence of sensible things, we should be able to determine it further by looking more closely at the relation between the receptacle and the sensible bodies.

⁷⁰Obviously much more would have to be said on Aristotle’s interpretation of Plato’s receptacle in the *Physics* as well as in other works, such as the *Metaphysics*, which however cannot be done within the limits of this paper.

⁷¹Plato actually gives two completely independent accounts of weight: on the one hand, weight is determined as dependent on the tendency of the motion of the elements—elements are heavy if they move toward their own kind (63a–e). On the other hand, it is traced back to the number of surfaces an element possesses (56a–b). The former explanation seems to account for differences within one kind of element (this fire particle is heavier than that), the latter for differences between elements (fire is lighter than earth). See also the discussion of weight in Cherniss, *Criticism*, 162–65; and Code, “Aristotle on Plato on Weight,” 201–11.

⁷²It is *dysalótaton*, literally, “most hard to catch.”

3.3 *The Receptacle and its Content*

From the tradition, Plato adopts the view that the basic perceptible bodies⁷³ in the created universe are the four so-called elements, fire, air, water, and earth, out of which all other perceptible things are constituted. And it is these elements that the receptacle receives and presents to us:

But the nurse of becoming, moistened and inflamed and receiving the *morphai* [shapes] of earth and air, and qualified by all these other *pathê* [affections, properties] that accompany these, had every sort of diverse appearance to the sight. (52d4–e1, Cornford's translation with alterations)

In order to figure out the exact relation between the nurse of Becoming and the sensible bodies as sketched by this quotation, we should first attempt to elucidate Plato's explanation of how the receptacle can be moistened and inflamed. For this might seem to imply that the receptacle itself changes. But the receptacle does not show any features that could lead to its self-inflammation or moistening. Rather, these characteristics have to come from what the receptacle receives. The only things the text names as being received by the receptacle are the *morphai*, the shapes⁷⁴ of the things entering, and the *pathê* connected with these shapes (we will come back to the *pathê* below). The clause 'moistened and inflamed and receiving the *morphai* of earth and air' is describing the receptacle as having received all the four elements, water, fire, earth, and air. There is no Greek word for having received air and earth, as there is for having received water and fire, namely being moistened (*hygrainomenê*) and inflamed (*pyroumenê*). As a consequence, in the case of earth and air, Plato spells out what admitting an element actually means for the receptacle: it means receiving the *morphai*, the shape, of the elements. So let us pursue this thought that the receptacle gets inflamed, etc., by the shapes of the elements. For this investigation we will first have to abandon the receptacle for a little while and concentrate only on its content.

We have seen above that there are two things that appear in the receptacle, traces before creation, and elements after creation. To which of the two do the shapes in question belong? Plato claims that the receptacle is inflamed and moistened not only after but already before the creation takes place, when it has only received traces, not elements (52d–53b). Accordingly, the shapes responsible for the inflammation and moistening cannot be only the fully geometrical shapes of the elements brought about by the demiurge. The shapes of the traces differ from those of their elements in that they are lacking *logos* and *metron* (see 53a–b). But what exactly does Plato understand by the traces being *alogos* and *ametros* with respect to shapes?

Let us start with the positive. What could it mean for a shape to possess *logos* and *metron*? A shape that has *logos* seems to be one that can be grasped completely

⁷³They are, however, not the most basic *building blocks*, as he tries to show against almost all of the tradition.

⁷⁴Cornford (*Cosmology*, 184) argues against understanding *morphai* as shapes, as he thinks what passes out and into the receptacle are simply opposite qualities. However, since what accounts for the different qualities of the different elements in the *Timaeus* is their basic shapes, I do not see any good reason for following Cornford in this respect.

by *logos*, i.e. that can be completely accounted for in a rational way. Given the mathematics of Plato's time, this is only possible for *perfect* geometrical shapes (see 53e–54b), as for instance the perfect tetrahedra characterizing fire. As a consequence, a shape that is *alogos* cannot be completely accounted for in a rational way. In this sense such shapes will be imperfect, as are, for instance, shapes that consist of crooked lines that cannot be dissolved into straight or simple curved ones. In the mathematics of Plato's time, such figures would allow neither for a precise calculation of the content of their area, nor for a rational relation of their sides to each other. Accordingly, such figures are *ametros*, because no side, or part of a side, could be used as a measure for the other sides. Such an imperfect shape seems to be precisely appropriate for distinguishing traces from elements. And we will see later on that this is indeed how Plato accounts for the difference between traces and elements. So we can infer that the receptacle gets inflamed, moistened, etc., by the traces and elements in the same way, namely by their shapes—only in the first case it is by imperfect or non-rational shapes, in the second by perfect or rational shapes. For our overall aim of argumentation, we already see that even though the receptacle itself does not yet possess any geometrical features, it receives geometrical features from the elements in it and is obviously compatible with the basic requirements of geometry—a characteristic we saw to be crucial for a geometrical space.

Understanding the traces as well as the elements as having some specific shape—the former lacking, the latter possessing *metron* and *logos*—fits our quotation above (52d4–e1); and it can also explain the relation of the elements and traces to their Forms, which Plato describes as follows:

[T]he things that enter and leave it [the receptacle] are imitations [*mimēmata*] of those things that always are, imprinted after their likeness. (50c4–6, Zeyl's translation)

Given that the things entering the receptacle are imprinted after the likenesses of the Forms, they should possess structures that can be derived from the Forms. The basic geometrical shapes of the elements are clearly intelligible, so they qualify easily for imprints of the Forms.⁷⁵ But the traces, too, insofar as they possess shapes, can be related to the Forms. Because, however, they only possess shapes that are not fully rational—we might call these proto-geometrical—they can only hint at the Forms, which seems to be appropriate for mere traces.⁷⁶ A full imitation of the Forms is only achieved by the full geometrical structure of the elements; the traces, by contrast, seem to be bad copies of the Forms.

This account raises, however, three questions crucial for this paper; the first two concern the things entering, and the third concerns the receiver. As for the things entering, we have to answer (a) how can physical features, like the burning of fire,

⁷⁵And the intelligible structure of the Forms thus seems to be analogous to mathematical structures.

⁷⁶See 53b. Harte (*Traces*, 132–33) makes it clear that traces cannot be a “smidgen.” Her second reading of the traces as something “that closely resemble, but do not precisely correspond to, the configurations of the regular solids” (137) seems akin to my position. See also Mohr, *God and Forms in Plato*, 111–17, who makes a case for understanding the traces as geometrical particles. It is, however, not clear to me if by ‘geometrical’ he means that they could have been accounted for by the geometry of Plato's time, or only by a later geometry.

be explained with the help of geometrical shapes? And if the geometrical forms are indeed the basis for the physical phenomena, (b) why do we not perceive these geometrical shapes, but rather fire, water etc.? With respect to the receptacle, we have to explain (c) how it is possible that the receptacle itself is not visible while at the same time it is called "inflamed" and "moistened" and thus is characterized in terms that seem to imply visibility. I will take these three questions in turn.

(a) For Plato, geometrical forms are the ultimate building blocks for the things in the sensible world. Consequently, the physical and perceptible features of the sensible things have to be derived ultimately from geometrical features. Accordingly, Plato translates these features into physical ones. For instance, the tetrahedron's geometrical feature of being pointed is translated into physical acuteness, which in turn is taken as the explanatory basis for the burning of fire (what is acute can most easily cut through other things). And the geometrical fact that the tetrahedron has the least number of surfaces of the five geometrical bodies is translated into its being the most mobile one (56b). These further properties seem to be what Plato calls the *pathê* of the elements.

Of course, Plato has to make sure that there is still a difference between, say, a tetrahedron made out of straws and a tetrahedron which is the basis for fire, for after all the one of straw is not piercing. In the Platonic picture this difference is accounted for by the fact that in the tetrahedron that is a building block for fire, there inheres a tendency to move in a certain direction: the tendency to move toward the other fire particles. This tendency to move toward its kind is based on the like-to-like attraction we saw introduced as a brute fact above and seems to be specific for the physical world.

(b) Given that geometrical forms are the ultimate building blocks for our sensible world, why do we not perceive these geometrical shapes described by Plato and dealt with in Greek geometry, but rather what Plato quite appropriately calls "every sort of diverse appearance," i.e. the most varying collection of phenomena? Plato is not claiming that we see tetrahedra, but rather that we see fire, not that we perceive cubes, but earth. This is what appears to us (*phainesthai*, 51b and 52e). Thus, Plato actually has to answer two questions here: First, why do we not see geometrical bodies even though they are the basic building blocks of our world? And second, if we only have four basic building blocks for the phenomena, how can they nevertheless account for the whole variety of the phenomenal world? The explanatory power of necessity and reason we saw so far can account only for the occurrence of sensible tetrahedra; a further resource is thus needed in order to explain what we perceive in the sensible world. We can call this Plato's atomistic base.⁷⁷

According to Plato, the geometrical bodies as such are too small to be perceived by us (56c). Perception is only possible if some of the geometrical bodies accumulate (54c–d). As a whole, however, such a bunch of geometrical bodies does not need to have the same shape as the individual bodies. And once enough of these geometrical bodies aggregate so that they actually reach a perceptible size, what we see is indeed not a bunch of the perfect geometrical shapes that constitute the

⁷⁷See also Vlastos, *Plato's Universe*, 68–69.

elements, the tetrahedra, octahedra, icosahedra, and cubes, but something quite different—sensible bodies: fire, air, water, and earth. And these sensible bodies are constantly moving and changing.

To be more precise, the bunch of tetrahedra as a whole does not seem to be transformed into something having the shape of fire, but we in fact *perceive* this bunch of tetrahedra *as* something quite different. This solution seems to be similar to the theory of Leucippus and Democritus. There, too, what we do perceive is not the basic elements of the world, as they are too small for perception,⁷⁸ but only a bunch of them together. Plato's and the atomists' answer to the question why we do not perceive the most basic building blocks but something quite different is very similar. However, their response to the question how the basic building blocks can account for the variety of the phenomenal world is rather different. What accounts for the infinite diversity of the phenomena in Democritus and Leucippus is the infinitely many shapes of the atoms (as, for instance, DK 68 A35 makes obvious).⁷⁹ By contrast, Plato does not require atoms with infinitely many different shapes; rather his basic "atoms" boil down to the combination of two basic forms, bodies bounded by two kinds of triangles that cannot be reduced to each other (53d–54b). In addition, to make sure that he can explain the richness of the phenomenal world, Plato employs the faces of each element in different sizes, so that we get varieties within each element (57c–d).⁸⁰ From a systematic point of view, explaining the phenomenal world with only two kinds of forms can be seen as a rather remarkable improvement on the atomistic account.⁸¹

According to Plato's atomistic base, all elements are reducible to two basic geometrical forms, and all phenomena can be explained as variations of these forms. What we perceive is the *changing connection of a bundle* of basic elements, never the elements themselves. And Plato's explanation provides us also with the resources to explain different kinds of changes in the world according to the two different ways in which aggregates of the basic "atoms" can dissolve. The resources explain these changes in a way that secures that the intelligible structure of the basic elements, which they have inherited from the Forms, stays constant. So while a bunch of, say, octahedra can dissolve into smaller bunches of octahedra and hence turn from one big piece of air into smaller ones, the intelligible structures of the octahedra are not changed at all here. In this way Plato can explain our perception of the

⁷⁸See e.g. DK 68 A37.

⁷⁹However, they also employed differences in position and arrangement; see e.g. DK 67 A6.

⁸⁰The basic triangles themselves seem to have only one size, but the faces of the basic bodies can be made out of different numbers of these basic triangles, and thus we get bodies of different sizes; see Cornford, *Cosmology*, 230–39; Harte, *Parts*, 239–46; and Artmann and Schäfer, "Fairest Triangles," 258–60.

⁸¹For the difference between the simple bodies of the atomists and Plato, cf. also Aristotle, *GC* 325b15–33. By "dividing" the four elements according to the kind and number of their basic triangular surfaces and their relation to the Forms, Plato is mocking those *peri physeôs* writers before him who assumed one or another or all four of the four elements to be the ultimate basis of physical reality (cf. also his explicit ridicule in 48b–c). The fact that earth is the only element that is bounded by a different elemental triangle might sound like a reminiscence of one of the natural philosophers before Empedocles who all seemed to give a more basic status to one of the four elements, e.g. Thales to water, Anaximenes to air. However, not only does earth lack any special status in Plato, it also lacks the main feature that grants one element a special status in pre-Empedoclean time: that all the other three elements can be derived from it.

increase or decrease of phenomena (and, below a certain minimum number of octahedra, even disappearance). On the other hand, an octahedron itself can be dissolved into two tetrahedra, so that the basis for air is turned into the basis for fire, which we perceive as elemental change. In this case one intelligible structure is transformed into another, as all geometrical bodies in the created world can only be transformed into other geometrical bodies and hence into other intelligible structures. While the body resulting from an elemental change will not have the very same intelligible structure as the one it results from, it is guaranteed that it will possess some geometrical structure and hence will be the imitation of one of the Forms of the basic elements. In this way the elements are indeed, as introduced above, “imitations of those things that *always are*, imprinted after their likeness” (50c5–6, my italics).

(c) So far we have shown how the basic elements can change and be different at different times. But in the sentence preceding the last quotation, Plato claims that it is the *receptacle* that appears different at different times: “The things that enter it [the receptacle] make it appear different at different times” (50c3–4). At the same time the receptacle was introduced as being *not visible* (51a7) and *not perceptible* (52b2). Plato’s claim in the quote at the beginning of this section that it has “every sort of diverse appearance to the *sight*” (52d4–e1) and his statement that the receptacle is appearing differently at different times do not seem to fit to the alleged imperceptibility of the receptacle. So does Plato contradict himself here?

We saw above that the receptacle cannot have any specific characteristics on its own and hence has to remain imperceptible. However, as that which enables things to be sensible—it is the site in which geometrical bodies as the basis for the physical world can be developed—the receptacle is also responsible for the perceptibility of the world. It appears (*phainetai*) as the images of the Forms that enter into it (50c), which, in the case of fire, are tetrahedra with a certain tendency to move that for us humans will appear as fire. But the receptacle will only appear fiery insofar as it is the site in which (the shape of) fire can appear. It is not appearing itself in the sense that it would show any features specific for itself; in this sense it is not perceptible. It only appears as that which it receives and thus is *responsible* for the *perceptibility* of diverse phenomena; it makes them perceptible. Phenomenologically, the receptacle is nothing but what appears in it; ontologically, however, the receptacle is also a necessary condition for the existence of the sensible world. Using a somewhat wider notion of appearance than Plato, we can say that the *mimēmata* of the Forms appear insofar as they get sensible existence in the receptacle—as *phantasma* of something they have to come to be in something else, the receptacle, which grants them their (sensible) existence (52c); and the receptacle appears as fiery, etc., because it is that in which the *mimēmata* appear.

So a basic sketch of how Plato conceives of the content of the receptacle might look as follows: the intelligible *mimēmata* of the Form of fire enter, i.e. “appear” in the receptacle and thus become sensible. This is done by configuring the basic triangles available appropriately, i.e. in the case of fire basic triangles are arranged as tetrahedra. Once fire passes away, the triangles of the tetrahedra dissolve and reconfigure to build whichever other *mimēmata* comes into being. We see that Plato employs what seem to be two different strands of accounting for phenomenal fire:

on the one hand intelligible images of the Forms, which belong to the realm of intelligence, on the other hand triangles that constitute a certain element, but also endure as triangles once the element passes away. Thus to a certain degree these triangles seem to have a life of their own. To account for these two different strands of explanation, Allan Silverman employs geometrical Forms accounting for the triangles, as well as what he calls “traditional Forms” accounting for fire, so that “a molecule of fire will consist of both a cluster of form-copies of fire ... and an arrangement of isosceles triangles” (*Dialectic*, 280). And in the very optimistic picture that Plato sketches, the “space occupied by the body of the fire molecule will be the very place in which the form-copies of Fire occur” (*Dialectic*, 280). However, as Silverman himself confesses, “there is the air of the *ad hoc* to this coincidence of form-copy and appropriate body” (*Dialectic*, 280). Such an *ad hoc* lucky coincidence can be avoided, I think, if we do not assume that Plato’s text gives us two copies that coincide, but rather understand the form-copy of the traditional Form as a geometrical structure.⁸² So the *mimêma* of fire can be thought of as the intelligible formula of a tetrahedron, for instance, if we take the surface area, as “ a^2 times the square root of 3.” This image of the Form can “appear” in the receptacle by having it configured such that triangles are arranged according to this formula. In this way the geometrical structures can help to transfer the non-spatial intelligible structures into something spatial. And while the Form of Fire and the Form of Tetrahedron will both have some structure that can be imitated by the same formula given above, the Form of Fire also seems to contain something that accounts for the tendency of the *mimêmata* to move in a certain way once they appear in the receptacle.⁸³

We have seen that the relation of the receptacle to the visibility and perceptibility of the sensible things does not undermine the receptacle’s lack of physical features. What can put this into doubt, however, is the involvement of the receptacle in the initiation and continuation of motion. For such a contribution does not seem to be possible if the receptacle is nothing but the condition for the appearance of the sensible things. In order to set something in motion, the mover has to have some characteristics that can act on the thing to be moved—we will see below some reference to this.

3.4 *Spatial Structures in the Timaeus*

Having looked at the function and features of the receptacle and its relation to its content, we now come back to our initial question, whether the receptacle can be understood as a full-fledged space. In order to answer this question, we first

⁸²For a different solution trying to avoid Silverman’s *ad hoc* coincidence, cf. Harte, *Parts*, 262n189.

⁸³The difference between tetrahedra and fire in the sensible world has to be based somehow on a difference between the Form of Fire and the Form of Tetrahedron. Hence I assume that Plato works with what Silverman calls “traditional Forms” as well as with geometrical Forms in the *Timaeus*; there is the Form of Fire as well as of the Tetrahedron. Of course a lot of questions concerning the details of this metaphysics remain that I cannot deal with in this paper; so, for instance, do the triangles that are configured in the receptacle require the Form of Triangle according to which the demiurge straightens them out? And how exactly are the Forms of Fire and of Tetrahedron (and of Triangle) related to each other? Is it similar to the way threeness and oddness are connected in *Phaedo* 104a?

have to make clear which spatial aspects the Platonic picture introduces. This will be the task of the current section. Only then can we finally decide whether these spatial aspects are enough to constitute a space in the sense determined at the beginning of this paper.

The task of the current section will be best fulfilled if we distinguish which of these spatial structures are derived from the receptacle itself and which from the things in it, whether these structures are introduced before or after creation, and finally whether these spatial structures are due to necessity or to reason. Let us start with looking at possible spatial structures *derived from the content* of the receptacle. For this purpose we should distinguish spatial structures introduced by the traces from those dependent on the elements. Obviously, the spatial structure of the elements is established after creation, that of the traces before the creation process. Thus all spatial structures of the traces have to be derived from the realm of necessity, since the demiurge has not done any work yet, and the Forms can only guarantee intelligible, not spatial structures.⁸⁴ The traces present us with three spatial aspects: (1) regionalization, (2) distance, and (3) extension, which we can show implies a certain dimensionality. Let us look at these three spatial aspects in turn.

(1) Because the shaking motion of the receptacle leads to a basic order of the traces according to likeness, there is a *regionalization* based on the distribution of the elements (53a). Silverman⁸⁵ rightly points out that the regionalization of the receptacle requires something further than the receptacle itself; but while he assumes we need demiurgic activity for this, I think the text shows us a basic regionalization independent of the demiurge, simply due to the motions of the traces. According to my interpretation, basic regions⁸⁶ are established as the traces of fire gather together here, those of earth there. While before creation fire, earth, etc., lack any *metron* and *logos*, there is nevertheless a rough regular arrangement as “the different kinds came to have different regions, even before the ordered whole consisting of them came to be” (53b). This regionalization seems to implement a basic spatial structure in the receptacle; however, it is a structure that is dependent on the traces and cannot be determined any further.⁸⁷ The receptacle is involved in this order only insofar as the motion of the receptacle enables the elements to gather together like to like.⁸⁸ But the receptacle itself re-

⁸⁴Thanks to the creation myth, Plato makes it possible for us to determine which features do go back to necessity and which to reason. This is independent of whether we think that Plato literally assumes that necessity ever operates completely independent of the influence of reason, as Cornford (*Cosmology*, esp. 162–77) assumes, or not, as, for instance, Silverman (*Dialectic*) would argue.

⁸⁵Silverman, “Timaeon Particulars,” 93.

⁸⁶Cf. the usage of ‘*chōra*’ in 53a and 57c1.

⁸⁷Similarly, Johansen (*Timaeus-Critias*, 131–32) assumes that the differentiation of places is not inherent in the receptacle, but a result of its being occupied by different bodies. According to him, the receptacle has no determinate internal structure.

⁸⁸We saw above that a like-to-like attraction is inherent in the elements, but 52e–53a makes it clear that this is not enough to account for their sorting. Rather, the motion of the receptacle is required in addition, perhaps as a basis for the elements from which to push themselves off. Broadie reads the initial swaying of the receptacle as amplification of the disequilibrium of its contents and of its “gestures towards movements”; cf. *Divinity*, 227; and “Contents,” 182 and 184.

mains completely homogenous in the sense that it itself possesses no differences or order. So far it is nothing spatial over and above these different regions, which are dependent on the traces.

But does the regionalization introduced by the traces not also allow for localization? And should such localization not be a feature of the receptacle? The fact is that Plato is not using this basic regionalization to establish any further spatial order that we might now expect. He does not use it to establish any directions like up and down. It seems he could have easily done this by claiming that where the traces of the earth came to be, that is what we call down, or right, or back, and where the traces of fire have landed, we call up, or left or front.⁸⁹ Alternatively, he could have claimed that since, say, water and air traces came to be in between the earth and the fire traces, we can understand the former as inside and the latter as outside. We do not, however, get anything of this sort from Plato. He does not give us any information about the position of the traces of the elements. In order to do that he would have had to set something as fixed, for instance, the here of the fire traces, in relation to which all the other traces could then be localized. Since Plato does not fix such a stable point, the different regions cannot be used for localization. Thus the receptacle before creation cannot be understood as an answer to the questions we kept in mind as criteria for physical space, like: Where is earth? Or: To which place, from which place, or where is fire moving?

(2) The traces also allow for introducing a notion of *distance*. We are able to say that the fire traces gather together, for instance, *near* the traces of air, and *further away from* the traces of water. A rough way to determine such distances would be with the help of the amount of the traces: two traces are close to each other if only a few are in between, and they are far away if they are separated by a lot of traces. However, we can only determine degrees of nearness, not the exact quantity of the distances between the traces, because they are of irregular shape. As mentioned above, in order to determine such degrees of nearness, we do not need a measurement unit and hence need not be able to count the traces; we can determine them similarly to when we say these patches of dark green moss are further away from each other than those, because there is more light green moss in between. In this case we also do not count the moss.

(3) As the traces possess irregular shapes, they are obviously extended. We can count this as the third spatial aspect introduced by the traces. But can we determine it any further? The extension of the traces cannot be determined by the basic geometrical structure the elements possess, but it seems to imply a certain *dimensionality*. While Plato does not say anything explicitly about their dimensionality, it appears that he does in fact presuppose that the traces are three-dimensional.

⁸⁹Notions we are familiar with from Aristotle, who determines the center of the universe as the place toward which earth moves (this is within the ordered universe, but then there is no—literal or metaphorical—initial chaos). For Plato, even within the ordered universe, directions like above and below are only relative; what is below for an individual element is always the region where its own kind is situated, so what is below will be different for each of the four elements: “[T]he path towards its own kind is what makes a thing moving along it ‘heavy’ and the region into which it moves, ‘below,’ whereas the other set of terms [‘light’ and ‘above’] are for things behaving the other way” (63e, Zeyl’s translation).

For in 31b he claims that “that which comes to be must be bodily”⁹⁰ and, after the introduction of the traces in 53c, he requires all bodies to have depth: “In the first place, then, it is of course obvious to anyone that fire, earth, water, and air are bodies; and all body has depth.” Since the traces also come to be, they should be bodily and hence three-dimensional. As a consequence, the receptacle at least has to allow for three dimensions. But again, this is a spatial determination deriving from the content of the receptacle.

Let us now turn to the spatial structure introduced with the elements as the content of the receptacle after creation. If we look at the continuation of the quotation just given (53c), it seems that Plato indeed presupposes three-dimensionality as a feature of all the contents of the receptacle:

Depth, moreover, must be *bounded by surface*. And every surface that is *rectilinear* is composed of triangles. (53c6–8, Cornford’s translation, my italics)

According to the quotation, whatever possesses depth, i.e. all bodies, traces, as well as elements, is bounded by surfaces. What is specific for the elements is that their bounding surfaces are rectilinear and thus composed of triangles. The rectilinearity ensures that the surfaces can be reduced to triangles as the simplest surfaces bounding a three-dimensional object (within Euclidean geometry). With these triangles also come the geometrical rules related to the concept of a triangle, as becomes obvious, for instance, from the conclusions involved in sketching the structure of the simplest bodies in 54d–e.

All elemental bodies inherit the rationality of the triangles by which they are bounded. They are now fully graspable by reason and hence do not lack *logos* any longer. The rational spatial structures introduced in the creation process are thus based on the rectilinearity of the surfaces bounding three-dimensional bodies. The geometrical structure of the elements introduced with the rectilinearity allows also for measuring distances in the universe. One triangle could in principle be taken as a basic unit to measure out whatever distance needs to be determined. So while Plato does not give an explicit account of it, it seems that we can understand the straightening of the bounding surfaces as the demiurge’s introduction of *metron* into the universe. For this permits connecting the physical bodies with numbers.⁹¹

By tracing back the rectilinear surfaces of the elemental bodies to two basic triangles (53c–d), Plato systematizes the four elements: there are five basic bodies,⁹² four bodies for the four elements, the fifth for the shape of the world as a whole, as it is closest to the perfect form of a sphere. The four elemental bodies are distinguished by the kind of basic triangle constituting their surfaces and by the

⁹⁰In the Reason Part of the *Timaeus*, dimensionality is discussed when the proportionality of the four elements constituting the World Body is introduced. The proportion necessary for a three-dimensional body is given as a reason why we need four basic elements; see 31b4–32c4.

⁹¹The introduction of the World Soul, whose movements give us the idea of number, might be seen as another aspect of the demiurge’s introduction of *metron*.

⁹²It is five basic bodies, as there cannot be any more polyhedra where all faces are congruent regular polygons and the same number of faces meet at every vertex; see the proof in Euclid’s *Elements* at the very end of Book XIII. These five have come to be known as the Platonic bodies. For the objection that a dodecahedron cannot be gained from the basic triangles used by Plato, see below.

number of their surfaces.⁹³ And those bodies that can be traced back to the same basic triangles can be transformed into each other; so two tetrahedra can form one octahedron, and two and a half octahedra make for one icosahedron (56d–e). These transformations are introduced to explain the details of elemental changes.

With these geometrical transformations of the basic shapes of the elements, however, Plato assumes the elements not only to be bounded by surfaces, but also to be composed of them. For the only reason two tetrahedra should be required for a transformation into one octahedron is the assumption that what has to stay constant during the transformation is the number of faces (four times two). The traces are three-dimensional, as we saw above, which implies that the demiurge splits up the three-dimensional traces into surfaces that he straightens and puts together to form the three dimensional elements (54d–55c).⁹⁴ Accordingly, the three-dimensional traces also seem to consist of an adequate arrangement of two-dimensional surfaces. Aristotelians and others would consider the idea that a three-dimensional solid consists of two-dimensional surfaces to be impossible or at least problematic. Plato, however, in his account of the four basic elements in 54c–55c, clearly makes this presupposition—he claims, for instance, that “the isosceles *triangle* went on to *generate* the fourth *body* [the cube].” Obviously, he sees the transformation from two to three dimensions grounded in the adequate motions of the surfaces. So in order to transform two tetrahedra into one octahedron, Plato has to assume that the angle between three surfaces of the tetrahedra is opened and the fourth surface fitted in. Three-dimensional bodies will then be composed out of two-dimensional surfaces by moving the surfaces and changing the angles between them.

We saw that the receptacle has the potentiality for two- and three-dimensionality. Is dimensionality thus also a *spatial feature of the receptacle itself*? Being the site in which geometrical structures both are and are developed, the receptacle itself re-

⁹³Each of them has a certain shape derived from the combination of basic triangles, and a certain size. The size is on the one hand a function of the shape—fire elements will be smaller than water elements, because they have less surface area—and on the other hand a variable within each kind of element; there are, for example, fire bits of different sizes that start out from differently sized surfaces; see Cornford, *Cosmology*, 230–39.

⁹⁴What remains nevertheless problematic are the changes of the volumes of the elements resulting from such an elemental change: two tetrahedra and one octahedron do indeed share the same number of faces, but the volume of the two tetrahedra is only half the volume of the octahedron (we find similar problems with the volumes in the transformations involving icosahedra). Accordingly, such elemental transformations should lead to constant changes of volumes. But if the volumes of the elements change constantly, and if void between the elements is excluded (as claimed in several passages, e.g. 58a, 59a), then also the volume of the universe as a whole should be changing constantly—a rather unwelcome consequence. This could be prevented if we assumed that whenever one octahedron is transformed into two tetrahedra, simultaneously somewhere else transformations take place that make up for exactly this change in volume; see also Cornford, *Cosmology*, 245–46. Plato, however, nowhere mentions this presupposition. Alternatively, we could assume that, in seeming contrast to 58a, Plato does allow for (extensive) gaps in the created universe (these gaps could not be void, however, but would have to be undetermined receptacle). Whichever alternative we choose, Plato’s account of the transformation of the elements seems to resemble his account of astronomy: he leaves the details to be filled out by others and gives only a rough sketch naming the basic principle—in astronomy the basic principle is that all heavenly motions are to be explained by combinations of concentric circular motions; here it is that the shapes of the basic building blocks and their transformations are to be explained in geometrical terms.

ceives the elements either as solid three-dimensional bodies or as two-dimensional surfaces that are situated at certain angles to each other in such a way as to form something three-dimensional. Accordingly, the receptacle receives *dimensionality*. This might seem enough to make the receptacle a geometrical space: it allows for three kinds of geometrical elements to be transformed into each other and thus for geometrical laws to hold. However, the three-dimensionality does in no way belong to the receptacle considered on its own. The potentiality of the receptacle for dimensionality needs to be actualized by its content. The receptacle on its own only allows for this actualization without itself being three-dimensional. Each possible *shape* of the receptacle depends on the changes of the bodies and the reconfigurations of the surfaces in it. Thus the receptacle on its own can indeed stay amorphous, because it does not possess any *determined* form that it would keep permanently.

The receptacle can thus only be seen as a geometrical space insofar as it receives the shapes of the geometrically characterized elements and their dimensionality. The spatial feature that we can, however, claim as specific for the receptacle is the continuity it guarantees between the surfaces, and, if Plato does allow for some gaps between the elements, the continuity it ensures between the elements (as we saw above, such gaps cannot be void in the sense of absolute emptiness in the World, but have to be “filled” by the receptacle). The receptacle thus also seems to be identical with the distance between elements or surfaces. However, this distance is again fully determined by what it connects. So distance can after all not be understood as a spatial feature belonging to the receptacle considered on its own. But continuity is a spatial feature of the receptacle before as well as after creation.

In addition, we might count as spatial features of the receptacle before creation the fact that, as we have seen above, it is itself moveable and can in turn move—features of interest for a possible physical space—and that it is the constant “this” *in which* everything comes to be. After the creation process the receptacle possesses an additional feature, i.e. it is completely bounded. But this bounding is done by the demiurge and thus due to reason. Independent of any reason, the receptacle only possesses the potentiality to be bounded.

4. THE RECEPTACLE AND PLATO'S NOTION OF SPACE

Before we finally attempt to answer our original question, let us step back for a second and consider the function a notion of space can play for the set-up of a cosmos—the stage for Plato's receptacle. If we think of the different “layers” of a cosmos, we immediately find that there have to be some basic building blocks that make up the sensible things (which might consist of something matter-like and some structure). The building blocks move and change and come into being somehow—these changes possess a certain periodicity or lack thereof and are concurrent or successive, characteristics that are determined with the help of a notion of time. And the basic building blocks and their changes have to be somewhere—being a permanent ground for transformations and the appearance of the basic building blocks, and allowing for localization and the determination of distances is normally a task of a notion of space. Of course there are a lot of other

determinations of the basic building blocks and their changes, like the weight and density of the elements, and the cause, direction, and internal structure of their changes. But these might be derived from the basic notions just mentioned.

With the traces and elements Plato has introduced the basic building blocks of the universe, and in the Reason Part he introduced time, covering, among other things, the temporal functions mentioned. But what about a Platonic notion of space? Having seen in the last section which possible spatial characteristics are dependent on the receptacle and which on its content, we should now be in a position to answer the question whether Plato's receptacle on its own is indeed space in any sense we discussed in the beginning. It seems we have gone a long way for rather bad news.

The receptacle on its own cannot be a geometrical space, as there is no topology or metric to speak of. It misses one of the most basic features of any space, dimensionality, because it inherits all dimensionality from the things in it; the receptacle itself has only the potentiality for dimensionality. And we cannot even apply the notion of compactness and orientability to the receptacle. Whether it allows for homeomorphic transformations or not is thus not a reasonable question. Considered on its own, the receptacle possesses no specific extension, because its extension is dependent on what it receives; accordingly, there is also no distance specific to the receptacle to be determined. While we can conceive of the receptacle as the distance between two surfaces bounding one thing or between two things, this distance is fully determined by the things between which the distance holds. So the idea of a metric cannot be based on the receptacle considered on its own. Nevertheless, the receptacle is what ensures the continuity among all its contents. Thus it possesses one topologically relevant feature. However, this and the potentiality for dimensionality are not enough to call it a full-blown space.

But what, then, is the receptacle and why does Plato call it space (*chôra*)? The reason for this label seems to be that Plato introduces the receptacle as the constant "this" in which the bodies change. *Qua* that in which the bodies change, the receptacle seems to possess a specific extension in the created universe, in contrast to what we can say of it in the pre-cosmos. But yet again, the determination of this extension is derived from something else, namely from the dodecahedron that Plato claims to be the form of the world as a whole. This becomes clear when we look at the relation between the cosmos and the receptacle.

Because the pentagons necessary for a dodecahedron cannot be derived from Plato's basic triangles, which constitute all the elements,⁹⁵ the relation of the dodecahedron to the things contained is unclear. There are two possible interpretations: the world as a whole could be conceived of either as the unity of all things (Plato wrongly assuming that the basic triangular surfaces of the things can add up to pentagons), or as an independent World Body with a form independent of the things contained.⁹⁶ But in both cases the extension of the world is not deter-

⁹⁵For this problem see also Aristotle, *De caelo* 306b–307b19; Cherniss, *Criticism*, 154; and Cornford, *Cosmology*, 218.

⁹⁶In addition, it is not clear how the description of the world as a whole as spherical in the Reason Part of the *Timaeus* (33b) fits with its description as a dodecahedron here. The idea might be that

mined by the receptacle. In the first interpretation the extension of the world is determined by the unity of all things, in the second interpretation by the World Body, which, however, cannot be simply the compressed receptacle. For then the receptacle would no longer be amorphous and imperceptible. Accordingly, the World Body has to be thought of as an entity of its own. In this second interpretation we get a new extension, namely the extension between the dodecahedron and the encompassed bodies, which again is fully determined by the surfaces of geometrical bodies. As long as the World Body does not change, its extension also stays constant. So at least parts of the receptacle seem to receive a stable shape. However, because the things in the World Body change constantly, as we have seen above, the extension between the things and the dodecahedron changes accordingly. As a consequence, the receptacle remains amorphous, without any permanent determination of its own on both interpretations, even if according to the second one it is permanently bounded by the embracing World Body.

Plato's introduction of the dodecahedron as the shape of the World Body shows that we have to be cautious in our understanding of the receptacle as that *in which* things come to be and change. We should not understand "in which" as "within the last boundary in which the things are,"⁹⁷ because this would be the World Body. Rather the "in which" identifies the receptacle as that which ensures the continuity among all things within the World Body. An image might help to understand this specific meaning of "in which": if we have bodies moving in a vessel filled with water, the vessel (corresponding to the dodecahedron) marks the boundary of the motions of the bodies (which correspond to the elements) while the water (corresponding to the receptacle) is what guarantees the continuity of their motions and is in this sense that in which the bodies move.⁹⁸

In line with this image, we saw that the receptacle is characterized as something physical—it is moved by the traces and moves the things—because in Plato's picture the receptacle has to be physical itself in order to allow the *mimêmata* to appear as something physical. In contrast to water, however, the receptacle does not have an extension on its own. And it is not described as a body, since, in spite of being a physical entity, it is not perceptible and cannot be determined independently of the bodies in it. In this sense it stays amorphous. Although the receptacle is itself not a body, it is itself moving and moved, and can thus lead to effects that we normally expect from what is bodily—a feature that might remind us of the characteristics of a magnetic field in modern conceptions.

We have seen that *the receptacle itself* cannot be understood as a full-blown space. However, Plato does have a notion of space, which he unfolds via the dodecahe-

the form of a dodecahedron is as close as we can get to a sphere in the realm of necessity. See also Cornford's (*Cosmology*) reference to *Phaedo* 110b, where Socrates talks about the resemblance of the spherical earth and a dodecahedron.

⁹⁷This is a spatial notion familiar from Aristotle's *Physics* IV.

⁹⁸So even if Plato does allow for gaps in the universe in connection with elemental transformations (while he excludes gaps when describing the compression of the things in the World Body), the receptacle grants the continuity of these gaps. The water image is only meant to help illustrate the specific meaning of "in which" in question. Why the receptacle should, however, not be understood as completely analogous to water was explained above.

dron and the things in the receptacle, i.e. traces and elements. Not only is the content of the receptacle three-dimensional, even if derived from two-dimensional surfaces; the *content-filled* receptacle also introduces a full geometrical space: the created universe, in which the elements are geometrically structured and fully compressed, is connected—there are no disjoint patches—and also closed and bounded and hence compact. And it is orientable with respect to the basic elements as they can have an orientation, for instance, they can be right-handed, once the order of the universe is given. The continuity between the elements is secured by the receptacle, ensuring that any element in it possesses a neighborhood of elements. Only the dodecahedron that forms the limit of the universe does not possess a neighborhood.

The created universe also allows for homeomorphic transformations as described above in section 2. However, they should not be mistaken for the transformations Plato is most interested in, i.e. the transformations among the three elements fire, air, and water into each other. While these elemental transformations seem to be parallel to the continuous deformations in which objects retain their topological properties—like the changes from doughnuts to coffee cups the topologists like to play with—the elemental transformations actually occur under tearing and breaking,⁹⁹ not, like homeomorphic ones, under stretching and bending. So Plato's elemental change does indeed also include a change of the topologically relevant features. Employing topology thus allows us not only to see where Plato does work with the most basic spatial notions (also *in potentia*), but also to clarify the status of such changes.

As for a metric, we saw how tracing back the surfaces of the elements to two basic triangles allowed for the possibility of determining the distances between elements. While we are not explicitly given any distance units, the basic geometrical bodies could serve as such units determining (not only degrees of nearness but the quantity of) the distance.

But the actual space finally developed by Plato is not only a topological space; it is more specific, namely a Euclidean space. When the demiurge binds the initial traces with rectilinear surfaces and reduces all surfaces to two basic triangles, the elements seem to inherit the rules we know from Euclidean geometry. This can be seen, for instance, from the fact that the difference between the two basic triangles crucial for the set-up of the elements is not a topological difference, but a difference in Euclidean geometry, or from the role that the different sizes of the elements play. Size is not a topological property, so differences in size do not have explanatory power within a merely topological account. But Plato uses these differences as a necessary condition for the explanation of *physical* processes.

So Plato does indeed have a geometrical space depending on the elements, at any rate after creation. And while this space depending on the elements is Euclidean, the topological concepts employed allow us to grasp also the potential spatial features of the receptacle. Now is this geometrical space also open for a

⁹⁹See 56e–57b, where elementary change is described: other elements are cut up by fire, while fire is shattered and quenched by them. We see that elemental change in Plato cannot be thought of as a mere homeomorphic mapping.

physical interpretation? Yes, at least in connection with the receptacle. How the elements can be transformed and where they move to, i.e. the determination of the changes and locomotions of the elements, is explained by their geometrical structure (and their tendency to gather together like to like). And (at least the microscopic structure of) the shapes of the sensible phenomena can be derived from the geometrical structure of those elements.¹⁰⁰

The remaining two criteria for physical space—to be that in which all motions and sensible things are situated, and to be a condition for the appearance of what we perceive—are fulfilled by the receptacle. However, as we saw above, in order to localize anything in the receptacle (and thus situate it fully) the content of the receptacle is again required.

The receptacle fulfills the latter criterion, being a condition for the appearance of what we perceive, in virtue of being a physical entity—it is involved in (originally chaotic) motion and causation by being itself moved and by causing the traces of the elements to move, and after creation it exists in time. It needs to be physical itself, in order that what appears in it should be physical. This renders the receptacle a *physical* condition for spatial stuff. But we saw that its main task is to be the *metaphysical* foundation for the spatial aspect of the world. As a set of potentialities for all the basic spatial features, the receptacle is the metaphysical basis for the development of geometrical and physical space; this basis Plato develops with the help of the traces and elements as an actual geometrical and physical space. It is as the metaphysical basis for geometrical and physical space that the receptacle also explains the possibility of the sensible world as a whole—it enables the images of the Forms to appear as sensible things and the sensible things to move and change—and is thus introduced as a third *genos*.

Being a condition for the physical world as a whole, the receptacle is itself not accessible in the way a physical body is, i.e. by perception. Rather, we saw that it requires a certain kind of inference, which Plato calls “bastard reasoning.” The receptacle is not comprehensible by straightforward reasoning, because it is itself nothing actualized, but only a set of potentialities. In contrast to an ordinary conclusion derived from given premises, in this case we have to infer a *new* premise (the existence of the receptacle) that allows for explaining how we can derive a *given* conclusion (the existence of sensible things) not solely derivable from the premises given before (the existence of the Forms and of the demiurge).¹⁰¹ So we

¹⁰⁰See criteria (b) and (c) for physical space above in sect. 2.

¹⁰¹This inference structure may be a version of what is also called inference to the best explanation. Broadie (*Divinity*, sects. 6.5–6.7) thinks that after 49c7–50b5 Plato wants to prove the existence only of the Forms, not of the receptacle. She connects reading the main passages of Timaeus’s second beginning as establishing the existence of the receptacle with an “ontological reading” of the receptacle—the receptacle is introduced to answer some ontological problems with Forms and images—while she connects understanding it as proving the existence of the Forms with her own “cosmological reading,” in which the receptacle meets a specifically cosmological need. I do not think that we actually have to decide between a purely ontological and a purely cosmological account of the receptacle. Rather, the cosmology of the *Timaeus* shows us that the Platonic ontology so far is not enough to give an account of the cosmos, and that a further ontological principle has to be assumed. But the ontological account is only spelt out as far as the cosmology of the *Timaeus* calls for. Broadie gives two main arguments against an ontological understanding: first, it would require the receptacle to be introduced at the

have to look for a condition that allows for completing the premises in such a way that we can indeed derive the given conclusion, i.e. a condition that allows for a metaphysics capable of explaining the sensible world. In principle there may be more than one condition that could complete such a system. Plato's receptacle can therefore only serve as part of a "likely explanation" of the world. Timaeus's claim, to give only a likely account of the world, may therefore be most accurate for Plato's description of the realm of necessity.¹⁰²

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very beginning of Timaeus's cosmology, when he distinguishes Being and Becoming. Secondly, the receptacle passage should then deal with all kinds of sensible things, not only with the four elements. However, since all sensible things are made up of the four elements, this is enough to sketch the role the receptacle plays vis-à-vis the Forms and the sensible things. And given that Plato's readers are already familiar with the first two ontological principles from other dialogues, it seems rather natural that Timaeus's monologue would start with them. The third, completely new *genus* is best and most persuasively introduced where the explanatory need for it becomes obvious—at Timaeus's second beginning. It also seems unlikely that Plato would spend much more time with proving the existence of the Forms than of the receptacle given that he has already argued for them in other dialogues, as for instance in the *Phaedo*, while the receptacle is the novelty here. And the second beginning claims in 48e that the task of the new account is to show that we have to assume a third basic kind.

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