

## Plato's Reception of Presocratic Natural Philosophy.

It is commonly thought that the *locus classicus* and most evident place to start for Plato's reception of presocratic natural philosophy (PSNP) is the passage known as Socrates' autobiography *Phaedo* 96a ff.<sup>1</sup> Here Socrates talks of his early interest in *peri phuseôs historian*, the "enquiry concerning nature," followed by his subsequent disenchantment with this type of enquiry.<sup>2</sup> He is then excited by the possibility of explanation in terms of *nous* in the works of Anaxagoras, but is disappointed with the results and so takes up his *deuteros plous*, the "second sailing." Undeniably this is important evidence, but in what follows I wish to press two points. Firstly, I would caution against a too stereotypical interpretation of the *Phaedo* passage, such that it is seen as a blanket condemnation of all PSNP. Secondly, the *Phaedo* passage is far from being our only source of information on Plato's attitude to PSNP, or indeed the most interesting or most important source. Subsequent to these points, I will argue that Plato is not uniformly critical of all PSNP either in the *Phaedo* or elsewhere. I will also argue that Plato has more than one critique of PSNP and importantly Plato has more than one taxonomy for PSNP. These critiques and taxonomies are related to those of the *Phaedo*, (note the plural here) but they are not identical and have some subtle and interesting differences which allow us a much richer account of Plato's reception of PSNP. Plato's reactions to PSNP also point to some interesting facts about PSNP.

### **Caution**

I will begin with some words of caution. Plato was not, and indeed made no claim to be a historian of PSNP or presocratic philosophy more generally. As with Aristotle, there are issues concerning how we should treat what Plato tells us about the presocratics and how we should understand his attitude to them.<sup>3</sup> At least in part this is tied up with the issues of what Plato was attempting to do with his dialogues and the arguments he gave to his interlocutors, issues which we can hardly settle here. Did Plato faithfully record the views of the presocratics as he understood them? Even here, the "as he understood them" may be problematic, as with Aristotle.<sup>4</sup> Or did Plato caricature some presocratic views into more extreme positions for his interlocutors, for his own dialectical/philosophical/dramatic purposes? Was the presocratic person or the presocratic idea the main focus for Plato?<sup>5</sup> This issue is made more problematic by the fragmentary and contested state of the evidence on PSNP (and the fact that sometimes Plato is part of that evidence) such that in places it is difficult to give a definitive answer.<sup>6</sup> This is exacerbated by that fact that Plato rarely named

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<sup>1</sup> My thanks to Jon Griffiths and Hugh MacKenzie for their comments.

<sup>2</sup> How the autobiography of Plato's character Socrates relates to that of the historical Socrates is open to question, cf. Aristophanes *Clouds* 230 ff., Plato *Apology* 19b-d and 26d.

<sup>3</sup> On Aristotle, see H. Cherniss. *Aristotle's Criticism of Presocratic Philosophy*. Baltimore: John Hopkins Press, 1935 and the debate that has followed, on Plato see M.M. McCabe. *Plato and His Predecessors*. Cambridge U.P., 2000.

<sup>4</sup> The standard complaint about Aristotle is that he saw the presocratics very much in the terms of his own philosophical structures and categories.

<sup>5</sup> One might argue that this is complex as at least the dramatic portrayal of persons is related to their philosophical ideas in Plato, e.g. the appearance/disappearance of Protagoras' head in the *Theaetetus*.

<sup>6</sup> In relation to the *Phaedo* at least, there is clear reference to the Pythagoreans and Sedley, D. Platonic Causes, *Phronesis* 43, 1998, pp. 114-132, J. Bryan. *Likeness and Likelihood in the Presocratics and Plato*. Cambridge UP, 2015, G. S. Betegh. *Greek Philosophy and Religion*. A companion to ancient philosophy / edited by Mary Louise Gill and Pierre Pellegrin. London: Blackwell 2016, have all made cases for other interesting precursors.

presocratic thinkers.<sup>7</sup> Plato may well have alluded to some or indeed many of them, but evidence of allusion is notoriously difficult to deal with. We do not have, and indeed there may not be clear cut criteria for deciding on whether a passage alludes to a previous thinker or not. A further consideration here is whether it is possible for us, nearly 2,500 years distant from Plato's milieu, to pick up all the resonances and nuances of allusions. I will also add a word of caution in that views on Plato's own natural philosophy vary widely. Those who believe that Plato had no interest in generating a serious natural philosophy of his own are likely to find the view that Plato dismissed PSNP as a whole a conducive one. So beware that I take the view that Plato did take the possibility of giving his own account of nature seriously and in line with that I find the idea that he had a varied and sophisticated reception of PSNP attractive.<sup>8</sup> While the "no interest" view is rare in its extreme form now, there is a wide spectrum of views on how interested Plato was in giving an account of the natural world and what sort of status such an account had for him.

### *Peri Phuseôs Historian*

It is of critical importance for our understanding of Plato's reception of PSNP that we are clear about the meaning of this phrase at *Phaedo* 96a8. *Historian* is relatively unproblematic, though I prefer "enquiry" to "investigation" as giving a looser, less methodologically rigid and more philosophical sense to the project which I believe to be appropriate.<sup>9</sup> Burnet's "natural history" has too many resonances with the nineteenth century discipline and overly restricts the sense of *historia*.<sup>10</sup> The real issue here though is the Greek term *phusis*, literally "nature," with the cognate terms *phusikoi* and *phusiologoi*, literally "naturalists" and "those who talk about nature." It is highly misleading here to translate *phusis* as "physics" or something similar, or to translate *phusikoi* or *phusiologoi* as "physicists." PSNP was much broader than any modern conception of physics, including e.g. zoogony and meteorology. This should be clear from any cursory inspection of PSNP and what is included in works titled "*Peri Phusis*." It should also be clear from Plato at *Phaedo* 96a5 where the questions Socrates first mentions in relation to *peri phuseôs historian* are to do with coming to be, existing and perishing, zoogony, psychology, epistemology and cosmology. Physics/physicist also has connotations of physicalism or materialism, that is someone who believes the world to consist of physical or material entities only. Again, for many thinkers who would ordinarily be counted within the canon of PSNP, that is not so. Anaxagoras and *nous* would be a key example here, not least because Plato recognised Anaxagoras and *nous* as part of PSNP. So too physics/physicist carries methodological connotations (that the work is, e.g. empirical or experimental) which are inappropriate for PSNP.

The term *phusis* also has connotations which are not fully captured by the translation "nature." Firstly, it has a sense of giving the origins, development and current constitution of something, as LSJ have it "*origin... the natural form or constitution of a person or thing as the result of growth.*" Secondly, *phusis* derives from *phuein*, "to grow" and so can carry a strong organic sense to it. Thirdly, as Mourelatos has recently argued, *phuein* can have a sense of dynamic being, of coming into being where, *esti* expresses a more static sense of

<sup>7</sup> There are further questions here. What reason did Plato have for naming some previous thinkers and not others? What reason did Plato have for naming them in some passages but not others where it can be argued that they are clearly alluded to?

<sup>8</sup> See A. D. Gregory. *Plato's Philosophy of Science*. London: Duckworth, 2000.  
*Ancient Greek Cosmogony*. London: Duckworth, 2007.

<sup>9</sup> I would avoid the idea that there was a unitary investigation of nature rather than methodological diversity among the presocratics and 'investigation' may imply a more empirical approach than was actually the case.

<sup>10</sup> There is not much to be gleaned from Plato's other uses of *historia* and its cognates (*Phaedrus* 244c9, *Cratylus* 437b1, *Sophist* 267e2) other than he is generally positive about it. Whether *peri phuseôs historian* is Plato's own phrase or a term he has picked up from some other source is unknown.

being.<sup>11</sup> All of this can be seen in the *Phaedo* 96a ff., where Plato clearly thinks *peri phuseôs historian* encompasses more than what we would understand by physics and is particularly interested in why each thing comes to be, exists, and perishes. That Plato treats *phusis* in a dynamic manner can also be seen from how he treats these topics and also from how he treats the more abstract questions (still part of *peri phuseôs historian*) of why one person becomes taller than another or why one number is greater than another. So too we can see this in the *Timaeus* where Plato gives his account of *phusis*, giving the origins, development and current constitution of the cosmos and living things. The cosmos itself is a living thing and there is of course great emphasis on coming into being. In the *Timaeus* Plato also makes significant use of the phrase *kata phusin*, “according to nature.”<sup>12</sup>

So *peri phuseôs historian* is the enquiry concerning nature, with nature being understood in the early Greek sense of “nature.” Much as I admire PSNP, it was not physics being conducted by physicists, or even wholly materialist. Examined in this manner, that may seem relatively evident, but it is alarming how often terms such as physics, physicist and materialist are used in this context even in relatively modern work.<sup>13</sup>

On a related issue, I generally translate *aitia* and its cognates as “reason” or “explanation” in Plato rather than “cause.”<sup>14</sup> There are very good grounds for a similar approach to Aristotle, translating his four *aitiai* as “four reasons” or “four explanations” or four “because.”<sup>15</sup> Much of this also applies to Plato and it is also important to avoid overly modern, physical, or mechanical connotations of “cause” in places. I am also reluctant to give Aristotelian names to Plato’s *aitiai* (material, formal, efficient or teleological) as again this can introduce significant distortions and anachronisms. We may ultimately decide that some of Plato’s *aitiai* might reasonably in some sense be called causes, though that requires considerable discussion.

### ***Phusis* and the presocratics**

Having taken care to consider the meaning of *phusis* in Plato’s *Phaedo*, we also ought to take care in considering the meaning of *phusis* in the presocratics, especially as the transmitted title of many of their works is simply *Peri Phusis*, “Concerning Nature.” Again, *phusis* here is nature not physics! There is a temptation here, born out of generosity to the presocratics to try to interpret their natural philosophy as physically or mechanically as possible. The goal here is to try to find greater affinities with modern science such that we can then have a higher opinion of PSNP. There are serious historiographical objections to such an approach, which will tend to highlight the supposed affinities between ancient and modern thought while excluding the differences. It is also important to recognise that on an objective analysis of the evidence, many of the presocratics were not physical or mechanical thinkers. It is equally important to recognise that this is Plato’s perception of a significant portion of PSNP as well. So in the *Philebus* Plato has Socrates say:

Well, Protarchus, should we say that the whole universe is ruled by unreason, irregularity and chance, or on the contrary, just as some of those who came before us

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<sup>11</sup> A.P.D. Mourelatos. Reviews of Laks and Most, *Early Greek Philosophy*, *Bryn Mawr Classical Review*, 2018.

<sup>12</sup> *Timaeus* 47c is an important example here.

<sup>13</sup> See e.g. S. Menn. On Socrates’ First Objection to the Physicists. *Oxford Studies in Ancient Philosophy* 2010, pp. 37-63.

<sup>14</sup> See Vlastos, G.L. Reasons and Causes in the *Phaedo*. Reprinted with revisions in *Platonic Studies*, 2nd edition, Princeton U.P., 1981, pp. 76-110, cf. D. Sedley. Platonic Causes, *Phronesis* 43, 1998, pp. 114-132.

<sup>15</sup> See M. Hocutt. ‘Aristotle’s Four Because’, *Philosophy* 189, 1974, pp. 385-399.

said (*hoi prosthen hêmôn elegon*), say that *nous* and a marvellous organising intelligence steer (*diakubernan*) it.<sup>16</sup>

Plato then recognized that there were people before him who believe that an intelligence steered the whole universe. Cosmology in this sense is clearly part of *peri phuseôs historian* for Plato. A little later we also get: “This supports those of old who believed that *nous* always rules the universe.”<sup>17</sup> Fowler in the Loeb attributes this view to: “Anaxagoras and probably some now unknown precursors.”<sup>18</sup> It is interesting that Fowler chose to comment here (and not at 28d) and in this manner. I believe this is indicative of two things, a tight focus on Anaxagoras and *nous* generated by the idea that the *Phaedo* defines Plato’s attitude to PSNP and a failure to recognise that there were interesting presocratic uses of *kubernain*, to steer or govern. Plato may be referring to Anaxagoras here but we can be rather more positive about the supposedly “unknown precursors.”

There was a tradition in PSNP of using the verb *kubernain* in important cosmological contexts and we can find its use in Anaximander, where the *apeiron* “surrounds all and steers all” (*periechein hapanta kai panta kubernan*), the Hippocratics and Heraclitus where “all is steered through all,”<sup>19</sup> Parmenides where a goddess sits in the middle and steers all,<sup>20</sup> and Diogenes of Apollonia who says that:

In my view that which has intelligence is called air by men, and all men are steered (*kubernasthia*) by this and it has a control (*kratein*) over all things. This seems to be a God to me and to have permeated everywhere, to arrange all things and to be in all things.<sup>21</sup>

Diogenes is worth quoting here for two reasons. Firstly, he uses both *kubernain* and *kratein* (to control or have power over) together and there are further presocratic thinkers who use *kratein* or its cognates in a similar manner or on its own.<sup>22</sup> This broadens our group of presocratics. Secondly, it should be clear from this that steering, at least for Diogenes is thoroughgoing and ongoing. By that I mean that it affects all parts of the cosmos and does so at all times, not just for cosmogony.<sup>23</sup> Where the steering principle has been recognised there has been a tendency to play down its role, suggesting it applies only to some part of the

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<sup>16</sup> Plato, *Philebus* 28d.

<sup>17</sup> Plato, *Philebus* 30d.

<sup>18</sup> H.N. Fowler and W.R.M. Lamb, *Plato: Statesman, Philebus, Ion*. Loeb Classical Library, 1925, p. 269 note 1.

<sup>19</sup> Heraclitus DKB41. All things are steered (*ekubernêse*) through all. Cf. Heraclitus DKB64, The thunderbolt steers (*oiakizei*) all things. For the Hippocratics, *On Regimen*, I/ 10 tells us that: “In a word, everything was arranged (*diakosmêsato*) in the body by fire, in a manner suitable to itself... The hottest and strongest fire, which controls (*epikrateitai*) all things, manages everything according to nature (*kata phusin*), it is imperceptible to sight or touch. In this are soul, mind, understanding, growth, change, diminution, separation, sleep, waking. This steers all things though all (*panta dia pantos kuberna*) both here and there and is never still.”

<sup>20</sup> Parmenides Fr. 12. The narrower rings are full of unmixed fire, those close by are full of night but with some measure of flame. In the middle of this there is a goddess, who steers (*kubernai*) all things, ruling the hateful birth and mixture of all things, sending female to have sex with male, and conversely male with female.

<sup>21</sup> Diogenes of Apollonia Fr. 5.

<sup>22</sup> The Hippocratic *On Regimen* I/10 uses *kubernain* and *kratein* as well, Anaximenes uses *kratein* (as our soul, being air, holds us in order (*sungkratei*), so wind and air envelop the whole *kosmos* DK13B2), The Derveni Papyrus too (col. 19, 3 air controls (*epikratei*) all), and Anaxagoras (DKB12 *pantôn nous kratein*, ‘nous controls all’, DKB12 *kai tês perichôrêsios tês sumpasês nous ekrateisen* ‘and nous controlled the whole revolution’).

<sup>23</sup> Uses of *kubernain* Heraclitus DKB41 and Hippocratic author, *On Regimen* I/10 would also suggest that steering is ongoing and thoroughgoing.

cosmos or only for a specific period. It is worth noting that in both Plato and Aristotle the role of steering is thoroughgoing and ongoing.<sup>24</sup> The role of *kubernein* and *kratein* in PSNP then is not easily dismissed even if it has been downplayed in many accounts. It is important to recognise here that a taxonomy of teleology/non-teleology for the presocratics does not result in an empty set for teleology and that Plato is quite aware of this.

### Demarcating PSNP

One objection to what I have been arguing so far might be to say that what Plato understood by *peri phuseôs historian* was different from how the presocratics understood PSNP. I doubt that there is any significant dissonance here though. Consider this first from an ancient point of view. We might look at who Aristotle includes when he talks of *phusikoi* and *phusiologoi* which will give us a reasonably standard canon of presocratic philosophers and PSNP.<sup>25</sup> We might also simply ask who among the presocratics entitled their work “*Peri Phusis*” or something similar, which will give us pretty much the same results. More critically and possibly more contentiously we might then ask who and what Plato considered to be part of PSNP. If we then work through Socrates’ autobiography and the *Phaedo* more generally looking at the ideas/people named and alluded to we will get similar results, as indeed we will if we work our way in similar fashion through Plato’s other works and the *Timaeus* in particular. In both the *Phaedo* and the *Timaeus* Plato appears to be remarkably knowledgeable about PSNP in both breadth and depth.<sup>26</sup>

A different line of approach would be to look at the question of demarcation for PSNP from a modern perspective. What does and what does not count as PSNP? Clearly we must have some criteria as not all of presocratic thought is on natural philosophy. One way to do this would be to say if the presocratic in question is a physical/ mechanical thinker then they are part of PSNP and everyone else is excluded. That would exclude Homer, Hesiod and the Orphics. Whether that would exclude anyone from the standard canon of PSNP would depend on how physically and mechanically it is possible to interpret their work. The point of such an approach would be that now Plato’s critique in the *Phaedo* would be of the whole of PSNP so construed. Alternatively, one might characterise PSNP in terms of material causation.

Of course one can easily produce other demarcation criteria. One might argue that PSNP was characterised by invariance, loosely that given the same circumstances the same things happen, in contrast to the capricious interventions of the gods in Homer and Hesiod. So too one might use parsimony as a criterion, contrasting the ontological profligacy of myth, or the use of natural explanations, or the use of argument and observation against the authority of an account being derived from the gods or the muses. A combination of these criteria would again produce a reasonably standard canon of PSNP.

The term “mechanical” is used far too freely for the presocratics. It should be clear that explanations based around *kubernein* and *kratein* are not mechanical but are important for many presocratics. Anaximander also used many biological metaphors in explanation, the *gonimos*, “seed” and the bark similes in cosmogony, the use of *ekkprinein* “to secrete” in separation from the *apeiron*. Many other presocratics used biological rather than mechanical metaphors. Anaxagoras did not always fail to make use of *nous* in explanation (*nous* originates motion and controls (*kratein*) the separating off (B12, B13) and even when Anaxagoras fails to make use of *nous* the explanations are not mechanical as again he relies on biological metaphors. More radically, and I only have space to state rather than argue

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<sup>24</sup> See e.g. Plato *Politicus* 272d ff., Aristotle *Meteorology* I/2.

<sup>25</sup> One might also compare here those whom Aristotle considered to be *muthologoi* and *theologoi*.

<sup>26</sup> One might argue that the *Timaeus* is a running commentary on PSNP. In the *Phaedo*, Socrates exhibits very good knowledge of the people and ideas he criticizes, so too in the myth, see Sedley *ibid*.

here, there is a case that Leucippus and Democritus did not use mechanical explanations as despite their sparse materialist ontology the dominant explanatory metaphors for how like to like sorting occurs are biological (birds flocking together), agricultural (whirled sieve sorting like seeds), and maritime (beach pebbles).<sup>27</sup>

### *Peri phuseôs skopei*

While the *Phaedo* phrase *peri phuseôs historian* is well known, it is much less well known that at *Phaedrus* 270cd, Socrates says: “So see what Hippocrates and true reason (*ho alêthês logos*) say about the examination concerning nature (*peri phuseôs skopei*).” The *Phaedo* then is not our only source on Plato and some form of enquiry *peri phuseôs*. Here *skopein* means to contemplate/consider/examine/observe so perhaps the smoothest English translation would be “the contemplation of nature.”<sup>28</sup> In the next line we have “it is necessary to take in mind the nature of anything” (*dei dianoeisthai peri hotououn phuseôs*). Here *dianoeisthai* standardly means to have in mind or to intend. It is highly interesting that here it is possible for there to be *ho alêthês logos*, about the enquiry/ examination concerning nature. Whether *ho logos* is reason or account, it is clearly *alêthês* ‘true’. There is also much here that is reminiscent of the *Phaedo*. Socrates says that we should not trust the authority of Hippocrates, but see if what he says agrees (*sumphônei*) with our investigation of the matter, echoing the famous use of *sumphônein* in relation to hypotheses at *Phaedo* 100a5. As with *Phaedo* 99de, at *Phaedrus* 270de there is an association of the wrong method with blindness.

What is this method? First it must be considered whether what we are investigating is simple or multiform (*haploun hê polueides*), then if it is simple we must consider what ability it has to act or be acted upon, and if it is diverse then we must number its forms and then proceed for each as with something simple. This discussion of method is prompted by Socrates’ question of whether it is possible to gain any worthwhile knowledge of the nature of the soul (*psuchês oun phusin*, 270c1) without the nature of the whole man (*tês tou holou phuseôs*, 270c2). *Phaedrus* replies that if Hippocrates is to be trusted, we cannot know the body either except by this means of pursuing the enquiry (*Phaedrus* 270c). This may not tell us a great deal methodologically, but what is important here is that Plato clearly thinks that there is a proper method for conducting *peri phuseôs skopei* and this is at least part of it.

One indication that we undervalue this *Phaedrus* passage is that PSNP is often referred to as *peri phuseôs historian* or *historia per phusis*. It is indeed proper to try to find a Greek term for PSNP which does not import modern conceptions of physical science. However PSNP could equally be referred to as *peri phuseôs skopei* or *skopein peri phusis*. Should we be quite so fixated by Socrates’ autobiography as a source for Plato’s reception of PSNP? The *Phaedrus* passage is good evidence against too stereotypical a reading of the *Phaedo* giving a blanket rejection or condemnation of PSNP.

### Presocratic medical writers

The *Phaedrus* passage raises another question. Should the Hippocratic and other early medical writers be considered to be part of PSNP? Although usually excluded from the canon of presocratic philosophy, we should at least consider whether they form part of PSNP.<sup>29</sup> The

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<sup>27</sup> Like to Like in Leucippus and Democritus is not a force, but a principle of sorting which occurs only within a vortex. See A. Gregory Leucippus and Democritus on Like to Like and ou mallon. *Apeiron: a Journal for Ancient Philosophy*, 46, 446-468, 2013. See Sextus Empiricus *Against the Mathematicians* VII 116-118 for the biological metaphors, also note that what surrounds each cosmos and gives it integrity for Leucippus and Democritus is a *humen*, a biological membrane, Diogenes Laertius IX, 31.

<sup>28</sup> The verb *skopein* is very common in Plato, interlocutors often beginning speeches with *skopei*, ‘consider’.

<sup>29</sup> So, e.g. G.S. Kirk, J.E. Raven, and M. Schofield, *The Presocratic Philosophers*. 2nd edition, Cambridge U.P 1983 and J. Barnes. *The Presocratic Philosophers*. 2nd edition. Routledge and Kegan Paul: London and New York 1982 omit them as do many others

Hippocratic *On Regimen* would have a strong case, with a strong Heraclitean influence and in particular I/10 on the origins and nature of the cosmos deals with many PSNP themes. So too the Hippocratic *On the Sacred Disease*, which argues that the sacred disease (epilepsy) and indeed all other diseases have a *phusis* would be a strong contender. In relation to *Phaedrus* 270cd, it would seem that Plato certainly considered Hippocrates to be part PSNP.

Hippocrates is concerned with the *phusis* of the body and its component parts (270c 3-5) and clearly has important things to say about the proper method for *peri phuseôs skopei*. We might also look at *Gorgias* 501a, where we find that: “Medicine has examined (*eskeptai*) the nature (*phusin*) of what it looks after and the explanation (*aitian*) of what it does and can give an account (*logon... dounai*) of each.” So again we have *skopein* and *phusis*, and it is clear that medicine can give an explanation of its practice (Cf. *Phaedo* and its treatment of *aitiai*) and can give an account of both (Cf. Plato *passim* on giving accounts).

There are several reasons why this is important. If we are asking what the Greeks thought was PSNP, or more specifically what someone who followed directly after PSNP though was PSNP, here we have good evidence that medical writers were included for Plato. We ought to be very suspicious of any modern definition of PSNP which ignores this fact. There is also a broader aspect to accepting Hippocrates and other early medical writers as part of PSNP. This is that Plato clearly gives some of their thought a positive reception. As we have seen Hippocrates is endorsed on method and it is well known that Plato’s replenishment theory of pleasure and pain is influenced by earlier medical work. The later part of the *Timaeus* is also fruitful ground here as Plato discusses the nature of the body, the nature of disease and how to treat disease in a manner which clearly reflects earlier medical work as much as the earlier astronomy, cosmology and theory of matter treats presocratic thought in these areas.<sup>30</sup> It is significant here that in his treatise on natural philosophy, Plato includes the nature of the body, disease, and treatment and again sees these as part of PSNP. That he does should be no surprise. Plato clearly buys into the conception of *phusis* as origins, development, and current state and wants to give an account of the entire cosmos and its contents. He also buys into the idea of the macrocosm-microcosm analogy (seen in presocratics such as Anaximander, Hippocratic *On Regimen*, etc.) so here we have the account of the microcosm to match the earlier account of the macrocosm. I am also inclined to agree with Levin’s recent work that Plato saw the medical tradition as a rival, both in terms of giving an account of *phusis* and in prescribing how we should lead a good life.<sup>31</sup> As with the physical cosmos and the presocratics, Plato in the *Timaeus* took over the focal points of the debates in medicine, critiqued some views, and took over and transformed others in order to generate his own account

### **Is there approval of some PSNP in the *Phaedo*?**

Does Plato approve of some PSNP in the *Phaedo*? An interesting passage here is *Phaedo* 108e-109a7, where Socrates says that:

I am now persuaded that, firstly, if (the earth) is *peripherês* and in the centre of the heavens, then it requires neither air to prevent it falling nor any other necessitation of this sort, but the uniformity of the heaven itself in every way and the equipoise of the earth itself is sufficient to restrain it. For something which is equipoised and is placed in the middle of something homogenous cannot yield to being moved aside in any way, but in like manner will remain steadfast.

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<sup>30</sup> The mainw sources for Plato here are generally thought to be Philolaus and Philistion (see e.g. G.E.R. Lloyd. *In the Grip of Disease*. Cambridge U.P., 2013 p. 153) though Plato addresses a wide number of debates/ issues here, not least minimal intervention self-healing versus radical intervention.

<sup>31</sup> S.B. Levin. *Plato's Rivalry with Medicine: A Struggle and Its Dissolution*. Oxford UP, 2014.

If this is a report of a presocratic view (which Socrates is persuaded by) then the problem of the shape of the earth in the *Phaedo* is easily resolved. I have left the contested word *peripherês* here untranslated. Most naturally it would mean flat and round but that seems to clash with other passages which would suggest a spherical earth. If Plato did mean a spherical earth here, it is odd that he does not use *strongulos* (round, 97e1) or *sphairos* (spherical, 110b7) as he does in other passages in the *Phaedo*. The conditional is then important. If the earth is *peripherês*, it stays in position and implicitly a spherical earth would do so as well on this reasoning, *a fortiori*. The key thing here is the positive reception of a piece of PSNP but I would also note the way in which Plato transforms the received view from a flat round earth to a spherical one for his own purposes. The most likely candidate for reference here is Anaximander, who did indeed hold that the earth is flat and round and that it stays in place. One might compare here the more critical line taken on theories of the earth's immobility at *Phaedo* 99b6-8: "This is why one man surrounds the earth with a vortex, making the earth remain still because of the heavens, while another supports it on a base of air, as though it were a broad kneading trough."<sup>32</sup> Possible allusions here are Anaxagoras, Leucippus, and Democritus for the vortex theory and Anaximenes for the supported by air theory. Here again we see good knowledge of PSNP.

A second candidate for a presocratic theory which receives a positive welcome in the *Phaedo* is the like to like principle, though again we need to exercise caution. Like to like was actually a family of relationships, depending on what is thought to be like and how that likeness is mediated. The first recorded instance of like to like is Homer, "God always leads like to like,"<sup>33</sup> which Plato quotes at *Lysis* 214a6. In the *Phaedo*, Plato relies on the principles that like is known by like and like perceives like for the relation of the soul to the forms (*Phaedo* 79c ff.).<sup>34</sup> Both of these principles can be found in Empedocles (by earth we see earth, by water, water etc.),<sup>35</sup> and Aristotle *Metaphysics* 1000b makes clear that both perception and knowledge are involved here.<sup>36</sup> If we go later in Plato, then Sextus Empiricus tells us that:

There is an old view which, as I said previously, has long been prevalent among the *phusikoi*, that like recognises like. Democritus confirmed of this opinion and Plato spoke of it in his *Timaeus*. Democritus founds his argument on both animate and inanimate things. For animals, he says, flock with animals of the same kind—doves with doves, cranes with cranes, and so with the other irrational animals. Similarly in the case of inanimate things, as can be seen from seeds that are being winnowed and from pebbles on the sea-shore. For in the one case the whirl of the sieve separately arranges lentils with lentils, barley with barley, wheat with wheat; and in the other case, by the motion of the waves, oval pebbles are pushed into the same place as oval pebbles, and round pebbles as round as pebbles, as though the similarity in things has some sort of ability for leading things together.<sup>37</sup>

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<sup>32</sup> Is καρδόπιω, which usually means "kneading trough," the right text? A more plausible alternative in the context of something broad being supported by air is καρδοπίω, the lid of a kneading trough as. Aristotle specifically mentions a lid in this sort of context, *De Caelo* 294b13-30.

<sup>33</sup> Homer, *Odyssey* XVII, 218

<sup>34</sup> Arguably elsewhere in the *Phaedo* as well—81d according to Woolf, R. G. (2004) The practice of a philosopher. *Oxford Studies in Ancient Philosophy* 26:97-129 and possibly 64a and 84b.

<sup>35</sup> Empedocles, DKA17.

<sup>36</sup> Cf. Sextus Empiricus, *Adversus Mathematicos*, I. 302-3. Arguably one can find like to like in many other places among the presocratics as well, certainly in the Derveni Papyrus, Col. 25 7-9 and possibly in Parmenides Fr. 8, 25.

<sup>37</sup> Democritus Fr. 164, Sextus Empiricus *Against the Mathematicians* VII 116-118.



In the *Timaeus* Plato accepts that like is sorted with like, but disagrees with Democritus on whether like to like sorting is sufficient for cosmos formation. In relation to these passages, it is important that we recognise that at *Phaedo* 99b, Plato has Socrates be critical of those who are: “Unable to distinguish between the real reason (*aition*) for something and that without which the reason (*aition*) could ever be a reason (*aition*).” Socrates then rejects physical explanations as inadequate in general and specifically in cosmology rejects explanations in terms of some physical support for the earth (a vortex, or air supporting the earth) in favour of explanations which state why it is good for the earth to be where it is and be stable. However, at *Timaeus* 46de we find that:

All of these are *sunaitiai* (auxiliary explanations), which the god uses as tools to instantiate the form of the good. However, they are thought by most men to be not the *sunaitiai* but the *aitiai* of all things, cooling and heating, packing together and dispersing and all such actions... we must speak of both types of *aitiai*, but keep separate those which with the aid of mind generate that which is beautiful and good, from those which are devoid of understanding and in each case produce chance, unordered results.

A change, or at least a refinement from the *Phaedo*? Or, given that Plato does accept some ideas from PSNP in the *Phaedo*, and the passages we have seen from the *Timaeus*, *Phaedrus*, and the *Gorgias*, do we sometimes frame Socrates’ critique of PSNP in the *Phaedo* too harshly or too stereotypically?

### **Anaxagoras and Taxonomies**

Plato in the *Phaedo* clearly had an objection to Anaxagoras’ natural philosophy. According to Socrates, Anaxagoras’ book made the claim that: “*Nous* orders and is the reason for everything.”<sup>38</sup> Socrates then expected an explanation of everything in terms of the best, as intelligence would surely choose the best ordering in each case. However, he then says: “I found a man making no use of *nous* nor ascribing to it any reason for the ordering of things, employing instead air, aether, water, and many other absurdities.”<sup>39</sup> Socrates is critical of those who “cannot discriminate between different things, the real reason and that without which the reason could ever be a reason.”<sup>40</sup> It is important here to recognise that Plato did not object to the project of explaining the natural world. He expected a certain type of explanation of the shape and position of the earth and of the motions of the sun, moon and stars but did not get what he hoped for. As we have seen, he returns in the *Phaedo* to give his own account of the shape and position of the earth and the *Timaeus* will give a full account of the nature and motions of the heavens. This critique can then be used to generate a taxonomy for PSNP, those who employ *nous*, or perhaps those who employ teleology, and those who do not.

The status of this critique is a matter of debate, as Plato also has criticism of PSNP in terms of forms, which he thinks are required to solve the puzzles outlined at 96d ff. This is further complicated by the fact that at *Phaedo* 99c Socrates says:

They do not truly believe that it is the good (*agathos*) and proper which binds and holds everything together. I would most gladly become anyone’s student concerning

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<sup>38</sup> Plato, *Phaedo* 97b. Cf. Anaxagoras DKB12.

<sup>39</sup> Plato, *Phaedo* 98b.

<sup>40</sup> Plato, *Phaedo* 99b.

such a reason and how it prevails; but since I was deprived (*esterêthên*) of this, neither able to find it myself nor to learn it from any other, would you like, Cebes, for me to demonstrate how I worked out and created for myself a second voyage (*deuteros plous*) in search of explanation?

The nature of this *deuteros plous* has been the subject of considerable debate. Is it a second best way? If so, what is it second best to, and how can it be second best if it involves the method of hypothesis and the postulation of forms? Does Socrates abandon teleology entirely here? The debate is too large to address fully here, but I would counsel against taking a too rigid and stereotypical view of the *deuteros plous* as simply a second best. One sense of *deuteros plous* is taking to the oars when there is no wind, that is we must do things for ourselves, do something active. This is interesting relative to *Phaedo* 96b and some of the questions that Socrates asked himself in his youth:

Is it blood with which we think, or air, or fire, or is it none of these? Is it the brain (*ho engkephalos*) which grants the sensations of hearing, sight and smell, are memory and opinion produced from these, and is it from memory and opinion acquiring stability that knowledge is produced?<sup>41</sup>

Note the use of *ho engkephalos*, brain, rather than Plato's usual *he psuche*, mind/soul here, and the external and causal explanation of the acquisition of knowledge. The second voyage requires the soul to hypothesize and to work for itself. So the phrase *deuteros plous* may be ironic, but complex in its irony, with the first voyage easier and simpler in its ontology and its demands on the human mind with the second voyage harder but richer and more rewarding.

On the issue of teleology, I side with those who believe that teleology is still part of the *deuteros plous*. One of the first things that Socrates does when setting out on this second voyage at *Phaedo* 100b is “hypothesise there to be something beautiful itself by itself and similarly a good (*agathos*) and a large and all the others.” I would also agree with Sedley that the explanation of the earth’s stability at *Phaedo* 108e involves teleology,<sup>42</sup> and would argue that at *Phaedo* 99c8 *esterêthên*, “I was deprived (of learning about teleology)” is an aorist, where a sense of being deprived for all time would require a perfect tense. Plato’s character Socrates does indeed go on to learn about such teleology in the *Timaeus*.<sup>43</sup> All this is by way of saying that the *Phaedo* reception of PSNP is not simple. Plato clearly approves of some PSNP in the *Phaedo* and he has more than one critique of PSNP. What I want to press next is that Plato had interesting further critiques of PSNP and that he had other taxonomies for PSNP as well.

### **Cosmogony, plausibility and chance**

*Laws* 889b is an important passage for Plato's cosmogony and his criticism of PSNP:

Let me put it more clearly. Fire, water, earth and air all exist due to nature and chance (*phusei... kai tuchê*) they say, and none to skill, and the bodies which come after

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<sup>41</sup> The views of Empedocles, Diogenes of Apollonia/Anaximenes, Heraclitus and Alcmaeon. Plato as ever is remarkably well informed on PSNP!

<sup>42</sup> Sedley *ibid* p. 370. Cf. J.G. Lennox. Plato's Unnatural Teleology. In D.J. O'Meara (ed.) *Platonic Investigations*, Washington D.C U.P., 1985, pp. 195-218, G. Fine. Knowledge and Belief in Republic V-VII. *Companions To Ancient Thought 1, Epistemology*, ed. S. Everson, Cambridge U.P. 1990, pp. 85-115. I agree with Sedley that “To understand the *Phaedo*'s teleological programme we must distinguish Plato's own authorial voice from the voice of his character Socrates.”

<sup>43</sup> Agreeing with Sedley *ibid* p. 7.

these, earth, sun, moon and stars, came into being because of these entirely soulless entities. Each being moved by chance, according to the power each has, they somehow fell together in a fitting and harmonious manner, hot with cold or dry with moist or hard with soft, all of the forced blendings happening by the mixing of opposites according to chance. In this way and by these means the heavens and all that pertains to them have come into being and all of the animals and plants, all of the seasons having been created from these things, not by intelligence, they say, nor by some god nor some skill, as we say, but through nature and chance (*phusei kai tuchê*).<sup>44</sup>

Key to Plato's conception of the cosmos is that it is a "fitting and harmonious" ordering of its components. As we saw earlier, Plato accepts like to like sorting as a phenomenon but does not believe it to be adequate to explain cosmos formation. Here we see why. Like to like sorting will not give a "fitting and harmonious" blend of opposites. That can only happen by chance acting against the tendency of like to like sorting, which is utterly implausible for Plato. The phrase "nature and chance" (*phusei kai tuchê*) is interesting here. A more subtle point concerns what are taken to be the elements of earth, water, air, and fire. Does their nature come about by chance? According to Plato in the *Timaeus*, no. These elements decompose into component parts and the component parts are chosen by the demiurge (with intelligence and executed with skill) as they are the best. This criticism of some PSNP is related to the *Phaedo* criticism concerning *nous* and explanation, but is by no means the same as it. It will generate a different taxonomy for PSNP based on "nature and chance."

### **Zoogony and plausibility**

The following passage from *Timaeus* 44e concerning the human head is also interesting in relation to PSNP:

In order that it should not roll around on the ground, with its heights and depths of every kind, and be at a loss in scaling these things and climbing out of them, they gave it body as a means of support for ease of travel.

Now think of Empedocles' account of anthropogony, with the separate body parts moving around until they join up to form the first humans.<sup>45</sup> Those which cannot move themselves (heads, and indeed many other parts) will get stuck in ruts adding a layer of improbability and implausibility to the account. What follows in the passage beginning at *Timaeus* 45a ff. adds further layers to this critique. Not only do we need the right parts, but there is a necessary order to these parts (head, neck, chest, abdomen, etc.) and the parts must also be in the correct orientation (face, throat, breasts, genitalia, etc. to the front) or we do not have properly formed humans. This strategy of adding layers of implausibility to accounts of how things might come about by chance is applied to cosmogony and stoichogony (the origin of the elements) as well, as we have seen. It is of great importance to consider these ideas in context. In the modern world our ideas of cosmogony, zoogony, and stoichogony are founded on highly complex models which have taken many years to develop. This makes these ideas plausible to many, even if there is still disagreement, some arguing that belief in evolution is akin to believing that a whirlwind sweeping through a junk yard could assemble a jumbo

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<sup>44</sup> Cf. *Timaeus* 35a6-8 where blending sameness, difference and being is difficult and not something that would occur by chance.

<sup>45</sup> Empedocles DKB57: On the earth there burst forth many faces without necks, arms wandered bare bereft of shoulders, and eyes wandered needing foreheads. DKB61: Many sprang up two faced and two breasted, man faced ox progeny, and conversely ox headed man progeny.

jet.<sup>46</sup> This debate was still going strong in late antiquity and an interesting comparison is Lucretius, *De Rerum Natura*, 5, 186-194, who argued that infinite time/atoms/space will generate our cosmos by chance and Cicero, *On the Nature of the Gods* II, XXXVII, who argued that if we had a bag full of innumerable letters and threw them on the ground we would not get the Annals of Ennius, not even a single verse.

### **Multiplicities**

Some presocratics postulated unlimited multiplicities, whether they were worlds (co-existent or successive), shapes and sizes of atoms or non-viable biological forms. The following passage from the *Philebus*, while it is in the specific context of the analysis of limited and unlimited, might equally well apply to Leucippus and Democritus, or Empedocles:

The indefinite plurality of things and in things makes you in each case indefinite of thought and someone of neither status nor account, since you have never yet examined the number in anything.<sup>47</sup>

There are several word plays in the Greek here which associate allowing indefinite plurality in the world with being indefinite in thought and suggest that if you cannot give an account in either words or numbers then you are a person of no account. Plato's account of the world is determinate. For Plato there is a single, unique cosmos, there are a small and definite number of mathematically specific shapes for the ultimate building blocks of matter, and there are unitary, well designed species. All of these entities are designed or chosen by the demiurge as the best available. Similar sentiments to the *Philebus* passage can be found in the *Timaeus*. The following passage at directly after the *Timaeus*' description of how the two basic types of triangles combine to form the complex plane triangles and squares and these then form the three dimensional elements:

If in considering all this someone should raise the quite proper question of whether the number of *kosmoi* should be said to be unlimited or limited, he will suppose that the view that they are infinite is that of someone who is indefinite (*apeirou*) on a matter on which he should be definite.<sup>48</sup>

Again we have the play on indefinite in the world and of thought, though here it could be rendered "inexperienced on a matter in which he should be experienced."<sup>49</sup> Related to the objection to indeterminate multiplicities is an implicit objection to some *ou mallon* explanations. Here *ou mallon* means "not rather" and is in effect an expression of indifference. Simplicius tells us that:

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<sup>46</sup> F. Hoyle, *The Intelligent Universe*. Michael Joseph, 1983, p. 19.

<sup>47</sup> Plato, *Philebus* 17e5, cf. *Philebus* 64e and *Theaetetus* 183b. Is this one reason why Plato does not name some of his predecessors?

<sup>48</sup> Plato, *Timaeus* 55c. This passage goes on to question whether there is one or five *kosmoi*. If we take the uses of *kosmoi* here as "worlds," then it is hard to see why Plato should even begin to consider this. However Plato has just had Timaeus describe the organization of the elements out of their component parts. Each element has *summetria* and *taxis* and so might be considered a *kosmos* in itself, using *kosmeo* and its cognates to describe the process of ordering the elements. The passage can then be read as an objection to the idea that there are unlimited shapes and sizes of atoms rather than unlimited worlds, something that Plato has had Timaeus object to previously at 31a ff.

<sup>49</sup> *emmelôs* at *Timaeus* 55c7 is also interesting as a contrast to the *plêmmelôs* (discordant) behaviour prior to the ordering of the *kosmos* in the critical passage on the ordering of the *kosmos* at *Timaeus* 30a.

Leucippus supposed there to be an infinite number of atoms that are always in motion and have an infinite number of shapes on the grounds that nothing is such rather than such (*dia to mêden mallon toiouton ê toiouton einai*).<sup>50</sup>

It is notable in the *Timaeus* that the demiurge has a reason for all that he does and specifically he chooses the best types of triangles as the foundational entities. So again we have a slightly different line of criticism of some PSNP which could again be used to generate different taxonomies for PSNP, those who posit multiplicities, and those who use *ou mallon* explanations. We might also look at the way Plato treats flux and stability in the early part of the *Theaetetus* as that can also generate a related but different taxonomy for presocratic philosophy, as will the gods and giants passage of the *Sophist*.

### **Eudoxus and astronomy.**

Let me turn now to two specific instances of Plato's reception of PSNP. The astronomy of the *Timaeus* is committed to the idea that all of the motions of the heavens are either regular circular motions (RCM) as in the case of the stars, or are combinations of two RCMs, as in the case of the sun, moon, and five planets.<sup>51</sup> The system of Eudoxus (c390-c337) makes the same assumptions but is more complex, with three RCMs for the sun and moon and four for the planets. It is commonly assumed that Eudoxus influenced Plato, but there is a little evidence for this other than the suspect assumption that Plato was previously disinterested in astronomy and so must have been influenced by someone in producing the *Timaeus* model. Certainly there is a written first record in the *Timaeus* and if Plato was first with a prototype of an RCM system then we can see Eudoxus' more complex system as a refinement of it. This accords with the evidence of Simplicius, who says that:

Plato assigned circular, regular, and ordered motions to the heavens, and offered this problem to the mathematicians, which hypotheses of regular, circular and ordered motion are capable of saving the phenomena of the planets, and first Eudoxus of Knidos produced the hypothesis of the so-called unrolling spheres.<sup>52</sup>

However we resolve that priority question, there are important influences here that can be traced back into presocratic thinking. Circular motion can be traced back to Anaximander and the idea of regular circular motion can be traced to the Pythagoreans as Geminus tells us:

The Pythagoreans, who were the first to apply themselves to investigations of this kind, assumed the movements of the Sun, the Moon and the five planets to be circular and uniform. They would not admit, with reference to things divine and eternal, any disorder such as would make them move at one time more swiftly, at one time more slowly, and at another time stand still.<sup>53</sup>

The ideas of a central spherical earth, stable without physical support, with the stars orbiting it and the division of the heavens into fixed and wandering stars can all be traced back to the

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<sup>50</sup> Simplicius *Physics* 28, 8. Cf. Simplicius *Physics* 28, 24, Simplicius *De Caelo* 295, 7, Aristotle *Physics* 203a21, Aristotle *On Generation and Corruption* 314a22.

<sup>51</sup> The objection that Plato would not have been able to account for all the celestial phenomena he was aware of with RCM can be met simply by citing the fact that Eudoxus' model could not account for all known phenomena either: "The unrolling spheres of Eudoxus' school do not save the phenomena, not only those that were found later, but also those known before and recognised by them." Simplicius in *De Caelo* 504.17 ff.

<sup>52</sup> Simplicius in *De Caelo* 492.31 ff., cf. 488.18 ff.

<sup>53</sup> Geminus, *Isagoge* I, 19-21.

presocratics. *Timaeus* 40c is also interesting in the amount of practical, empirical knowledge it conveys:

The dances of these stars and their juxtapositions with one another (1), the circling backs and advances of their own cycles (2), which of the gods come into contact with each other and which into opposition (3), which cover each other relative to us (4), and for what periods they each disappear and again re-appear (5).

When planets pass each other in the zodiac, they can be close to one another (1), be so close that they appear to merge into one large object (3), or occlude one another (4). Planets can undergo retrograde motion (2) and Mercury and Venus disappear as they become close to the sun then reappear on the other side of the sun (5), a phenomenon much studied by the Babylonians. Either Plato was more of an observer than is generally accepted, or he gleaned a great deal of astronomical information from the PSNP tradition. A more global consideration for the *Timaeus* is that it is very self-conscious in producing an account of the cosmos which gives origins, development, and current constitution, very much in line with the presocratic *peri phuseôs* tradition.

### **The Pythagorean question.**

Was Plato a Pythagorean and what was his attitude to Pythagorean Natural Philosophy? Whether Plato was a Pythagorean or not is too large a question to address fully here. We are in need of criteria for what it would mean to say that Plato was a Pythagorean post-Burkert and the shift to treating the evidence of Plato and Aristotle on Pythagoras and the early Pythagoreans as primary. Does it make any more sense to call Plato a Pythagorean than it would to call him a Parmenidean or a Heraclitean, especially if Plato transformed Pythagorean natural philosophy for his own purposes, as he did with other presocratics? An interesting example here is how the demiurge constructs the orbits of the sun, moon and five planets in the *Timaeus*. That Plato uses a musical scale that derives from Philolaus is well known and indeed the general idea of a harmony of the heavens may well be Pythagorean. The ratios for one octave of this scale are: 1 – 9/8 – 81/64 – 4/3 – 3/2 – 27/16 – 243/128 – 2. Although these ratios may look arbitrary, in fact they are generated from the powers of 2 and 3. So 9/8 is  $3^2/2^3$ , 81/64 is  $3^4/2^6$ , etc. The Pythagorean justification of the series 1 – 2 – 3 – 4, the *tetraktys*, for the production of a musical scale was that  $1 + 2 + 3 + 4 = 10$ , the Pythagorean perfect number.<sup>54</sup> The Pythagorean justification for there being 10 celestial bodies (earth, sun, moon, five planets, central fire and counter-earth), some of which could not be observed, was that this too was in accord with the perfect number. Plato's approach is the reverse of this. He accepts that there are the sun, moon, and five naked eye planets and develops the Philolaus scale as far as to generate ratios for the orbits of these entities.<sup>55</sup> His final number, 27, has no significance in itself.<sup>56</sup> Secondly, in the *Timaeus* and subsequent works there is no mention of any audible harmony of the heavenly bodies. There is a harmony to the structure of the world soul, but no sound. This, of course, differs from the

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<sup>54</sup> See Aristotle *Metaphysics* 986a8 on the significance of 10.

<sup>55</sup> See Aristotle *Metaphysics* 986a and *De Caelo* 293a25. Also cf. Simplicius' report of Plato's challenge to 'save the phenomena' (see below) and Aristotle *De Caelo* 293a on the Pythagoreans 'doing violence to' the phenomena in order to bring them into line with their theory.

<sup>56</sup> Plato's alleged ban of observation from astronomy at *Republic* 530b6-c1 might be thought to run contrary to this approach. I have argued there is no such ban A. D. Gregory. *Plato's Philosophy of Science*. London: Duckworth, 2000, Ch. 2), but a contrast between how one does astronomy and how it ought to be used in the education of the guardians. The *Timaeus* certainly does not recognise any such ban. As Vlastos comments (1975) p. 50, it is saturated in the language of observational astronomy, and see in particular *Timaeus* 47a ff. on eyesight and astronomy.

Pythagoreans, and also differs from the myth of Er at *Republic* 617bc. As we saw in the last section, the idea of combinations of RCM is new and builds on earlier, possibly Pythagorean ideas of singular RCM. Plato's cosmology is also quite different from that of Philolaus, which had a central fire, surrounded by sun, moon, earth, counter-earth, five planets, and the stars.

A second important consideration in the *Timaeus* is the relation between number and matter. According to Aristotle, for the Pythagorean's sensible substances were constituted from number.<sup>57</sup> In the *Timaeus* though, matter is constituted from shape not number and the approach is geometrical rather than arithmetical. The basic units in the *Timaeus* are 1, 1, □2 and the 1, □3, 2 triangles, which combine to form the three dimensional shapes for earth, water, air, and fire. These triangles cannot be broken down any further, as Aristotle's criticism makes clear. Here Plato takes over the presocratic scheme of the elements as earth, water, air, and fire and transforms it to his own ends. None of these elements are primary (contrary to Thales on water, Anaximenes on air, and Heraclitus on fire) and indeed none are elements in the sense that they cannot be decomposed into parts.<sup>58</sup> It may well be that the Pythagoreans were the first to emphasize the importance of number in the investigation of the natural world, but Plato takes on that insight and transforms its application in important ways. It is important to reject the idea of a homogenous, unitary Pythagorean/Platonic "number mysticism" and to be able to discern the differences in their approaches.<sup>59</sup>

### Conclusion.

Plato's reception of PSNP is complex and points to some interesting facts about PSNP. We need to look beyond Socrates' autobiography in the *Phaedo* in order to grasp its full breadth and to understand it fully. Aristophanes may have forced a stereotyped dichotomy for PSNP and its critics in *The Clouds* for comic effect but there is no need to follow him in thinking about Plato's reception of PSNP.<sup>60</sup> One important lesson we should learn from Plato's reception of PSNP is that we should not construe PSNP in too narrow a fashion. It was not just natural philosophy done by "the presocratic philosophers" (at least some medical writings should be considered) and that natural philosophy encompassed a very broad range of questions and approaches, not just materialist or mechanist views. It is important to recognise that there was a significant PSNP tradition based on the idea of *kubernerein* and *kratein*. PSNP has been termed *historia peri phusis* but could equally well be termed *skopein peri phusis*. Plato clearly had multiple criticisms of PSNP and had multiple ways of generating taxonomies of PSNP. This too may indicate that PSNP was actually rather more diverse than some modern accounts allow. Those criticisms were in many ways interesting, sophisticated, and show a good knowledge of PSNP.

Plato's reception of PSNP may be rather more positive than some accounts allow. The *Phaedrus* passage shows approval of some PSNP methodology and the *Phaedo* clearly approves of some PSNP ideas. That Plato criticizes the *physiologoi* should be taken as a sign of his interest, rather than his disinterest in natural philosophy. It is not the investigation or explanation of nature *per se* that worries him, but the methods and explanations that the *physiologoi* employ. The *Phaedo* does not argue that tallness, Socrates in prison, or the shape

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<sup>57</sup> Aristotle, *Metaphysics* XIII/6, 1080b16-22.

<sup>58</sup> Here is a further criticism of some PSNP (are elements properly elements?) and a possible further taxonomy for PSNP based on it.

<sup>59</sup> It is arguable that numerology was not part of original Pythagoreanism but was read in by later commentators (L. Zmud. Plato as Architect of Science, *Phronesis* 43, 1999, pp. 211-244). If that is true, there is still a need to distinguish Plato's views in the *Timaeus* from that sort of numerology, especially as Aristotle perceives such numerology at least in Philolaus.

<sup>60</sup> Plato's 'Gods and Giants' passage at *Sophist* 245e ff. might be the closest to such stereotyping, but Plato has reasons for this.

and position of the earth are matters of no interest, rather that some PSNP explanations of these phenomena are not adequate. When it comes to his own natural philosophy, Plato accepted some PSNP ideas and transformed others to his own ends.

It is important that we give up the idea that Socrates' autobiography defines Plato's attitude to PSNP. There is important material in Plato which gives us a much richer and more interesting account of Plato's reception of PSNP and allows us insight into how we interpret Socrates' autobiography.

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