Chapter 4

Compresence versus Containment of the Opposites

Anaxagoras's claim that there is a share of everything in everything is at the very core of his metaphysics. Taken at face value, the claim sounds barely intelligible. Its brevity leaves much work to be done by the interpreters. Each of the very few words that appear in it, as well as the general metaphysical picture that the principle expresses, have been subject to much investigation in the scholarly literature, even since antiquity. Yet no consensus has been reached. The challenge is to understand not only what metaphysical position the principle expresses, but also how it fits with the other principles governing Anaxagoras's ontology. I argued for a fresh line of interpretation in the preceding chapter, which I now want to compare and contrast with the existing alternatives, to bring out further what is distinctive about it. Interestingly, ancient and modern scholars have converged on three main lines of interpretations of Anaxagoras's principle that there is a share of everything in everything. They are the so-called Particulate, the Proportionate, and the Liquids interpretations.[1] On the Particulate interpretation, the fundamental elements of Anaxagoras's ontology are conceived of as actually present *as such* in

1. Supporters of the particulate interpretation include among others Raven (1954), Guthrie (1965), and Kerferd (1969). Supporters of the proportionate interpretation on the other hand include Strang (1963), Barnes (1979), Schofield (1980), and Mourelatos (1986). Sorabji's (1988) interpretation and Lewis's (2000) discussion of it are examined separately in chapter 4.

the extreme mixture out which of everything is composite, as material (indivisible) *particles* of finite size which are too small to be perceptually discerned as such. The mixture appears to be uniform, but it isn't. On this interpretation, the qualitative variety of the existing stuffs is accounted for in terms of concentration of particles of different kinds at different locations. On the Proportionate interpretation on the other hand, the total quantity of each type of fundamental element is mixed together with the total quantities of the rest of them, *in some proportion*. The totality is a mixture that is uniform through and through, and the mixture is infinitely divisible. As has already been extensively discussed in the literature, both lines of interpretation are prey to difficulties. They both lack positively supportive textual evidence and in fact conflict with some of the evidence we have.[2] Additionally, they commit Anaxagoras to holding problematic philosophical views. More recently, the discussion has received renewed attention from fresh suggestions made by Patricia Curd, and by Gareth Matthews in discussion with John Sisko. I group together the views of these three interpreters, even if they do not engage with each other directly, because they all share a *mass logic* approach to Anaxagoras's ontology—this is their central innovation. For them, Anaxagoras is thinking of (actually existing) masses of stuffs being present in composite things, in variable quantities, as impurities that are everywhere in the things in question. This line of interpretation, which I refer to as the Liquids interpretation, differs from the Particulate interpretation because it does not postulate the existence of small particles of definite size, and from the Proportionate interpretation because it does not postulate that the ingredients are present in potentiality only. As my own interpretation, as presented in chapter 3, assumes the divisibility of the opposites' instances (as per **NoLeast-P**), I also engage in this chapter with the line of interpretation according to which divisibility does no metaphysical work in

2. As others have also noted, Anaxagoras does not mention either particles or proportion anywhere in the extant text; but this is not the only, or even main, textual difficulty affecting these interpretations.

Anaxagoras's system. The present chapter as a whole engages with the main existing readings of Anaxagoras's principle that there is a share of everything in everything, aiming to offer further support for the substantial interpretative shift I introduced in chapter 3.

4.1. THE PROPORTIONATE INTERPRETATION

In this and the following section of the present chapter I will review the Proportionate and Particulate interpretations, in turn. The Proportionate interpretation, in essence, takes every constituted thing in Anaxagoras's world to contain portions of everything else, where the portions are not present in each thing as distinct parts (or particles)—rather, they are present as *proportions* of kinds in a mixture.[3] On this interpretation, Anaxagoras is using small and large to indicate the quantitative proportion of an item within the local or global mixture in which it is present. For instance, "The 'smallness' of, say, gold [in the global mixture] consists not in its being divided into minute particles, but rather in the simple fact that there is very little gold in the world" (thus Barnes 1982 [vol. 1, revised]: 23). It follows on this reading that when in B1 things are said to be "not visible 'on account of smallness' it means something like 'on account of the small proportion of most substances relative to the proportions of air and aether in the total mixture'; whereas 'unlimited in smallness' means something like 'without limit on how small they [the substances] may be divided up'" (thus Schofield 1980: 77).[4] The last explanatory remark made by Schofield amounts to the claim

3. There exist many formulations of this interpretation in the literature; for instance, Schofield describes the Proportionate interpretation thus: "The ingredient portions of every sort of thing which are contained in each object or stretch of stuff of a given kind need not themselves take the form of parts individuated in the same general fashion as objects or stretches, nor need they be distributed among such parts . . . they are to be thought of simply as proportions" (1980: 75).

4. By "substances" Schofield means the opposites. On the use of the term "substance" in relation to Anaxagoras, I share Curd's concern voiced in (2010: 158, n. 11).

that, for Anaxagoras, there is no limit on how small the proportion in which something is present in something else might be. On the Proportionate interpretation, the primordial mixture is thoroughly homogeneous, as no ingredients in it can be individuated as such, as a part of the mixture. Attributing this view to Anaxagoras however commits him to a stance that is not, and cannot, be his, as it entails that the ingredients exist in mixtures only potentially, and not actually, and thus could change from being in potentiality to being in actuality in certain circumstances. On the Proportionate interpretation the homogenous primordial mixture would be like, e.g., seawater, that is, (pure) water and salt through and through. Seawater contains a certain proportion (but no actual parts) of (pure) water and of salt; on the other hand, salt and water can be retrieved from it, so they exist potentially in the mixture, and could transition to actuality. We are now in the position to see two fundamental problems with the Proportionate interpretation. First, on this interpretation, Anaxagoras would be thinking that all the elements at the primordial stage of the universe are potential only.[5] In addition to the "weakened" sense in which, on this interpretation, things would be in existence at the beginning of the development of the universe, the second and even more fundamental difficulty with the Proportionate interpretation is that the transition from potentiality to actuality presupposes the possibility of generation of something new, in a stronger sense than the Parmenidean strictures in play in Anaxagoras's system allow, as we saw in chapter 1. In conclusion, the Proportionate interpretation appears to be wanting, on account of

5. In this connection, Schofield notes,

> It might well be doubted whether the primordial state envisaged by the proportionate interpretation is pluralistic enough. The interpretation affirms, of course, a plurality of kinds, existing as proportions of the total mixture. But is that existence more than *potential*—a promise that once the cosmogonic revolution begins, different objects and stretches of stuff of different sorts will be separated out? . . . [T]heir existence is still *potential* in comparison with the robust actuality of the particles of the rival interpretation. (1980: 78)

these two main difficulties, and also on account of the absence of any explicit supportive textual evidence. We turn next to investigate the prospects of the Particulate interpretation.

4.2. THE PARTICULATE INTERPRETATION

The Particulate interpretation is not prey to the concerns raised by the Proportionate interpretation: for according to the former, the local and global mixtures contain actual ingredients as distinct parts or particles in them—and not only proportions, that is, ingredients in potentiality. Thus, on the Particulate interpretation, no passage from potentiality to actuality is posited. Hence both the local and global mixtures are heterogeneous, and not uniform (contrary to what the Proportionate interpretation postulates). Schofield reconstructs the considerations that motivate the Particulate interpretation thus:

> In the beginning all things—i.e. all discrete individuals or bits of matter and all stretches of stuff (such as air and aither) which do not form discrete objects—were mixed together . . . as a single indistinct mass. . . . Anaxagoras may have thought that his acceptance (in F 17) of the Parmenidean interdict on the possibility of coming to be and perishing committed him to an original plurality of discrete objects and stretches: if you don't include an actual plurality in the original state of things, you will never be able to conjure one up at a subsequent stage. (1980: 70–72)

Additionally, the Particulate interpretation facilitates our understanding of how the ingredients can move around in space in virtue of the vortex initiated by *nous*; the moving around in space of proportions or potential entities is on the contrary difficult to make sense of. Generally, according to the Particulate interpretation, Anaxagoras uses small and large to indicate the actual physical dimensions of the

AQ: Please note that *nous* appears in lower case same elsewhere and capital "N" for *Nous* is retained in Extracts and within Quotes.

particles of the ingredients. In light of this, B1 is interpreted as saying, in Schofield's words, that

> [in the original mixture t]here were different instances of different substances (and presumably of the same substance), but . . . these were too small or too indistinct to be discriminable by a human or animal eye. (1980: 68)

These are the main advantages of the Particulate interpretation. Nonetheless, there are also difficulties that have been raised against it in the literature. I will here review two important arguments that were put forward by Jonathan Barnes and Edward Hussey respectively, as they will help us to gain a deeper understanding of the constraints that a sound interpretation has to satisfy. I call them the Saturation Argument and the Containment Regress Argument.

4.2.1. The Saturation Argument

This argument was developed by Barnes as a critique of the Particulate interpretation. It runs as follows:

> If every piece of S contains a particle of S1, . . . then every piece of S is wholly composed of particles of S1—which is absurd. (1979: 255)

The challenge is that, in the spirit of Anaxagoras's own principles, for every part of S there must be a part of S1 within it. On what reasoning, then, does Barnes hold that if every piece of S *contains* a particle of S1, every piece of S is then *wholly composed* of particles of S1? Consider: suppose that in a piece of S there is a particle of S1. Then either the S1 particle will be the whole of the S piece, which would conclude Barnes's reasoning, or the S1 particle will be a proper part of the S piece, leaving an S-remainder piece.[6] If the latter, there will be a

6. The remainder piece will be a proper part of the original S piece, according to the weak Supplementation Principle of mereology (see, e.g., Simons 1987; Casati and Varzi 1999).

further S1 particle in the S-remainder piece, and it will either be the whole of the S-remainder, or a proper part of it, and so on. Ultimately, in Barnes's argument, the regress stops when there are no S-remainder pieces left in the S pieces, but only S pieces that are wholly[7] composed of S1 particles. Hence the charge of absurdity. But the validity of Barnes's argument depends in fact on some further background assumptions that he does not make explicit. His argument is sound if we assume that S1 particles are finite in size, and that S divides into ultimate parts in which S1 particles fit exactly.[8] Indeed, Barnes's argument addresses only finite divisions of the mixants, because he intends it as a critique of the Particulate interpretation, which does not envisage unlimited smallness of particles, but only extreme smallness. Yet Anaxagoras tells us explicitly with **NoLeast-P** that all things are unlimited in smallness. If this is so, contrary to the Particulate interpretation, the pieces of S are unlimited in smallness, and so are the pieces S1. In that case, Barnes's argument is not valid. The requirement, by hypothesis, that every piece of S contains a particle of S1 *is* satisfied, even if S1 particles are always taken to be proper parts of S pieces, leaving an S-remainder part, ad infinitum. In such a case, the conclusion that every piece of S is wholly composed of particles of S1 does not follow—there will always be smaller particles of S1 to fit pieces of S as their proper parts, leaving a proper part S-remainder. The Saturation Argument does not, as such, rule out this type of containment of one element in another. I now turn to explore whether such containment can satisfy the requirements of Anaxagoras's ontology, and consider the Containment Regress argument.

4.2.2. The Containment Regress Argument

It might be thought that if one grants to Anaxagoras that all the elements are unlimited in smallness, which is what **NoLeast-P** states,

7. Since by hypothesis *every* piece of S contains a particle of S1.

8. If the particles of S1 did not fit exactly in the smallest pieces of S, the argument would not be sound; there would S-remainders with no S1 particles in them.

this would allow for a containment relation among the elements. On this hypothesis, each part of an element S would contain, not only a part of an element S1, but also a part of every kind of element there is in the ontology—of which, for Anaxagoras, there are many, if not unlimitedly many, kinds. Thus, given **NoLeast-P**, each piece of S would contain parts of S1, S2, S3, . . . as proper parts, while still leaving an S-remainder (since it is a piece of S), in every part of S, ad infinitum. Yet a different problem arises now, from the complexity of the structure of the contained elements. The difficulty comes about because it is not only S that contains parts of every type of fundamental element, but according to **EE-P**, every type of fundamental element contains parts of every type of fundamental element. What kind of structure emerges from the assumption of this type of containment? One that is barely intelligible. Expressing this thought, Hussey writes,

> Within any lump of X, there is a "share" of Y. Either this "share" is present as a number of continuous packets, or not. If not, the visualisation fails already and it is hard to see how talk of *quantities* is to be justified. But if the "share" of Y *is* present in spatially continuous packets within X, there will presumably be "shares" of X, and everything else within the packets of Y, so that we are started on an infinite progression. This destroys the possibility of drawing any *definite boundary* between the X and the Y in the lump, be X and Y whichever ingredients they may, and this in turns *destroys the notion of a packet* with which the infinite progression has started. (1979: 137, my emphasis)

Hussey's point is that if shares of each kind of stuff were within every share of every kind of stuff, the resulting configuration would lead to such a degree of structural complexity that, he concludes, we would lose track of the very notion of "contained unit." If to this we add Anaxagoras's proviso that each kind is unlimitedly small, with each unlimitedly small part containing a proper part of every kind of opposite, then the structure defies representation: each of the *infinitely* many, infinitely divisible parts of each element contains proper parts of the *infinitely* many, qualitatively different kinds of element, with a remainder, and *each* of these (contained) proper parts contains proper parts of the *infinitely* many, qualitatively different kinds of element, with remainders, and so on ad infinitum (horizontally and vertically). This is not an infinite series of regressive steps. It is a series in which countless infinities "sprout" at each step, and in each item of each such infinity, further infinities "sprout," and so forth. This complexity becomes incomprehensible within the first couple steps of reasoning. Because of this , it is plausible to rule out that this is what Anaxagoras's ontology looked like. Even if one might want to entertain that Anaxagoras could accept a nonintelligible world, this interpretation is unsustainable. On the account of containment just sketched, there is nothing that could differentiate one kind of element from another. Thus the type of containment just envisaged undermines the intelligibility of any attempt to construe *different kinds* of element as *constituted* of every kind of element. By contrast, Anaxagoras's ontology does require the fundamental building blocks to be of *different* kinds.[9] In conclusion neither the Proportionate nor the Particulate interpretation delivers a sound interpretation of Anaxagoras's views—both are prey to difficulties, and neither sits well with the textual evidence. On account of these considerations, other attempts have been made in the scholarly literature. To these we now turn.

4.3. THE LIQUIDS MODEL

The impasse in the debate between the Proportionate and the Particulate interpretation has more recently motivated a fresh discussion which develops the idea that the ingredients of things are

9. On my proposed interpretation, the fundamental building blocks of different kinds are the opposites. As we will see, they are not composed of each other nor do the mixtures of the opposites change their constitution.

present in them as *masses*, not as particles of definite size (as, for instance, in the case of a mixture of salt and pepper) nor as fused constituents (as in the case of sugar in a cake). This mass logic approach may be visualized by means of a liquids model. The idea has been explored since antiquity,[10] but it has been most recently and most fully developed by Patricia Curd. She describes this interpretative approach to Anaxagoras's **EE-P** thus:

> The ingredients are like pastes or liquids; they are all mixed or smeared together such that all the ingredients are in every possible place in some concentration or other. Even though everything is unlimitedly small, and the mixture a thorough one, the mix need not be uniform; the concentrations of the various ingredients can vary in density or intensity in different places, but all of them have some non-zero density at every place. . . . We should think of the basic things as like liquids or pastes that flow together and occupy the same volume of space. (2010: 181, 184)

Note that liquids do not mix like salt and pepper, or like salt and water, or water and wine. Rightly, Curd is not appealing to the special way that *we* know liquids mix—which Anaxagoras would not have known—by *dissolving* one another's molecular bonds. Anaxagoras's fundamental elements cannot change one another, and they do not change, apart from their location. Rather, Curd finds in liquids a familiar example of how masses mix, which allows that the ingredients in the mix retain their own individuality (so they are not in the mixture only as potential entities), and yet that they can occupy the same space (so Barnes's Saturation Argument does not apply here). So on Curd's interpretation, what is it to be unlimitedly small, when recast in terms of masses? If their unlimited smallness facilitates the thoroughness of the mixture (as we know from Anaxagoras's line of

10. As we will see in chapter 6, the Stoics give water and wine as one of their examples of colocation.

reasoning in B6),[11] we need to understand what the units of, e.g., liquid are, ontologically. Are they collections of distinct unlimitedly small droplets? Curd explicitly rejects this line of thinking:

> I don't think the particulate model is the correct interpretation. If Anaxagorean stuffs are not particulate, then "small" and "large," at least here in B3 and B6 (and in B1 and B2 as well), do not refer to the size of a piece or drop or bit of an ingredient. (2010: 183–84)

How are we then to understand the smallness of the ingredients on the Liquids model? Curd writes,

> I take "small" and "large" in this context as a way for Anaxagoras to speak of submergence in and emergence from the background mixture of all things. (2010: 184)

Accordingly, she reads **NoLeast-P** as saying that "there is no limit on how submerged in the mix an ingredient can be" (2010: 184). For instance, gold in my flesh is very small, "I.e. its density is so low that it is submerged in the rest of the ingredients, and so it is not manifest" (2010: 184).[12] Before proceeding with the analysis of this last claim by Curd, I should mention that the Liquids model entails that the density of the ingredients cannot change. The reason is that liquids are not compressible, and so we cannot fit more of a liquid in a given volume of that liquid. For this model to help us understand

11. B6: "Since it is not possible that there is a least, it would not be possible that anything be separated, not come to be by itself, but just as in the beginning, now too all things are together" (ὅτε τοὐλάχιστον μὴ ἔστιν εἶναι, οὐκ ἂν δύναιτο χωρισθῆναι, οὐδ᾽ ἂν ἐφ᾽ ἑαυτοῦ γενέσθαι, ἀλλ᾽ ὅπωσπερ ἀρχὴν εἶναι καὶ νῦν πάντα ὁμοῦ).

12. Curd adds that her interpretation is close to Inwood's, who defines "smallness" as "the characteristic of being mixed and so not distinguishable from other stuffs" (1986: 22). See also Curd (2010: 187): "I am not suggesting that by 'large' and 'small' Anaxagoras *means* 'emergent' or 'submerged.' . . . Rather, in certain cases we should understand that what it is for something to be small just is for it to be of such density

Anaxagoras's ontology, it would have to develop a conception of a liquid that could change in density. Without such a development of the model, when Curd talks about changes in the density of an ingredient in the mixture, this can only be in relation to the amount of any other ingredient in that mixture rather in relation to itself, by becoming more dense; this is in line with **P-P**, which refers to the amounts of ingredients in relation to other ingredients.[13] Now, to the concept of submergence. We should not take submergence to mean dissolving. This is because Curd wants the Anaxagorean ingredients to be recognizable as such, when they are manifest in sufficiently high concentrations. She does not want the ingredients to be potentially present in the mixture. In that sense she is not a proponent of the traditional Proportionate interpretation. But her ingredients are present in mixtures in certain proportions, as we saw in her example of gold in my flesh. To pay full justice to Curd's interpretation, we need to put together the claim that the ingredients do not dissolve in the mixture (namely, that they are not in potentiality in the mixture) with the claim that the terms "large" and "small" do not refer to the sizes of pieces or drops or bits of an ingredient. So if we think of her interpretation as being illustrated by, e.g., a water-and-oil mixture, how are we to think of the water and the oil in the mixture? It should be possible for either ingredient to be in a large proportion in relation to the other ingredient in the mixture, or in a small proportion. The difference in proportion between them could be so big that, for practical purposes, in the one case the mixture could be thought of as being water, with the oil submerged, and in the other it could be thought of as being oil, with the water submerged. Let us consider the mixture in

or concentration that it is submerged in the mix and so is not apparent or evident. Context must determine the appropriate sense." I see important differences between Curd's and Inwood's interpretation and I will discussion the latter in conjunction with Furth's (1991) as a distinctive interpretative proposal in section 4.4. of this chapter.

13. The only difficulty that might arise for Curd's stance on this issue is with Anaxagoras's claim that some ingredients can be compacted. For instance, "From the earth stones are compacted by the cold" (B16). This phenomenon would require a Liquids model that allows for density changes.

which the oil is submerged. The oil is not in the mixture in very small droplets, or bits, or pieces, as we know from Curd (quoted above).[14] Extrapolating from Curd's pastes simile (2010: 181), we could perhaps think of the liquids as being in the mixture as malleable bodies. The problem is that the differences in the oil and the water cannot be that here the oil is more dense than there, since liquids or pastes cannot vary in their densities in the proposed model; a mixture can contain more or less of one of them, but it would accordingly displace another liquid or paste. So the submergence of an ingredient could not be achieved by reducing its density in the mix.

I admit that I find it difficult to put together all the metaphorical descriptions of the Liquids interpretation given by Curd into an account that accommodates Anaxagoras's claims about the ingredients in the mixture. I also find it difficult to understand how the liquids can supposedly occupy the same volume of space in the mixture. We need to bear in mind that they do not dissolve one another, because then they would exist only potentially in the mixture. Similarly, pastes (that do not dissolve each other, thereby remaining only potentially in the mixture) do not occupy the same volume of space. Typically, when pastes or liquids get mixed together, they come to occupy together a volume that is the sum of the volumes that each of them occupied separately. If the pastes do not dissolve each other, then when mixed they must displace one another (rather than occupy the same space), and end up being juxtaposed (even if not in the same way as salt and pepper, because we are thinking here in terms of masses). In sum, I cannot see how one can derive the colocation of ingredients in the mixture through the Liquids interpretation.

A further difficulty I find with the Liquids interpretation is in its understanding of Anaxagoras's claim in B1. Given Curd's proposed understanding of "small," it follows that she would explain Anaxagoras's claim that in the original mixtures all things were

14. Strictly, Curd does not say that they are not in droplets, etc., but that by "small," Anaxagoras does not mean the size of droplets, etc.

unlimited in smallness as meaning that all things in the mixture were unlimitedly submerged, along the following lines:

> In certain cases we should understand that what it is for something to be small just is for it to be of such a density or concentration that it is submerged in the mix and so is not apparent or evident. . . . In all three instances of the word here [i.e., in B1], "small" apparently has its specialized sense of "submerged." (2010: 87)

What "unlimitedly submerged" would mean here is not perspicuous. For argument's sake, let us take Curd's view to be that for Anaxagoras all things in the original mixture were everywhere in unlimitedly small concentrations or densities. The question is: why would Anaxagoras want to make such a claim? All he needs for the original mixture to be as he describes it is that no ingredient is predominant, and hence (perceptually) evident. So each ingredient in the mixture has to be *small*, in the sense of being submerged in the mixture. But why should Anaxagoras want to additionally claim that each ingredient is *unlimitedly small* in the mixture? If we look closely at B1, we see Anaxagoras is reported to have made in fact two distinct claims:

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> [1] All things were together, unlimited in amount and in smallness, for the small, too, was unlimited. [2] And because all things were together, nothing was evident on account of smallness.

> [1] ὁμοῦ πάντα χρήματα ἦν, ἄπειρα καὶ πλῆθος καὶ σμικρότητα. καὶ γὰρ τὸ σμικρὸν ἄπειρον ἦν. [2] καὶ πάντων ὁμοῦ ἐόντων οὐδὲν ἔνδηλον ἦν ὑπὸ σμικρότητος

Claim [2] says that the ingredients are small and hence not evident. But claim [1] says that the ingredients are unlimitedly small, not qua nonevident, but because there is no limit to smallness. I submit that it is difficult to explain claim [1] on the submergence interpretation, because Anaxagoras explicitly holds in claim [2] that the smallness of the ingredients is sufficient for their nonevidence. So one has to allow, with Curd, two senses of "small" (and "large") in Anaxagoras's text—in size, and in submergence.

We are not yet however in the position to assess the overall prospects of the mass logic approach that Curd develops, as this approach holds promise in some other respects. Gareth Matthews argues that this approach can help address a challenging problem in Anaxagoras's ontology which arises from **EE-P.** How there can be qualitatively *different kinds* of things in an ontology where everything is in everything? The problem is generated by the combination of **EE-P** and **NoLeast-P** with **P-P**, which we examined in chapter 2. Specifically, is there room for **P-P** in an ontology governed by **EE-P** and **NoLeast-P**? Matthews (2002 and 2005), who implicitly adopts the same mass logic approach as Curd,[15] poses the problem in the following terms:

> My watch chain is "most plainly" gold if, and only if, my watch chain contains more pure gold than anything else it contains. But, if [on account of **EE-P**] there is no such thing as pure gold, my watch chain will not contain more of that than anything else, there being no such thing as that. (2002: 1)

Note that Matthews does not assume that it is part of the nature of each ingredient of the mixture to contain other stuff as part of its constitution, as it was assumed in the Containment Regress argument in section 4.2. Rather, on Matthews's reading, other kinds of stuff are mixed, as *impurities*, with each kind of stuff. On this assumption, Matthews proposes that we can, in Anaxagoras's system, form the conception of a pure kind of stuff from the recognition that impure stuff can be purified, even if not completely, at least approximately. Thus, although it will never be the case that we will reach pure, e.g., gold, there can be purer and purer gold—refined gold. For example,

15. I am not here concerned with settling who was the first to put forward the mass logic approach to Anaxagoras's ontology; it is interesting to note that Curd does not engage with Matthews's views although her translation (2007) follows the publication of Matthews's articles.

the mixture out of which Matthews's watch chain is made is that of a golden object because, although successive refinements of gold will never yield pure gold, they will increasingly converge on an amount of refined gold that will be greater than the amount of dross that will be generated by the refinement process. This gives us a way to think of the chain as being "most plainly" gold if, and only if, it contains more refined gold than dross, even if the refined gold is not quite pure.[16] In response to Matthews, and in response to an even more complex analysis (in Barnes 1982) and a further generalized version of the recursive refinement, John Sisko (2005) argues that on this reasoning the position we are left with is that

> no process of recursive refinement—not monadic, not dyadic, not polyadic recursive refinement—can be used to determine specifically *how much* gold is in a bar of gold. Matthews's proposal fails, Barnes's proposal fails, and no other proposal that relies on recursive refinement can ever succeed. (2005: 244)

My own response to this line of interpretation is that Matthews assumes that the process of refinement filters *most*, even if not all, of the impurities out of an ingredient in the mixture. But Anaxagoras's elements are unlimitedly small, as per **NoLeast-P**. Anaxagoras also holds that the elements are unlimitedly large in amount, as per **NoLargest-P**—so what he means by their unlimited smallness is not their total quantity, which is unlimitedly large, but that they are each divided into unlimitedly small parts. As we saw in chapter 3, this means that their parts are as numerous as the points in a line:[17]

16. Matthews's proposal is also compatible with either the particulate or the proportionate model of explanation of the mixture. My discussion of his position here will not address either of these two versions one could develop of Matthews's arguments, since both the particulate and the proportionate interpretations have been found problematic in the scholarly literature, as reviewed in sections 4.1 and 4.2 above.

17. This is of course only an analogy, since points are not parts of a line; the important aspect of the analogy is the numerosity of the points, rather than their ontological status.

if a mixture of *r* and *g* is like the overlap of a red and a green line, the notion of refining the red line by filtering *most* of the green points out of it would not be applicable—there would always remain as many green points in it as we started with. Explaining the preponderance of elements in a mixture in view of their unlimited smallness may be more Anaxagoras's problem than Matthews's, but it follows that, given the unlimited smallness of the mixants, Matthews's recursive refinement cannot explain the preponderance of Anaxagorean (continuum dense) mixants.

4.4. THE NO-DIVISIBILITY INTERPRETATION

I will finally examine an existing alternative interpretation that most directly contrasts with mine, and that has been put forward with interesting arguments in the recent secondary literature. At the core of this alternative is the thought that Anaxagoras did not think at all in terms of infinite divisibility of the fundamental items in his ontology, but rather in terms of composition and segregation of mixtures, in line with his contemporary Empedocles. On this alternative interpretation, Anaxagoras qualifies the elements as "small" when intending to indicate that they are in a state of mixture, and thereby imperceptible. I call this the No-Divisibility interpretation. In Brad Inwood's words, "There is no need to posit infinite divisibility for Anaxagoras" (1986: 18).[18] Although a number of scholars hold this view, I here limit myself to engaging with the work of Brad Inwood (1986) and Montgomery Furth (1991), with reference also to Malcolm Schofield (1980) as a representative selection. I cannot fully pay justice here to each version of the No-Divisibility

18. Part and parcel of Inwood's line of argument in support of the nondivision interpretation is the view that "it is historically implausible that he should have conceived of infinite divisibility" (1986: 32–33). My response to this strand of the argument leans on Mansfeld's (1979) studies of the historical data, in particular in respect of the relation between Anaxagoras and Zeno; see also the appendix to this chapter.

interpretation that each of these scholars has developed. In lieu of that, I will respond to their common line of thinking by focusing on Anaxagoras's own arguments which make clear, in my view, the metaphysical work that divisibility does in his system, and why divisibility is needed for Anaxagoras's desired conclusions. In doing this, I will discuss some representative alternative readings of the relevant texts put forward by the proponents of the No-Divisibility interpretation, and show where they do not sit well with the extant evidence.

The thrust of the No-Divisibility interpretation is that "smallness" means being mixed, and "largeness," being manifest. Furth, for instance, puts the claim in these terms:

> [Anaxagoras's] notions of Large and Small have a theoretical application which is distinct from . . . their ordinary-life application to spatial size, and in particular they have nothing to do with infinite divisibility as everyone from Aristotle on has thought. (1991: 97)

Yet, looking at Anaxagoras's texts and the reasoning of his arguments, it is very difficult to imagine how one can understand them merely in terms of mixture and manifestedness. Consider, for instance, B5 (which we discussed at length in chapter 3):

> Even though these things have been dissociated in this way, it is right to recognize that all things are in no way less or more (for it is impossible that they be more than all), but all things are always equal.
>
> Τούτων δὲ οὕτω διακεκριμένων γινώσκειν χρή, ὅτι πάντα οὐδὲν ἐλάσσω ἐστὶν οὐδὲ πλείω (οὐ γὰρ ἀνυστὸν πάντων πλείω εἶναι), ἀλλὰ πάντα ἴσα ἀεί.

Separation does not make what they are separated from less, since it is unlimited, or make their totality less, since the totality remains the same. Importantly, increasing their *number* by the separation does *not* make them more, since the *total amount* remains the same.

Although in the final justification Anaxagoras says that "it is impossible that they be more than all," he could have also added, for the sake of symmetry, that it is impossible that they be less than all. Generally, I take Anaxagoras's argument to be that any division does not increase or decrease the total. By contrast, Furth explains the reasoning in Anaxagoras's argument thus:

> Changes in the manifestness or "largeness" do not involve any change in the number of the properties, which is a primitive, fixed given, already at the absolute maximum. I think some such thought is the obvious moral of fragment 5, a very pretty piece of reasoning about the place of "less" and "more": **It is necessary to recognize that all things are not in any way less** . . . **or more** . . . **("for it cannot be accomplished" that there be more** . . . **than all**) . . . but all things are always equal. (1991: 118, boldface in the original)

Let me first note that, if this is what Anaxagoras is saying here, namely that when something becomes large and manifest its number does not change, it is not clear why Anaxagoras would think he needed to state it at all—this is an evident and uncontroversial point. Second, when Anaxagoras says διακεκριμένον, even if he had meant "manifest," he could not have reasoned as Furth says he does. The reason why becoming manifest would not have increased the number of properties is not that their number is fixed as a constant in nature and that it is at an absolute maximum. Rather, the reason why becoming large and manifest does not change its number is that it is only a change in size—the now large and manifest was before smaller and unmanifest.

Turning now to Furth's rendition of what he refers to as a "very pretty piece of reasoning," contrast the way Furth reports the argument above and how the full argument reads in the original fragment B5. In reporting the argument, Furth leaves out its initial assumption: "Even though these things have been dissociated in this way." Furth understands this assumption as saying that things become manifest, which of course does not make them "less or more." Importantly, the omission changes the line of reasoning in Anaxagoras's argument. Whereas Anaxagoras is exploring in the argument what happens to the quantity of a thing when increasing its number by dividing its quantity, Furth reverses the logic of it, as if Anaxagoras examined what happens to the number of a thing when its quantity increases, which is not problematic. By contrast, Anaxagoras is investigating the relation of the number of a thing to its total quantity, rather than its size, and concludes that division increases the number, but does not change the quantity. The significance of the argument's conclusion is lost in Furth's rendition of Anaxagoras's reasoning, which may partly explain why Furth does not see the relevance of division in Anaxagoras's ontology. I will not pursue the discussion of Furth's interpretation further here.

Brad Inwood on the other hand reads a tautology in Anaxagoras's argument in B5:

> Each one is always equal to itself, being neither less nor greater than it is. It is better to see this as repeating the main point of fragment 3, that each χρῆμα has equal bigness and smallness, rather than to take it as merely saying tautologically that there are as many kinds of χρηματα as there are. (1986: 30–31)

This is a surprising conclusion, since Inwood's translation of the argument is this: "These things having been distinguished thus, one must recognize that all are in no way lesser or more" (1986: 30). The apodosis by itself is tautological, but there is also a hypothesis that must be taken into account. Anaxagoras is not considering how things are, as such, but what happens when, to use Inwood's translation, "these things have been distinguished." What difference does distinguishing these things make, to Inwood's mind, which leads Anaxagoras to wonder whether distinguishing them makes things lesser or more? The answer is not perspicuous.

An additional difficulty with Inwood's version of the No-Division interpretation is this: how are we to understand Anaxagoras's claim (in Inwood's translation), "Nor is there something which is itself the least of the small"? Inwood proceeds to offer this explanation: "On my hypothesis this states that there is no limit to how thoroughly things can be mixed" (1986: 29). But what is a thorough mixture? Inwood does not explain. In lieu of an explanation, he associates smallness with thorough mixture:

AQ: Please confirm if the quote marks are placed correctly. (NOTE: Single quotation marks are replaced by double quotation marks throughout).

> I would hypothesize that the smallness, for the χρήματα [pairs of opposites, wet-dry, hot-cold, etc.], is simply the condition of being thoroughly distributed in the mixture. There need be no reference to the size of discreet particles, as the traditional theory . . . requires. (1986: 24)

Let us assume, with Inwood, that being thoroughly mixed is being thoroughly distributed in the mixture. The question is: what does it mean to be thoroughly distributed? One hypothesis could be that it means being everywhere in the mixture. But in what sense is something that is everywhere small? Where then would what is large be, and how would it be different from the small? In what sense is the small distributed? Is this an articulated entity that is scattered, or is it a continuous entity? If articulated, into what? If continuous, in what sense is it mixed with other such continuous entities in the same regions, namely, everywhere? Finally and importantly, if an item is everywhere when thoroughly distributed, how can there be degrees of it? How can we understand that there is "no limit to how thoroughly things can be mixed"? I will not pursue the investigation of the No-Division interpretation further, as I believe that the difficulties I have raised for it make it clear that it is not a promising interpretation.

4.5. CLOSING REMARKS

We saw that Anaxagoras likes his paradoxes—he says, for instance, in B1 that each of the opposites, e.g., the hot, the dry, etc., is unlimitedly large and unlimitedly small. Their largeness is generally understood as the total amount of each opposite in the universe. Their smallness has been interpreted in the scholarly literature in different ways, namely in terms of there being very small particles (or masses), or very small proportions of each type of thing in the extreme mixture of everything in everything. The conclusion we are in the position to draw at this stage, having examined the main interpretations existing in the literature, is that we cannot understand Anaxagoras's ontology, as governed by **EE-P**, **NoLeast-P**, and **P-P**, in terms of elements (whether conceived as particles or as mass) *containing* one another ad infinitum, or as somehow merged into a blend in which the elements are present as proportions. Recall Hussey's Containment Regress argument, to the effect that Anaxagoras does not have the conceptual tools to preserve the qualitative differences among kinds of stuff, if each contains all the others, because they all become constitutionally "fuzzy." I submit that the argument applies to *any* interpretation that reads **EE-P** as a relation of containment, whether we think of proportions or masses or particles.

Could we really understand the Anaxagorean mixture if it had such a structure? If each type of thing contains in its constitution every other of the infinitely many types of thing that exist in Anaxagoras's ontology, the mixture becomes *unimaginably* complex, on account of **NoLeast-P**, unable to differentiate between different kinds of thing. The structure of matter will be of at least aleph-1 complexity—that is, it will have at least aleph-1 regresses, of aleph-1 cardinality each. Every part of, e.g., gold would be divisible into aleph-1 parts of gold, each of these parts would contain bits of aleph-0 kinds in it, and each bit would have aleph-1 parts of its *own* kind, each of which would be further divisible . . . and so on and so forth. A regress of unimaginable complexity follows. Hence, we cannot begin to understand difference in kind between these things.

My conclusion is that the problem in so understanding Anaxagoras's ontology lies in the notion of constitutional *containment*. We need a fresh start. My proposal as presented in chapter 3 draws on a largely overlooked part of the textual evidence, where Anaxagoras phrases **EE-P** in terms of the elements that make up his ontology as being *compresent* with one another, rather than as *contained* in one another. It offers an account of Anaxagoras's ontology that is *not* based on constitutional containment, but rather necessary compresence of the opposites, facilitated by the fact that the opposites exist as divided gunk.

4.A. APPENDIX: ZENO'S ARGUMENT FROM MULTITUDE

Controversy has developed in the secondary literature on whether Anaxagoras was responding to Zeno's arguments, or Zeno to Anaxagoras's. John Palmer (2009) recently argued that Anaxagoras was responding to Zeno, and I here adopt this line as my working hypothesis.[19] One of the arguments that Zeno of Elea developed is of particular relevance to our understanding of Anaxagoras's ontology at this stage of our investigation. The argument, an ancestor of the Bradley's regress, is this:

> If there are many things, entities are unlimited; for there are always other entities between entities, and again others between those. And thus entities are unlimited.[20]
>
> εἰ πολλά ἐστιν, ἄπειρα τὰ ὄντα ἐστίν· ἀεὶ γὰρ ἕτερα μεταξὺ τῶν ὄντων ἐστί, καὶ πάλιν ἐκείνων ἕτερα μεταξύ. καὶ οὕτως ἄπειρα τὰ ὄντα ἐστί.

It is here not possible to pay justice to the argument as such and the important scholarly discussion that centers on it. Palmer (2009: 243 ff.) suggests that Anaxagoras was influenced by this Zenonean argument, and thinks it makes sense to suppose that Anaxagoras would have conceived of **EE-P** in

19. There is evidence that Anaxagoras had an even more sophisticated understanding of the infinite than Zeno, insofar as Zeno believed, but Anaxagoras rightly did *not* believe, that if the many things are just as many as they are, they are *finitely* many. Many things can be just as many as they are and be infinitely many, since being infinitely many is not the outcome of change, e.g., of increase in number, as Zeno thought. See, for instance, Palmer (2009: 245–46). For more on the issue of Anaxagoras's dates as such see Mansfeld (1990).

20. Fragment 3, in Palmer's (2009) translation.

terms of a *containment* relation among elements, precisely in reply to Zeno's argument. Palmer explains, in support of this interpretation, that if each element contained parts of every element, this would avoid commitment to the separateness and distinctness of each element from the others. If the elements are neither separate nor distinct from one another, they are not vulnerable to the Zenonean regress above, because they are not many; hence, there are no in "between" entities, since the elements are not separate and distinct. By contrast, on my interpretation of Anaxagoras, his physical system can resist the Zenonean regress on account of the compresence of the elements, rather than on account of their mutual containment.

In thinking about whether the containment or the compresence interpretation avoids the Zenonean regress, my concern is with the density of the continuum. One can distinguish a point, and individuate it, as we do in mathematics, but can the point be separate from other points? I gave reasons to doubt that it can (in section 3.1.2). One can think of a part that is distinct and separate in a whole, e.g., a student in a class; and an entity can be distinct and separate from another entity it overlaps with; e.g., the neutrinos that go through us all the time are distinct from us, even while they momentarily overlap with us. But in neither case is there an assumption of continuum density. Zeno's argument does not explicitly specify either distinctness or separateness, but only the multitude of the entities. Furthermore, there is no conclusive historical and/or textual evidence that Anaxagoras was developing his ontology as an answer to Zeno's argument from multitude quoted above. It suffices to note here that even if Anaxagoras was responding to Zeno's argument from multitude with his cosmic mixture of elements, we have found no reason to assume that this led him to favor the containment over the compresence interpretation, or even vice versa.